White Sands Missile Range, New Mexico
Liquid Propellant Targets

Environmental Assessment

23 May 2002

U.S. Army Space and Missile Defense Command
P.O. Box 1500
Huntsville, Alabama 35807-3801

ENVIRONMENTAL ASSESSMENT
LIQUID PROPELLANT TARGETS AT WHITE SANDS MISSILE RANGE, NEW MEXICO

AGENCY: Missile Defense Agency (MDA)

ACTION: Finding of No Significant Impact

BACKGROUND: Pursuant to the Council on Environmental Quality regulations for implementing the procedural provisions of the National Environmental Policy Act (40 Code of Federal Regulations 1500-1508), Department of Defense (DoD) Instruction 4715.9, and Army Regulation 200-2, the United States Army Space and Missile Defense Command (USASMDC) has conducted an Environmental Assessment (EA) of the potential environmental consequences of launching Liquid Propellant Targets (LPTs), some with aerial dispersion experiments, at White Sands Missile Range (WSMR), New Mexico.

The ability to test current and emerging defensive systems against Scud, Scud-type, and other LPTs at WSMR would provide MDA with the improved capabilities to conduct missile tests and to support the missile defense mission.

DESCRIPTION OF THE PROPOSED ACTION:

The MDA proposes to fuel and launch several Scud, Scud-type, and other LPTs from WSMR annually. It is currently anticipated that there would be approximately 15 launches during the first 5 years. The number of launches in subsequent years is not known at this time, but for purposes of analysis is presumed to be roughly the same. These target missiles would be used in the testing of various sensors to provide realistic overland developmental testing capability against existing and emerging ballistic missile threats. This EA analyzes the potential environmental impacts of conducting Scud, Scud-type, and other LPT missile launches and associated activities, to include the transportation, propellant storage, fueling, launch, flight, aerial dispersion experiments, ground impact, and debris recovery of these LPTs at WSMR.

The existing LPT missile being considered for launch from WSMR is a single stage, liquid-propellant missile, with an inertial guidance system and either a non-separating or a separating payload. The payload section of the LPT can be configured to contain instrumentation or various types of aerial dispersion experiments. Instrumentation payloads would impact on the ground along with the missile body. For LPTs with aerial dispersion experiment payloads, after the LPT begins its descent, the experiment would be triggered with a planned landing in a separate impact area. Experimental payloads could be a single object or multiple objects.

Modification and refurbishment of existing missile systems would be performed in existing facilities before the missile system is transported to WSMR, if necessary, and would be considered routine activities. Those activities are outside the scope of this EA. The MDA has begun development of an LPT that would augment the existing inventory of LPTs. The new LPT would be designed to have characteristics similar to the threat, but would use different propellants, and would be manufactured in the United States. Some likely propellants and the general characteristics of the new LPT are included in the analysis in this EA.

The LPT missiles would be transported to WSMR without fuel and would be stored unfueled in approved storage facilities. The LPT propellants include fuel, oxidizer, and an initiator. Fuels

included in the EA include kerosene coal-tar distillate, JP-8, unsymmetrical dimethylhydrazine (UDMH), monomethylhydrazine (MMH), and hydrazine. Oxidizers include inhibited red fuming nitric acid (IRFNA), hydrogen peroxide, and nitrogen tetroxide. The liquid propellants would be transported separately and would be stored at approved liquid propellant storage facilities. All transportation would be performed in accordance with U.S. Department of Transportation (DOT) approved procedures and routing requirements, as well as Occupational Safety and Health Administration requirements and U.S. Army safety regulations. Liquid propellants would be transported in DOT-approved containers. All safety procedures would be coordinated and approved through the WSMR Environment and Safety Directorate.

The LPT would use very small amounts (approximately 500 grams [1.1 pounds]) of explosive ordnance (solid propellant gas generator charge, ignitor cap, and squibs) for flight termination. Some aerial dispersion experiments would also use approximately 500 grams (1.1 pounds) of explosive to trigger the experiment. Explosive ordnance would be temporarily stored in an existing pyrotechnic storage facility on WSMR until installed in the missiles.

LPT missiles would be fueled before launch, typically over a 3-day period. Fueling would occur at Launch Complex (LC)-36 or at one of the proposed launch sites. All personnel involved in fueling operations would wear appropriate personal protective equipment and would receive specialized training in liquid propellant safety, handling, spill containment, and cleanup procedures before handling the materials. After fueling, the missile would be temporarily staged for several days (no more than 30) until transported to the launch area. The starter fuel would be transferred from a holding vessel on the launch vehicle to the missile by remote activation approximately 15 minutes before the planned launch.

Selection of a launch site would be determined by the specific requirements of a test program. LPTs launched from the northern launch sites would follow a ballistic trajectory and impact on one of the existing impact areas (G-10, G-16, G-20, or G-25) or a new impact area located southeast of Highway 70. LPTs launched from the southern launch sites would follow a ballistic trajectory and impact on one of the existing impact areas (649 Impact Area or AFSWC Target), one of two new impact areas north of the 649 Impact Area, or a new impact area located north of the Oscura Bombing Range. Prior to launches from Mine site, or other sites that would result in a trajectory that crosses White Sands pupfish habitat, the WSMR Environment and Safety Directorate would coordinate with the proponent and WSMR flight safety to review flight termination considerations for the White Sands pupfish. The New Mexico Game and Fish Department would also be notified of these planned launches.

The WSMR Environment and Safety Directorate would be notified before recovery activities begin. Following a test, critical or hazardous debris would be recovered as soon as the missile and immediate area are determined to be safe for recovery activities. The recovery team would wear appropriate protective clothing during recovery to minimize the potential for exposure to potentially hazardous materials. The WSMR Environment and Safety Directorate would be called to provide assistance, as determined necessary, in areas of sensitive resources.

Missile and aerial dispersion experiment debris, and oxidizer or fuel released after a test or termination, would be handled in accordance with the WSMR Installation Spill Contingency Plan (Annex G, Appendix I of the WSMR Disaster Control Plan). In accordance with the Military Munitions Rule, the WSMR Environment and Safety Directorate would determine what range clearance and remediation actions are necessary to support WSMR operations.

Missile and aerial dispersion experiment debris would be rendered safe, loaded onto a truck, and transported to the Range Residue Accumulation Point. If access to the debris were not possible with a vehicle, then the debris would be carried by helicopter sling to a nearby road for transport to the Range Residue Accumulation Point. All debris would be characterized to determine whether if it is hazardous waste. Hazardous waste would be disposed of via permitted procedures through the WSMR Hazardous Waste Storage Facility. There would be no on-site treatment of hazardous waste, except in the event of an emergency response requirement as allowed in the WSMR Resource Conservation and Recovery Act permit and U.S. Environmental Protection Agency regulations.

The majority of recovery operations would utilize existing roads and recovery by foot. Off-road vehicle recovery operations would be undertaken only if necessary, and would be coordinated with the WSMR Environment and Safety Directorate and other required WSMR organizations. Recovery operations would be carried out in accordance with the WSMR *Standard Operating Procedure for Environmental Protection During Recovery Action*. This standard operating procedure focuses on guidelines for avoidance of known sensitive areas on WSMR (e.g., Salt Creek and other White Sands pupfish habitat, San Andres National Wildlife Refuge, and Trinity Site National Historic Landmark) but also provides specific guidance for recovery in areas of unknown natural and cultural resources sensitivity. Sensitive areas are delineated in the text of the standard operating procedure and are graphically depicted as areas to be avoided or treated with higher levels of caution and review approval. Recovery operations would be limited to necessary vehicles and off-road access would follow the same entry route, to the extent possible, to complete the operation with minimal disturbance.

LPTs used in aerial dispersion experiments may include the use of submunitions and simulated chemical/biological agents as payloads to test lethality of LPTs with different types of payloads. Lethality testing involves conducting a kill assessment to evaluate the effectiveness of a test. Although there are presently no plans to use submunitions and simulated chemical/biological agents as payloads, they may be used in future testing of LPTs at WSMR. Information about potential submunitions and/or simulants is currently not available, and therefore, additional environmental analysis would be performed as needed, for any future tests involving lethality testing components.

ALTERNATIVES CONSIDERED BUT NOT CARRIED FORWARD:

Alternative Test Range. Poker Flat Research Range (PFRR), Alaska, is an overland range that was originally considered the preferred alternative for some of the initial LPT tests that include dispersion experiments in the payload. One of the limitations for using the PFRR is the requirement to conduct tests when the ground and surface waters are frozen. This limits testing to the December-April timeframe. Tests that were originally planned for April 2002 have been delayed, and therefore, could not be conducted at PFRR. Dispersion experiments require instrumentation at the impact area. The remote location of impact areas at PFRR would require airlifting the instrumentation and support equipment and establishing remote base camps. However, logistical support from Alaska-based military units was limited by ongoing military operations supporting Operation Enduring Freedom. A critical radar asset was also not available due to wartime requirements. Obtaining alternate logistic and radar support within the December to April testing window was not feasible, and the delays incurred if the experiments were kept at PFRR would unacceptably increase the cost and mission risks to the program. In addition, further evaluation has shown that the relatively short trajectories at WSMR would meet the test requirements. Due to the seasonal, cost, and logistics constraints involved in the PFRR

alternative and the revised trajectory requirements, the PFRR alternative was not carried forward.

Missile Fueling at National Aeronautics and Space Administration White Sands Test Facility (WSTF). Missile fueling at WSTF was not carried forward because it would require transportation of the fueled missile over public roads, and because the longer distances involved in transportation from WSTF to candidate launch sites on WSMR could create avoidable hazards.

LPT Launches at LC-94 or McGregor Range, Fort Bliss, Texas. LC-94 is located in the northern call-up area of WSMR, which includes a considerable amount of privately owned land. LPT launches from McGregor Range, Fort Bliss, were also considered as an alternative.

Launches at either of these alternative sites would require additional coordination, scheduling, and environmental analysis that could delay the LPT program schedule. Therefore, selection of these locations for LPT launch activities was not carried forward for analysis in this EA.

WSMR Former Liquid Propellant Storage Facility. Missile storage at the WSMR former Liquid Propellant Storage Facility was not carried forward because of site conflicts. Two 381-meter (1,250-foot) explosive safety quantity distance arcs cover a portion of the facility, and additional coordination would be required with the Army Tactical Missile System project office, operators of the radiography bunkers, and the WSMR Environment and Safety Directorate.

ALTERNATIVES TO THE PROPOSED ACTION:

No-action. Under the No-action Alternative, MDA would not proceed with LPT missile activity at WSMR. Flight test information for LPT missiles, needed for development of defensive missile sensors and other emerging technology, would not be collected from test activities at WSMR.

Lance missiles, which use liquid propellants, would continue to be launched as targets as part of the ongoing missile test activity at WSMR. Current testing and support activities at WSMR, involving a wide range of sensors and specialized equipment and facilities, would continue.

ENVIRONMENTAL EFFECTS:

Proposed Action. To provide a context for understanding the potential effects of the Proposed Action and a basis for assessing the significance of potential impacts, several environmental resource areas were evaluated. The resource areas determined to have a potential for impacts were airspace, air quality, biological resources, cultural resources, geology and soils, hazardous materials and waste, health and safety, land use, noise, water resources, and environmental justice. Each environmental resource was evaluated according to a list of activities that were determined to be necessary to accomplish the Proposed Action.

Implementation of the Proposed Action would result in negligible, short-term impacts to airspace, air quality, health and safety, land use, noise, transportation and infrastructure, and no impacts to environmental justice. Missile impact and debris recovery and disposal operations would result in minor impacts to biological resources, cultural resources, geology and soils, hazardous materials and waste, and water resources. Standard operating procedures and

mitigation measures have been incorporated into the Proposed Action to ensure the impacts do not exceed acceptable levels.

No-action Alternative. Under the No-action Alternative, no environmental consequences associated with the LPT activities are anticipated.

CONCLUSION: The resulting environmental analysis shows that no significant impacts would occur from the proposed LPT activities. Preparation of an Environmental Impact Statement, therefore, is not required.

ENVIRONMENTAL ASSESSMENT
LIQUID PROPELLANT TARGETS AT WHITE SANDS MISSILE RANGE, NEW MEXICO

AGENCY: Missile Defense Agency

ACTION: Finding of No Significant Impact

MISSILE DEFENSE TARGETS JOINT PROJECT OFFICE

_____ DATE: 8 Oct 02

MICHAEL E. JOHNSON
COL, AD
Project Manager

WHITE SANDS MISSILE RANGE ENVIRONMENT AND SAFETY DIRECTORATE:

Thomas A. Ladd DATE: 28oct02

THOMAS A. LADD
Director, Environment and Safety Directorate

WHITE SANDS MISSILE RANGE:

_____ DATE: 31 Oct 02

WILLIAM F. ENGEL
Brigadier General, USA
Commanding

APPROVED:

MISSILE DEFENSE AGENCY:

Ronald T. Kadish DATE: 13 NOV 02

RONALD T. KADISH
Lieutenant General, USAF
Director

APPROVED:

_____ DATE:_____

THOMAS A. LADD
Director, Environment and Safety Directorate

APPROVED:

_____ DATE: _____

HECTOR F. LOZANO
Acting Director, Material Test Directorate

APPROVED:

_____ DATE: _____

GLENN A. HERMAN
Director, National Range Operations

REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 0704-0188

1a. REPORT SECURITY CLASSIFICATION
Unclassified

1b. RESTRICTIVE MARKINGS

2a. SECURITY CLASSIFICATION AUTHORITY

3. DISTRIBUTION/AVAILABILITY OF REPORT

2b. DECLASSIFICATION/DOWNGRADING SCHEDULE

4. PERFORMING ORGANIZATION REPORT NUMBER(S)

5. MONITORING ORGANIZATION REPORT NUMBER(S)

6a. NAME OF PERFORMING ORGANIZATION
U.S. Army Space and Missile Defense Command

6b. OFFICE SYMBOL *(If applicable)*
SMDC-EN-V

7a. NAME OF MONITORING ORGANIZATION

6c. ADDRESS *(City, State, and ZIP Code)*
P.O. Box 1500
Huntsville, Alabama 35807-3801

7b. ADDRESS *(City, State, and ZIP Code)*

8a. NAME OF FUNDING/SPONSORING ORGANIZATION
Missile Defense Agency

8b. OFFICE SYMBOL *(if applicable)*
MDA

9. PROCUREMENT INSTRUMENT IDENTIFICATION NUMBER

8c. ADDRESS *(City, State, and ZIP Code)*

10. SOURCE OF FUNDING NUMBERS

PROGRAM ELEMENT NO.	PROJECT NO.	TASK NO.	WORK UNIT ACCESSION NO.

11. TITLE *(Include Security Classification)*
White Sands Missile Range, New Mexico Liquid Propellant Target Environmental Assessment

12. PERSONAL AUTHOR(S)

13a. TYPE OF REPORT	13B. TIME COVERED	14. DATE OF REPORT *(Year, Month, Day)*	15. PAGE COUNT
Final	FROM 2002 TO 2007	2002, May 23	236

16. SUPPLEMENTARY NOTATION

17. COSATI CODES			18. SUBJECT TERMS *(Continue on reverse if necessary and identify by block number)*
FIELD	GROUP	SUB-GROUP	Environmental Assessment

19. ABSTRACT *(Continue on reverse if necessary and identify by block number)*

The purpose of the Proposed Action is to expand the capabilities of WSMR to provide launches of Scud-type LPT missiles for flight analyses. This environmental assessment analyzes the potential environmental effects that could result from LPT program activities. Program activities include the transportation, fuel storage, fueling, launch, flight, ground impact, and debris recovery of these LPT missiles at WSMR. Intercepts are not included in this EA. Eleven broad environmental components were considered to provide a context for understanding the potential effects of the proposed action and to provide a basis for assessing the severity of potential impacts. The 11 areas of environmental consideration, discussed briefly as follows, are air quality, airspace, biological resources, cultural resources, geology and soils, hazardous materials and waste, health and safety, land use, transportation and infrastructure, noise, and water resources. No significant impacts were identified in the analysis.

20. DISTRIBUTION/AVAILABILITY OF ABSTRACT
[X] UNCLASSIFIED/UNLIMITED [ ] SAME AS RPT. [ ] DTIC USERS

21. ABSTRACT SECURITY CLASSIFICATION
Unclassified

22a. NAME OF RESPONSIBLE INDIVIDUAL	22b. TELEPHONE *(Include Area Code)*	22c. OFFICE SYMBOL
Julia Hudson-Elliot	(256) 955-4822	SMDC-EN-V

EXECUTIVE SUMMARY

EXECUTIVE SUMMARY

Introduction

The Missile Defense Agency (MDA) is assigned the mission, functions, and responsibilities for ballistic missile defense programs, projects, and activities. As part of an extensive ballistic missile defense research program, the Liquid Propellant Target (LPT) program is designed to provide Scud, Scud-type, and other LPT missiles, including a new LPT currently being developed by the MDA, for use as targets for several anti-missile and other emerging or future defensive platform technologies.

The ability to test current and emerging defensive systems against Scud, Scud-type, and other LPTs at White Sands Missile Range (WSMR) would provide WSMR with the capabilities to better support the MDA in tests of military systems being developed to respond to existing and emerging missile threats.

Test Program Activities

The MDA proposes to fuel and launch several Scud, Scud-type, and other LPTs per year. It is currently anticipated that there would be approximately 15 launches in the first 5 years. The number of launches anticipated in subsequent years is not known at this time, but for purposes of analysis is presumed to be roughly the same. These target missiles would be used in the testing of various sensors to provide realistic overland developmental testing capability against existing and emerging ballistic missile threats. This environmental assessment (EA) analyzes the potential environmental impacts of conducting Scud, Scud-type, and other LPT missile launches and associated activities, to include the transportation, propellant storage, fueling, launch, flight, aerial dispersion experiments, ground impact, and debris recovery of these LPT missiles at WSMR. The launch and testing of Lance missiles, and other previously used liquid propellant missiles at WSMR, is considered an ongoing activity under the No-action Alternative of this document.

The existing LPT missile under consideration for launching from WSMR is a single stage, liquid-propellant missile, with an inertial guidance system and a non-separating payload or a separating payload. The payload section of the LPT can be configured to contain instrumentation or various types of aerial dispersion experiments. Instrumentation payloads would impact along with the missile body. For LPTs with aerial dispersion experiment payloads, after the LPT begins its descent, the experiment would be triggered and impact in a separate impact area. Experimental payloads could be a single object or multiple objects. For example, a typical aerial dispersion experiment payload could contain between 25 to 50 metal objects, each weighing 15 to 25 kilograms (33 to 55 pounds).

Modification and refurbishment of existing missile systems would be performed in existing facilities before the missile system is transported to WSMR, if necessary, and would be considered routine activities. The MDA has begun development of an LPT that would augment the existing inventory of LPTs. The new LPT would be designed to have characteristics similar to the threat, but would use different propellants, and would be

manufactured in the United States. Some likely propellants and the general characteristics of the new LPT are included in the analysis in this EA.

The LPT missiles would be transported to WSMR without fuel, and would be stored unfueled in approved storage facilities. The LPT propellant includes fuel, oxidizer, and an initiator fuel. Fuels included in the EA include kerosene coal-tar distillate, JP-8, unsymmetrical dimethylhydrazine, monomethylhydrazine, and hydrazine. Oxidizers include inhibited red fuming nitric acid (IRFNA), hydrogen peroxide, and nitrogen tetroxide. The liquid propellants would be transported separately, and would be stored at approved liquid propellant storage facilities. All transportation would be performed in accordance with appropriate U.S. Department of Transportation (DOT) approved procedures and routing, as well as Occupational Safety and Health Administration requirements and U.S. Army safety regulations. Liquid propellants would be transported in DOT approved containers. All safety procedures would be coordinated and approved through the WSMR Environment and Safety Directorate.

The LPT would use very small amounts (approximately 500 grams [1.1 pounds]) of explosive ordnance (solid propellant gas generator charge, ignitor cap, and squibs) for flight termination. Some aerial dispersion experiments would also use approximately 500 grams (1.1 pounds) of explosive to trigger the experiment. Explosive ordnance would be temporarily stored in an existing pyrotechnic storage facility on WSMR until installed in the missiles.

LPT missiles would be stored unfueled, and would be fueled before launch, typically over a 3-day period. All personnel involved in fueling operations would wear appropriate personal protective equipment and would receive specialized training in liquid propellant safety, handling, spill containment, and cleanup procedures before handling the materials. After fueling, the missile would be temporarily staged for several days (no more than 30) until transported to the launch area. The starter fuel would be transferred from a holding vessel on the launch vehicle to the missile by remote activation approximately 15 minutes before the planned launch.

Selection of a launch site would be determined by the specific requirements of a test program. LPTs launched from the northern launch sites would follow a ballistic trajectory and impact on one of the existing G impact areas (G-10, G-16, G-20, or G-25) or a new impact area located southeast of Highway 70. LPTs launched from the southern launch sites would follow a ballistic trajectory and impact on one of the existing impact areas (649 Impact Area or AFSWC Target), one of two new impact areas north of the 649 Impact Area, or a new impact area located north of the Oscura bombing range. Prior to launches from Mine site, or other sites that would result in a trajectory that crosses White Sands pupfish habitat, the WSMR Environment and Safety Directorate would coordinate with the proponent and WSMR flight safety to review flight termination considerations for the White Sands pupfish. The New Mexico Game and Fish Department would also be notified of the planned launches.

The WSMR Environment and Safety Directorate would be notified before recovery activities begin. Following a test, critical or hazardous debris would be recovered as soon

as the missile and immediate area are determined to be safe for recovery activities. The recovery team would wear appropriate protective clothing during recovery to minimize the potential for exposure to potentially hazardous materials. The WSMR Environment and Safety Directorate would coordinate debris recovery in areas of sensitive resources, in accordance with WSMR guidance and technical support documents, to minimize intrusion and disturbance in the area.

Missile and aerial dispersion experiment debris and oxidizer or fuel released after a test or termination would be handled in accordance with the WSMR Installation Spill Contingency Plan (Annex G, Appendix I of the WSMR Disaster Control Plan). In accordance with the Military Munitions Rule, the WSMR Environment and Safety Directorate would determine what range clearance and remediation actions are necessary to support WSMR operations.

Missile and aerial dispersion experiment debris would be rendered safe, loaded onto a truck, and transported to the range residue accumulation point at the former liquid propellant storage site. If access to the debris is not possible with a vehicle, then the debris would be carried by helicopter sling to a nearby road for transport to the range residue accumulation point. All debris would be characterized to determine if it is hazardous waste. Hazardous waste would be disposed of via permitted procedures through the WSMR Hazardous Waste Storage Facility. There would be no on-site treatment of hazardous waste except in the event of an emergency response requirement as allowed in the WSMR Resource Conservation and Recovery Act permit and U.S. Environmental Protection Agency regulations.

The majority of recovery operations would utilize existing roads and recovery by foot. Off-road vehicle recovery operations would be undertaken only if necessary, and would be coordinated with the WSMR Environment and Safety Directorate and other required WSMR organizations. Recovery operations would be carried out in accordance with the WSMR *Standard Operating Procedure for Environmental Protection During Recovery Action*. This standard operating procedure focuses on guidelines for avoidance of known sensitive areas on WSMR (e.g., Salt Creek and other White Sands pupfish habitat, San Andres National Wildlife Refuge, and Trinity Site National Historic Landmark) but also provides specific guidance for recovery in areas of unknown natural and cultural resources sensitivity. Sensitive areas are delineated in the text of the standard operating procedure and are graphically depicted as areas to be avoided or treated with higher levels of caution and review approval. Recovery operations would be limited to necessary vehicles and off-road access would follow the same entry route, to the extent possible, to complete the operation with minimal disturbance.

LPTs used in aerial dispersion experiments may include the use of submunitions and simulated chemical/biological agents as payloads to test lethality of LPTs with different types of payloads. Lethality testing involves conducting a kill assessment to evaluate the effectiveness of a test. Although there are presently no plans to use submunitions and simulated chemical/biological agents as payloads, they may be used in future testing of LPTs at WSMR. Information about potential submunitions and/or simulants is currently not available and therefore, additional environmental analysis would be performed as needed, for any future tests involving lethality testing components.

Alternatives Considered but not Carried Forward

Alternative Test Range. A land range is required for aerial dispersion experiments, since part of the test objective is to observe dispersion patterns of the dispersed objects. Initially, WSMR was determined not to be large enough to accommodate the trajectories required for these tests. Poker Flat Research Range (PFRR), Alaska, is an overland range that was originally considered the preferred alternative for some of the initial LPT tests that include aerial dispersion experiments in the payload. One of the limitations for using the PFRR is the requirement to conduct tests when the ground and surface waters are frozen. This limits testing to the December to April timeframe. Tests that were originally planned for April 2002 have been delayed, and therefore could not be conducted at PFRR. Dispersion experiments require instrumentation at the impact area. The remote location of impact areas at PFRR would require airlifting the instrumentation and support equipment, and establishing remote base camps. However, logistical support from Alaska-based military units was limited by ongoing military operations supporting Operation Enduring Freedom. A critical radar asset was also not available due to wartime requirements. Obtaining alternate logistic and radar support within the December to April testing window was not feasible, and the delays incurred if the experiments were kept at PFRR would unacceptably increase the cost and mission risks to the program. In addition, further evaluation has shown that the relatively short trajectories at WSMR would meet the test requirements. Due to the seasonal, cost, and logistics constraints involved in the PFRR alternative and the revised trajectory requirements, PFRR was not carried forward.

Missile Fueling at National Aeronautics and Space Administration White Sands Test Facility (WSTF). Missile fueling at WSTF was not carried forward because it would require transportation of the fueled missile over public roads, and because the longer distances involved in transportation from WSTF to candidate launch sites on WSMR could create avoidable hazards.

LPT Launches at LC-94 or McGregor Range, Fort Bliss. LC-94 is located in the northern call-up area of WSMR, which includes a considerable amount of privately owned land. LPT launches from McGregor Range, Fort Bliss, were also considered as an alternative.

Either of these alternatives would require additional coordination, scheduling, and environmental analysis that could delay the LPT program schedule. Therefore, selection of these locations for LPT launch activities was not carried forward for analysis in this EA.

WSMR Former Liquid Propellant Storage Facility. Missile storage at the WSMR former liquid propellant storage facility was not carried forward because of site conflicts. Two 381-meter (1,250-foot) explosive safety quantity distance arcs cover a portion of the facility, and additional coordination would be required with the Army Tactical Missile System project office, operators of the radiography bunkers, and the WSMR Environment and Safety Directorate.

Alternatives to the Proposed Action

No-action. Under the No-action Alternative, MDA would not proceed with LPT missile activity at WSMR. Flight test information for LPT missiles, needed for development of

defensive missile sensors and other emerging technology, would not be collected from test activities at WSMR.

Liquid propellant missiles, primarily the Lance, would continue to be launched as targets as part of the ongoing missile test activity at WSMR. Use of the Lance missile was analyzed in the *Lance Missile Target Environmental Assessment* (Cortez III Environmental, 1996). The launch and testing of Lance missiles and other previously used liquid propellant missiles at WSMR are considered an ongoing activity under the No-action Alternative of this document. The analysis in the Lance EA is incorporated by reference. Its executive summary is included as appendix E.

Methodology

The purpose of this EA is to analyze the potential environmental consequences of the proposed LPT activities in compliance with the National Environmental Policy Act (NEPA), the Council on Environmental Quality regulations implementing NEPA (40 Code of Federal Regulations 1500-1508), Army Regulation 210-20*, Master Planning for Army Installations*, Department of Defense Instruction 4715.9, and Army Regulation 200-2, *Environmental Effects of Army Actions*.

Eleven broad environmental components were considered to provide a context for understanding the potential effects of the proposed action and to provide a basis for assessing the severity of potential impacts. The 11 areas of environmental consideration, include air quality, airspace, biological resources, cultural resources, geology and soils, hazardous materials and waste, health and safety, land use, transportation and infrastructure, noise, and water resources. Socioeconomics was not considered beyond an initial look, since personnel would be drawn from the existing workforce, with minimal impacts to socioeconomics in the affected region. Environmental Justice impacts are discussed in section 4.19.

To assess the significance of any impact, a list of activities necessary to accomplish the Proposed Action was developed. The affected environment at all proposed LPT flight testing locations was then described. Next, those activities with the potential for environmental consequences were identified. The level of analysis was commensurate with the potential of program activities to affect specific environmental resource areas.

Results

This section summarizes the conclusions of the analyses made for each of the 11 areas of environmental consideration.

Air Quality. The proposed LPT activities present the potential for impact to air quality due to liquid propellant fueling, the emission of missile exhaust products, and recovery of LPTs. Fueling activities would release minor amounts of fuel and oxidizer to the atmosphere. LPT exhaust includes carbon monoxide, carbon dioxide, hydrogen, nitrogen, and water. Operations personnel would be evacuated to a safe distance before launch according to established launch procedures, and non-operations personnel would be excluded from the launch area during launch operations. Missile launches are brief, discrete events, and

favorable wind conditions in the region would result in dispersal of combustion products over large areas and would not affect compliance with air quality standards. A nominal LPT flight would result in short-term air quality impacts at the LPT impact location. Standard operating procedures would establish appropriate response and recovery actions and would include personal protective equipment and determination of appropriate recovery zone hazard boundaries.

Airspace*.* Missile launch, flight, and impact would be contained with the R-5107 complex airspace, a special-use airspace specifically designated to segregate military operations from civilian and commercial airspace users. R-5111 would also be used when the Western Call-up area is used. LPT launches would not affect airborne activities and would not interfere with any low- or high-altitude en route airways or jet routes typically used by civilian and commercial airplanes. Although military airspace use within this complex would be affected, coordination with the Federal Aviation Administration and Holloman Air Force Base would minimize any adverse effects on military aircraft operations.

Biological Resources. The transportation of LPTs, fuel, and oxidizer would not be expected to impact biological resources. Personnel would be instructed to avoid all contact with wildlife that may be encountered during flight preparation activities. Based on previous wildlife studies and coordination with the WSMR Environment and Safety Directorate, noise associated with missile launches and post-flight recovery operations is not expected to cause adverse long-term effects to any threatened, endangered, or sensitive species of wildlife.

Selection of new impact areas would be coordinated with the WSMR Environment and Safety Directorate. Required biological surveys would be completed before any ground-disturbing activities.

Test flight trajectories would be planned to avoid impacts in the San Andres National Wildlife Refuge, White Sands National Monument, White Sands pupfish habitat, and other sensitive habitats. A qualified biologist would accompany the debris-recovery team if determined necessary by the WSMR Environment and Safety Directorate. Impact of the LPT or metal objects from the aerial dispersion experiment would result in disturbance of the ground surface and the loss of some plants in the debris impact areas. Oxidizer or fuel released after a test or termination would be handled in accordance with the WSMR Installation Spill Contingency Plan.

Cultural Resources. Existing impact areas for LPT testing have been previously surveyed. The results of the survey indicate several sites that have been determined to be National Register of Historic Places eligible. LPT missiles would be targeted away from these sites. For new impact areas that have previously been surveyed, avoidance, site testing, or data recovery, as appropriate, would be undertaken before the area is used for LPT missile or aerial dispersion experiment impacts. New impact areas that have not been surveyed would need to be surveyed in coordination with the WSMR Environment and Safety Directorate and consultation with the State Historic Preservation Officer before the area is used as a missile or aerial dispersion experiment impact area.

Geology and Soils. Geology and soils impacts could result from missile or aerial dispersion experiment impact and soil compaction and devegetation caused by accessing missile and aerial dispersion experiment impact sites and repairing the impact. Recovery operations would be carried out according to WSMR standard operating procedures and regulations to minimize soil disturbance. In addition to the potential for physical disturbance to the overlying soils, there is also a potential for soil contamination. After missile or aerial dispersion experiment impact in the impact area, if the oxidizer and fuel do not explode or burn at impact, then they would most likely be deposited on the ground. Oxidizer or fuel released after a test or termination would be handled in accordance with the WSMR Installation Spill Contingency Plan.

Off-road vehicle recovery operations would be undertaken only if necessary and in coordination with the WSMR Environment and Safety Directorate and the WSMR *Standard Operating Procedure for Environmental Protection During Recovery Action*. After recovering the target missile, the affected area would be restored to original grade where practicable to minimize any potential for water or wind erosion.

Hazardous Materials and Waste. All hazardous materials, such as solvents, propellants, and ordnance, would be transported, stored, handled, and disposed of according to manufacturers' instructions, Material Safety Data Sheet recommendations, internal standard operating procedures, and all applicable Federal, state, and community regulations and procedures. Emergency response planning would be incorporated into the LPT operations requirement in order to minimize any impacts due to an unplanned release of hazardous materials.

For a nominal flight, the missile would contain unburned propellant when it impacts the range within the planned impact area. Entry to the impact site would be restricted to approved hazardous materials response personnel until the area is determined to be safe. Missile and aerial dispersion experiment debris, and oxidizer or fuel released after a test or termination, would be handled in accordance with the WSMR Installation Spill Contingency Plan (Annex G, Appendix I of the WSMR Disaster Control Plan). In accordance with the Military Munitions Rule, the WSMR Environment and Safety Directorate would determine what range clearance and remediation actions are necessary to support WSMR operations.

Health and Safety. The WSMR Missile Flight Safety Office must approve all flight plans and trajectories and all planned impact areas. All nonessential personnel, private landowners, and the general public would be evacuated from all launch and impact areas before launch, and essential personnel would be removed to protected areas. Hazardous pre-launch operations including missile fueling would be conducted in accordance with standard operating procedures approved by the WSMR Environment and Safety Directorate and in accordance with all other applicable regulations. Personnel directly involved in fueling would wear appropriate personal protection equipment, and anyone not directly involved would be evacuated to a safe distance. The WSMR Installation Spill Contingency Plan would be incorporated into the standard operating procedures to enable rapid response to any leak and minimize the threat such a leak would pose to personnel and to the environment. Debris-recovery activities would be conducted in accordance with WSMR standard operating procedures.

Emergency response actions would be performed in accordance with the WSMR Missile Mishap Plan, Annex P to the Disaster Control Plan, and would include restricting access to the impact site at a distance sufficient to ensure personnel safety.

Land Use. All of the proposed program activities would take place in existing facilities or locations dedicated to missile testing activities. These activities would not alter the uses of the sites, which were in the past or currently are used to support missile testing. The use of LC-36 would require additional agreements with the Navy. The use of National Aeronautics and Space Administration WSTF for propellant storage is covered by existing agreements. Potential new impact areas within the WSMR range boundaries would require additional coordination. Launches would require road closures and the temporary evacuation of applicable portions of WSMR and in some cases the Western Call-up area. Use of the Western Call-up area is a normal, although infrequent practice, which is covered in existing evacuation agreements with private landowners and a Memorandum of Understanding with the Department of the Interior.

Noise. Launch noise at WSMR and the Western Call-up area would be of short duration, and operations personnel would be protected in control blockhouses or other protective shelter. Noise impacts would be mitigated by off-limit zones and hearing protection. Noise associated with debris recovery, such as the use of helicopters and motor vehicles, would produce elevated noise levels for a short period of time.

Transportation and Infrastructure. Maximum use would be made of existing infrastructure and facilities at each launch site. There would be additional temporary infrastructure demands from LPT flight testing activities on electrical, water, wastewater, fire protection, health, and police services. Road closures, although inconvenient, are relatively common in the area.

Water Resources. The potential for release to surface waters due to LPT flight testing activities would be minimal. There is no surface water within the proposed LPT missile or aerial dispersion experiment impact areas. Liquid propellants would potentially be released to the soil when the LPT missile lands in the impact area. The WSMR Environment and Safety Directorate would determine appropriate range clearance and remediation actions.

Cumulative Impacts

There would be an increase in overall emissions from missile launches, which would be short-term and localized. No effect on long-term air quality at WSMR would occur. Debris impact and recovery activities could have a cumulative impact on biological and cultural resources, soils, and surface water due to additional ground disturbance. However, the impacts would be minor and would be mitigated by carefully selecting and minimizing the number of recovery routes.

ACRONYMS AND ABBREVIATIONS

ACRONYMS AND ABBREVIATIONS

ACGIH	American Conference of Governmental Industrial Hygienists, Inc.
AFB	Air Force Base
AFSWC	Air Force Space Warfare Center
BOE	Bureau of Explosives
dB	decibel
dBA	A-weighted decibels
DoD	Department of Defense
DOT	Department of Transportation
EA	environmental assessment
EIS	Environmental Impact Statement
EOC	Emergency Operations Center
EOD	Explosive Ordnance Disposal
ERINT	Extended Range Interceptor
ESQD	explosive safety quantity-distance
FAA	Federal Aviation Administration
FTS	Flight Termination System
IDLH	Immediately Dangerous to Life or Health
IRFNA	inhibited red fuming nitric acid
kV	kilovolt
LC	Launch Complex
LER-4	Lance Extended Range–4
L_{max}	maximum sound level
LPT	liquid propellant target
m^3	cubic meter(s)
MDA	Missile Defense Agency
mg/m^3	milligrams per cubic meter
MMH	monomethylhydrazine
MSDS	Material Safety Data Sheet
NAAQS	National Ambient Air Quality Standards
NASA	National Aeronautics and Space Administration
National Register	National Register of Historic Places

NEPA	National Environmental Policy Act
NIOSH	National Institute for Occupational Safety and Health
OSHA	Occupational Safety and Health Administration
PEL	Permissible Exposure Limit
PFRR	Poker Flat Research Range
PM-10	particulate matter with a mean aerodynamic diameter less than or equal to a nominal 10 microns
ppm	parts per million
RCRA	Resource Conservation and Recovery Act
ROI	region of influence
SHPO	State Historic Preservation Officer
SOP	Standard Operating Procedure
STEL	Short-term Exposure Limit
TLV	Threshold Limit Value
UDMH	unsymmetrical dimethylhydrazine
U.S.	United States
USASMDC	United States Army Space and Missile Defense Command
U.S. EPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
WSMR	White Sands Missile Range
WSTF	White Sands Test Facility

CONTENTS

CONTENTS

APPENDICES

FIGURES

TABLES

THIS PAGE INTENTIONALLY LEFT BLANK

1.0 PURPOSE OF AND NEED FOR THE PROPOSED ACTION

1.0 PURPOSE OF AND NEED FOR THE PROPOSED ACTION

1.1 INTRODUCTION

The National Environmental Policy Act (NEPA), the Council on Environmental Quality regulations implementing NEPA (40 Code of Federal Regulations 1500-1508), Department of Defense (DoD) Instruction 4715.9, Army Regulation 210-20*, Master Planning for Army Installations*, and Army Regulation 200-2, *Environmental Effects of Army Actions,* direct that Department of the Army officials take into account environmental consequences when authorizing or approving major Federal actions. The U.S. Army Space and Missile Defense Command (USASMDC) has prepared this Environmental Assessment (EA) to analyze an additional category of target missiles proposed for launching, possible simulated training exercises, and testing at the White Sands Missile Range (WSMR), New Mexico.

1.2 BACKGROUND

The experience of the U.S. coalition forces and U.S. allies with ballistic missile attacks during the Gulf War of 1991 (Operation Desert Storm) highlighted the need for an effective missile defense. Because Scud and Scud-type missiles were the principal hostile ballistic missile forces encountered during the war, and variants of these missiles continue to be among the most proliferated in the world, the Missile Defense Agency (MDA) has expanded its inventory of target missiles to include these liquid propellant missiles. These missiles are proposed for use in the testing of various sensors and other emerging or future defensive platform technologies. Scud, Scud-type, and other liquid propellant target (LPT) missiles, including a new LPT currently being developed by the MDA, would use propellants as described in chapter 2 and analyzed in this document. Since the new LPT under development by MDA is in the initial stages of design, it will be analyzed generically in this document. Separate NEPA analysis will be prepared as required for its development activities when it is further defined. The ability to launch Scud, Scud-type, and other LPTs at WSMR would enhance the overall missile defense program test capabilities.

Liquid propellant missiles, primarily the Lance, have been launched at WSMR. Use of the Lance missile was analyzed in the *Lance Missile Target Environmental Assessment* (Cortez III Environmental, 1996). The launch and testing of Lance missiles and other previously used liquid propellant missiles at WSMR are considered an ongoing activity under the No-action Alternative of this document. The analysis in the Lance EA is incorporated by reference. Its executive summary is included as appendix E.

Some tests, such as dispersion experiments, require observation of debris dispersion patterns and analysis of debris, which requires an overland range. Other ranges, such as Vandenberg AFB, are being considered for some LPT testing that does not require an

overland range, and are not part of this analysis, since the testing requirements are different.

WSMR is a DoD major range and test facility with headquarters located approximately 25 miles east of Las Cruces, New Mexico. The range possesses unique characteristics necessary for the U.S. Army, U.S. Navy, U.S. Air Force, National Aeronautics and Space Administration (NASA), and other Federal and commercial testing concerns to conduct safe, large-scale experiments on advanced weapons and space flight systems.

WSMR covers approximately 8,288 square kilometers (3,200 square miles) in south-central New Mexico (figure 1-1). WSMR is the largest, all-overland test range in the western hemisphere. The range itself, together with adjacent call-up areas (figure 1-1), has diverse environmental attributes and resources. The primary mission of WSMR is the operation of a National Range in accordance with direction from the Army Test and Evaluation Command and DoD Directive 3200.11, *Major Range and Test Facility Base*. This mission includes range instrumentation research and development; developmental testing of U.S. Army, U.S. Navy, and U.S. Air Force air-to-air/surface, surface-to-air, and surface-to-surface weapons systems; dispense and bomb drop programs; gun system testing; target systems; meteorological and upper atmospheric probes; equipment, component, and subsystem programs; high-energy laser programs; and special tasks. WSMR also performs testing for commercial industry and foreign countries. NASA's nearby Lyndon B. Johnson White Sands Test Facility (WSTF) provides expertise and infrastructure to test and evaluate spacecraft materials, components, and propulsion systems.

Poker Flat Research Range (PFRR), Alaska, was originally considered for launching LPTs that included an aerial dispersion experiment. However, as described in section 2.12.1, PFRR was not carried forward for analysis in this EA.

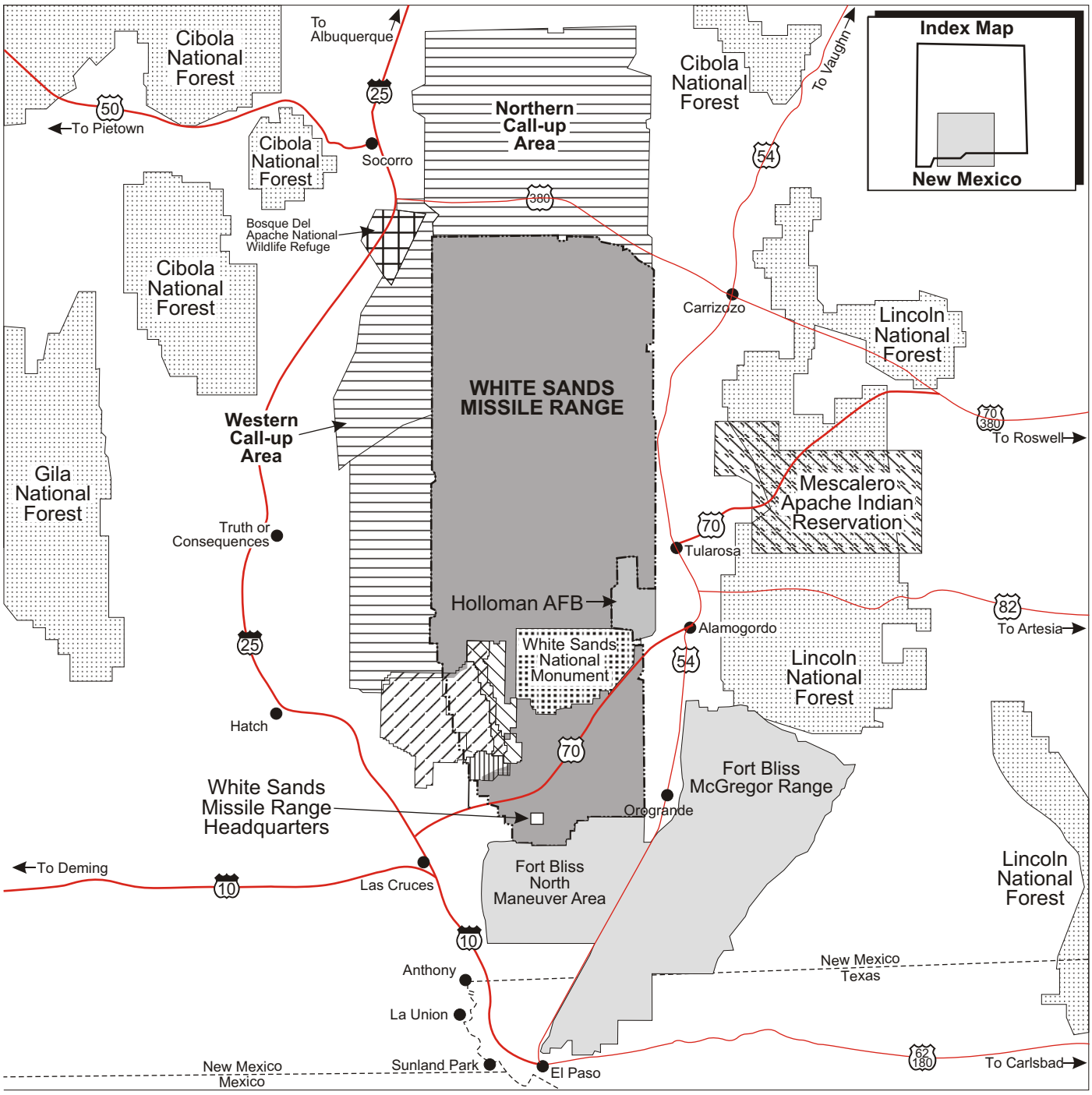
1.3 PURPOSE AND NEED

1.3.1 PURPOSE

The purpose of the Proposed Action is to expand the capabilities of WSMR to provide launches of Scud, Scud-type, and other LPT missiles for flight analyses by defensive missile sensors and other emerging or future defensive technologies.

1.3.2 NEED

LPT launch capabilities are needed to allow WSMR to better support MDA's testing needs in developing effective missile defenses. Under MDA oversight, U.S. Army, U.S. Air Force, and other military systems are being developed to respond to existing and emerging missile threats. Flight tests using LPTs are needed to fully validate system design and operational effectiveness of missile defense systems utilized by the various services in the DoD. Flight test criteria often require recovery of payload materials that may be released during the flight of an LPT which can only be accomplished at an overland test area.



EXPLANATION

- Roads
- Call-up Areas
- National Forest
- NASA White Sands Test Facility
- San Andres National Wildlife Refuge
- Jornada Experimental Range
- Indian Reservation
- White Sands National Monument
- National Wildlife Refuge

Scale

0 12 24 Miles

0 19 38 Kilometers

NORTH

05-23-02 WSMR1_Loc map

Vicinity Location Map, White Sands Missile Range

Figure 1-1

1.4 DECISION TO BE MADE

The decision to be made, supported by information contained in this EA, is whether to establish the capability at WSMR to launch Scud, Scud-type, and other LPT missiles from various locations on WSMR (not to include launches or impacts in call-up areas), in support of missile defense technology testing. This testing would include dispersion experiments originally planned for the PFRR and other follow-on dispersion experiments. The decisionmaker for the Proposed Action is the Director, MDA.

1.5 RELATED ENVIRONMENTAL DOCUMENTATION

Previous NEPA documentation prepared for LPT missiles and related test activities at WSMR includes:

Cortez III Environmental, 1996. *Lance Missile Target Environmental Assessment*.

U.S. Army Space and Missile Defense Command, 1998. *Environmental Assessment for the High Energy Laser System Test Facility (HELSTF)*, 18 February.

U.S. Army Space and Missile Defense Command, 1998. *Tactical High Energy Laser Advanced Concept Technology Demonstration Environmental Assessment*, 27 April.

U.S. Army Space and Strategic Defense Command, 1997. *Theater Ballistic Missile Targets Programmatic Environmental Assessment*, December.

U.S. Army Space and Strategic Defense Command, 1995. *Theater Missile Defense (TMD) Flight Test Environmental Assessment*, April.

U.S. Army Space and Strategic Defense Command, 1995. *U.S. Army Kwajalein Atoll Temporary Extended Test Range Environmental Assessment*, October.

White Sands Missile Range, 1998. *White Sands Missile Range Range-Wide Environmental Impact Statement*, January.

2.0 DESCRIPTION OF PROPOSED ACTION AND ALTERNATIVES

2.0 DESCRIPTION OF PROPOSED ACTION AND ALTERNATIVES

2.1 PROPOSED ACTION

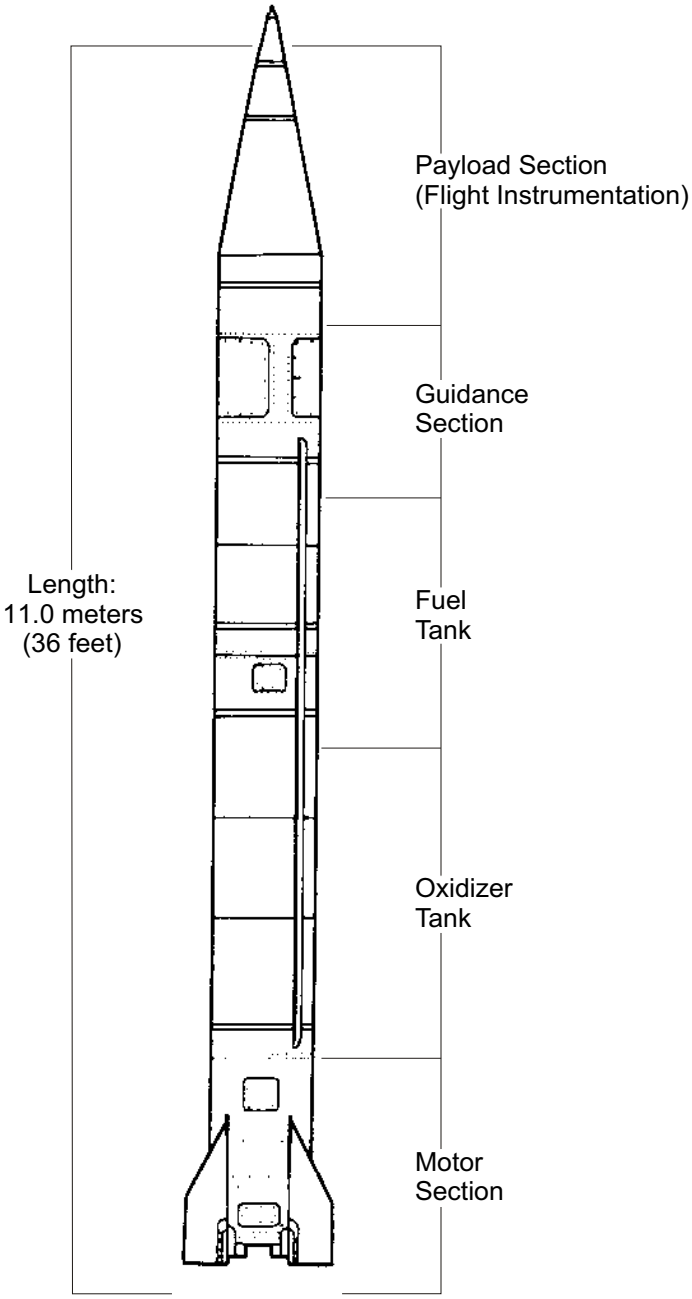
The MDA proposes to fuel and launch several Scud, Scud-type, and other LPTs per year. It is currently anticipated that there would be approximately 15 launches in the first 5 years. The number of launches anticipated in subsequent years is not known at this time, but for purposes of analysis is presumed to be roughly the same. These target missiles would be used in the testing of various sensors to provide realistic overland developmental testing capability against existing and emerging ballistic missile threats. This EA analyzes the potential environmental impacts of conducting Scud, Scud-type, and other LPT missile launches and associated activities, to include the transportation, propellant storage, fueling, launch, flight, aerial dispersion experiments, ground impact, and debris recovery of these LPT missiles at WSMR.

The Proposed Action would involve only minimal new site preparation activities to establish an additional liquid propellant missile launch capability at WSMR. Several additional impact areas at WSMR are proposed to increase test capabilities. Flight scenarios for Scud, Scud-type, and other LPTs that are not covered in the analysis presented in this LPT EA would be analyzed in appropriate future supplemental documentation.

2.2 LPT MISSILE AND SUPPORT EQUIPMENT DESCRIPTION

2.2.1 EXISTING LPT

In this EA, the existing Scud and Scud-type LPTs under consideration for launching from WSMR are single stage, liquid-propellant missiles using propellants listed in table 2-1, with an inertial guidance system and a non-separating payload (figure 2-1). Some tests may include a separating payload and aerial dispersion experiment, which would involve the release of 25 to 50 metal objects from the payload before missile impact. Scud and Scud-type missiles were successfully flight tested without incident at U.S. Army Kwajalein Missile Range in 1997. The LPT would be launched from a self-propelled launch vehicle. Missile launch procedures would be controlled from a separate command center, housed in a transportable trailer or existing permanent launch facility if available. Launch commands to the launch vehicle would be transmitted via fiber optic and analog cabling, which would be placed in an existing cable tray or directly on the ground surface. Table 2-2 lists the characteristics of the LPT and launch vehicle.



Source: VISTA, 1997.

Representative LPT Missile

Figure 2-1

Not to Scale

Table 2-1: LPT Propellant Constituents

Component		Approximate weight in kilograms (pounds)	Approximate volume in liters (gallons)
Main Fuel	60% coal tar distillate 40% kerosene	825 (1,815)	1,022 (270)
Oxidizer	100% IRFNA	2,920 (6,425)	1,836 (485)
Initiator Fuel	50% triethylamine 50% dimethylanilines	30 (66)	34 (9)

IRFNA = inhibited red fuming nitric acid

Table 2-2: LPT and Launch Vehicle Characteristics

Characteristics	Description
LPT	
Propulsion System	Single-stage, liquid-fueled
Propellants	Kerosene-based main fuel, inhibited red fuming nitric acid oxidizer, and initiator fuel composed of triethylamine and dimethylanilines
Guidance System	Inertial
Range	Approximately 50-300 kilometers (31-186 miles)
Altitude	Approximately 15-90 kilometers (9-56 miles)
Length	11 meters (36.1 feet)
Diameter	0.88 meter (2.9 feet)
Finspan	1.81 meters (5.9 feet)
Weight (unfueled)	2,090 kilograms (4,608 pounds)
Weight (fueled)	5,865 kilograms (12,930 pounds)
Payload Weight (maximum)	1,000 kilograms (2,205 pounds)
Payload Type	Instrumentation package (including data acquisition system, telemetry system, and flight termination system; includes four sealed nickel-cadmium batteries)
	Experiment package (instrumentation plus metal experiment objects with location beacons)
Flight Termination System Type	Forced engine cutoff (fuel chop)
Launch Vehicle	
Wheels	8
Fuel	Diesel
Length	13.2 meters (43.3 feet)
Width	3 meters (9.8 feet)
Height	3.2 meters (10.5 feet)
Height (with missile erected)	13.1 meters (43 feet)
Weight (without missile)	27,800 kilograms (61,290 pounds)

2.2.2 FUTURE LPT

The MDA has begun development of a LPT that would augment the existing inventory of LPTs. The new LPT would be designed to have characteristics similar to the threat, would use different propellants, and would be manufactured in the United States. The current concept is to use JP-8 as the fuel and 90–92 percent hydrogen peroxide as the oxidizer.

Due to the fact that the future LPT is in the earliest phase of design, the specific quantities of the future LPT propellants are not available. For analysis purposes it is assumed the quantities would be similar to the existing LPT. The JP-8 would have similar handling and safety characteristics, and environmental fate as the coal tar/kerosene fuel. The hydrogen peroxide would have similar handling and safety requirements as inhibited red fuming nitric acid (IRFNA). The handling requirements and health and safety issues of hydrogen peroxide are also similar to IRFNA but less hazardous. A summary of the physical characteristics of the existing and proposed liquid propellants and the Material Safety Data Sheets (MSDS) for each propellant is provided in appendix D.

The transportation, final assembly and preflight activities, liquid propellant storage, and missile fueling activities are expected to be similar to the existing LPT as described in sections 2.4 through 2.7. The potential launch sites for the future LPT would be the same as those described in section 2.8. Flight test activities would be similar to those described in section 2.9. The launch vehicle and associated launch equipment would be built in the United States, in a configuration similar to the existing LPT. The flight termination system (FTS) has not been designed but is expected to be a propellant cutoff system using solenoid valves in the propellant feed lines and a shaped charge to disperse the propellants at altitude. The missile exhaust emission components cannot be calculated at this time but they are expected to be similar to those listed in section 2.9 for the existing LPT. Postlaunch activities would be similar to those described in section 2.10, although the quantity of propellants remaining at impact following a nominal flight are not known at this time. In the case of a flight termination, because the FTS would disperse the propellants at high altitudes, the quantity of propellant remaining at impact would be minimal.

When the future LPT missile is completed, and if testing is proposed at WSMR, the specific characteristics of the future LPT would be evaluated to determine if additional environmental analysis is required.

2.2.3 OTHER LIQUID PROPELLANTS

Although not currently planned for use, several other propellants could be used for LPTs including hydrazine fuels (unsymmetrical dimethylhydrazine [UDMH], monomethylhydrazine [MMH], hydrazine) and nitrogen tetroxide as an oxidizer. The analysis of the use of UDMH at WSMR is included in the Lance EA (Cortez III Environmental, 1996). MMH and hydrazine have handling, safety, and environmental fate characteristics that are similar to UDMH. Nitrogen tetroxide is a strong oxidizer with handling, safety, and environmental fate characteristics that are similar to IRFNA. Appendix D includes summary information and the MSDS for each of these additional propellants. The analysis in this document

encompasses the types of environmental effects associated with the full range of liquid propellants that might be used in LPTs at WSMR.

2.3 FLIGHT TEST HARDWARE ASSEMBLY, MODIFICATION, AND REFURBISHMENT

Modification and refurbishment of existing missile systems would be performed, if necessary, in an approved missile assembly building at designated government or contractor facilities before the missile system is transported to WSMR and would be considered routine activities at these facilities. Approximately 25 personnel would be involved in the process. This process typically includes tests on components and subsystems, and administrative functions. The modification or refurbishment of the LPT would involve the use of various solvents, cleaning materials, and adhesives (such as acetone and isopropyl alcohol). These materials are routinely used for such purposes and would be handled in accordance with data provided on the appropriate MSDS. No modifications to existing facilities would be required for the activities above, and no unusual utility requirements or additional personnel would be required to support the level of activity required for the Proposed Action.

2.4 LPT MISSILE SYSTEM AND LIQUID PROPELLANT TRANSPORTATION TO WSMR

The unarmed LPT missiles would be transported to WSMR without fuel, and would be stored unfueled in approved storage facilities. The liquid propellant would be transported separately and stored at an approved liquid propellant storage facility.

All transportation within the continental United States would be performed in accordance with appropriate U.S. Department of Transportation (DOT) approved procedures and routing, as well as Occupational Safety and Health Administration (OSHA) requirements and U.S. Army safety regulations. Liquid propellants would be transported in DOT approved containers, most likely by surface transport. Appropriate safety measures would be followed during transportation of the propellants as required by DOT and as described in the Bureau of Explosives (BOE) Tariff No. BOE 6000-I, *Hazardous Materials Regulations of the Department of Transportation* (Association of American Railroads, 2000).

In addition to the missile, launch vehicle, and propellants, several other support equipment items would also be transported to WSMR. These include the following:

- Launch control van (if existing permanent launch facilities are not available)
- Pad equipment shelter (pick-up truck with electronics shelter on truck bed)
- Missile transport and fueling trailer

- Four 100-kilowatt diesel or gasoline generators (only used if power is not otherwise available)
- Specialized fueling equipment (pumps, valves, fittings, and hoses to transfer propellants from storage tanks to missiles)

2.5 FINAL ASSEMBLY AND PREFLIGHT ACTIVITIES AT WSMR

Missile components and support equipment would arrive at WSMR approximately 30 days before a scheduled launch. The components and equipment would be stored at the selected launch area or other available facilities for final preflight assembly and integration and necessary preflight tests. Final assembly of the missiles would occur in a missile assembly building. The LPT would use small, electroexplosive devices with a total of approximately 600 grams (21 ounces) of explosive ordnance (solid propellant gas generator charge, ignitor cap, squibs) which would be temporarily stored in an existing pyrotechnic storage facility until installed in the missile. Final assembly activities would involve the use of various solvents, cleaning materials, and adhesives. These materials are routinely used for such purposes and would be handled in accordance with data provided on the appropriate MSDS. Any hazardous waste items generated would be handled in accordance with the WSMR Resource Conservation and Recovery Act (RCRA) Permit.

Approximately 25 temporary duty personnel would be required for preflight and testing operations for up to 30 days before each launch. Up to 40 persons could be required in the event of a dual launch. Appropriate personnel would be ammunition-certified in accordance with Army Materiel Command Regulation 350-4, *Training and Certification Program for Personnel Working in Ammunition Operations* (Army Materiel Command, 1992). These activities are considered routine for WSMR, and no additional permanent WSMR personnel would be required.

All specialized training in liquid propellant handling, storage, and emergency response would be completed before any propellant is shipped, and the training and documentation would be approved by the WSMR Environment and Safety Directorate. Representatives from the WSMR Environment and Safety Directorate would approve Standard Operating Procedure (SOP) documentation and participate in a dry run to be conducted before the start of operations, to include use of proper safety equipment and personal protective equipment, and simulated propellant handling, missile fueling, defueling, spill containment, and cleanup activities.

2.6 LIQUID PROPELLANT STORAGE

2.6.1 STORAGE ACTIVITIES

The LPT propellant is composed of the fuel (a kerosene-type or JP-8 petroleum product, or hydrazine), the oxidizer (IRFNA, hydrogen peroxide, or nitrogen tetroxide), and the initiator fuel. Table 2-1 lists the propellant ingredients for an existing LPT missile. The initiator fuel, required only in small amounts, can be collocated with the main fuel. Assuming a

quantity of propellant for two LPT missiles, the oxidizer must be stored at least 183 meters (600 feet) from any petroleum-based fuels. As a result, two propellant storage areas must be established. Figure 2-2 shows a general storage site layout. Propellants would be shipped/stored in DOT-approved containers in accordance with all accepted governing standards. Fuels would be stored in stainless steel containers, and the oxidizer in aluminum containers. The storage containers would vary from 114 to 1,140 liters (30 to 300 gallons) in capacity. They would be placed in a single layer on a concrete surface. Although a leak of any components from the containers would be highly improbable, approved spill containment exists at each site to ensure any accidental leakage does not enter the soil. All procedures would be coordinated and approved through the WSMR Environment and Safety Directorate. The propellant storage locations would be periodically monitored for leaks by visual inspection, and appropriate notifications and response activities would be initiated upon the discovery of a propellant leak.

Two alternative locations exist for the propellant storage sites:

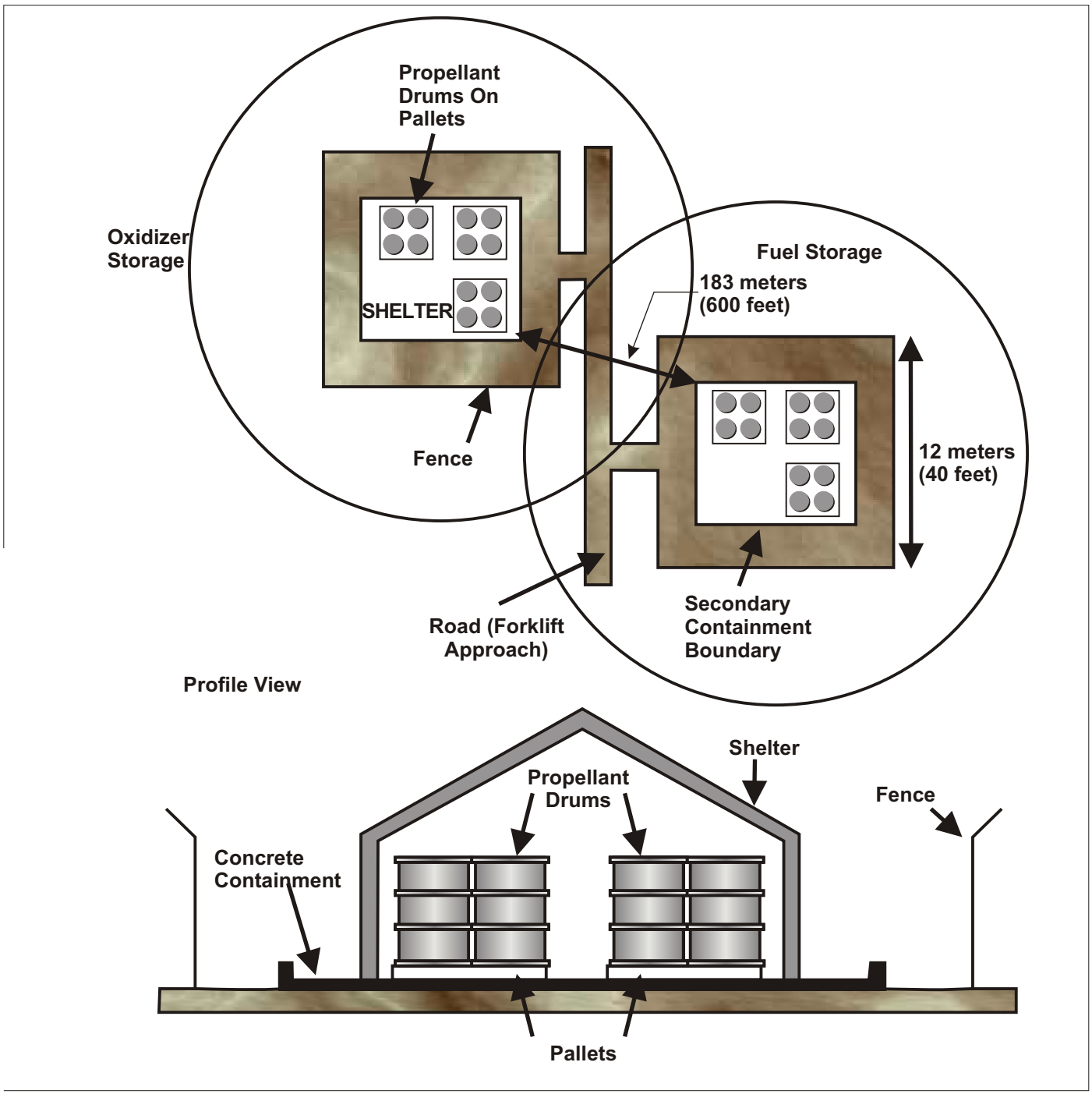
- Launch Complex (LC)-36/Aerobee Launch Complex
- NASA WSTF (the preferred location)

2.6.1.1 LC-36/Aerobee Launch Complex

The LC-36 site (figure 2-3) is operated by the Navy and has fuel and IRFNA storage rooms attached to the rocket launch tower at the facility. The rooms are separated by a concrete wall. The rooms are designed in accordance with DoD Standard 6055.9, *DoD Ammunition and Explosives Safety Standards,* to store liquid propellants, and as such they are ventilated, have explosion-proof fixtures, and have sumps in the floor. Plumbing leads from the sump in each room to separate underground 2,840-liter (750-gallon) catchment basins. Adequate space is available to store propellant for one LPT. LC-36 has been used to store liquid propellants as recently as 1995.

2.6.1.2 NASA White Sands Test Facility

Fuel and oxidizer storage sites at WSTF were constructed in accordance with DoD Standard 6055.9 and are currently active and available. Adequate space is available at the fuel and oxidizer sites to store propellant for at least three LPTs. The Army currently has a Memorandum of Agreement with NASA through 2002, which allows for storage of liquid propellants at WSTF. The Memorandum of Agreement could be extended if necessary to accommodate the LPT program. Figure 2-4 presents a map of the facility.

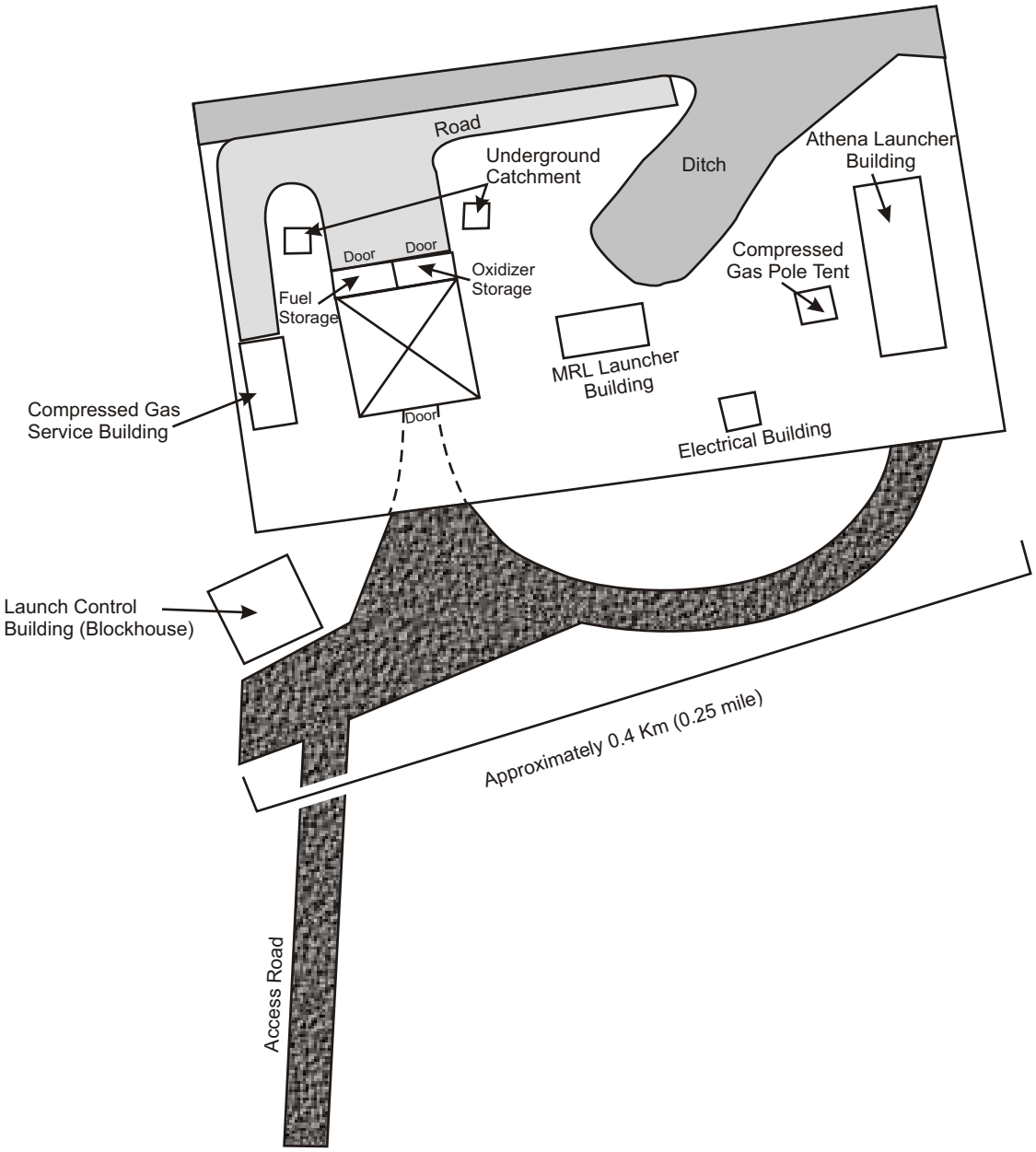


EXPLANATION

Notional Propellant Storage Site (similar for each constituent)

Not to Scale

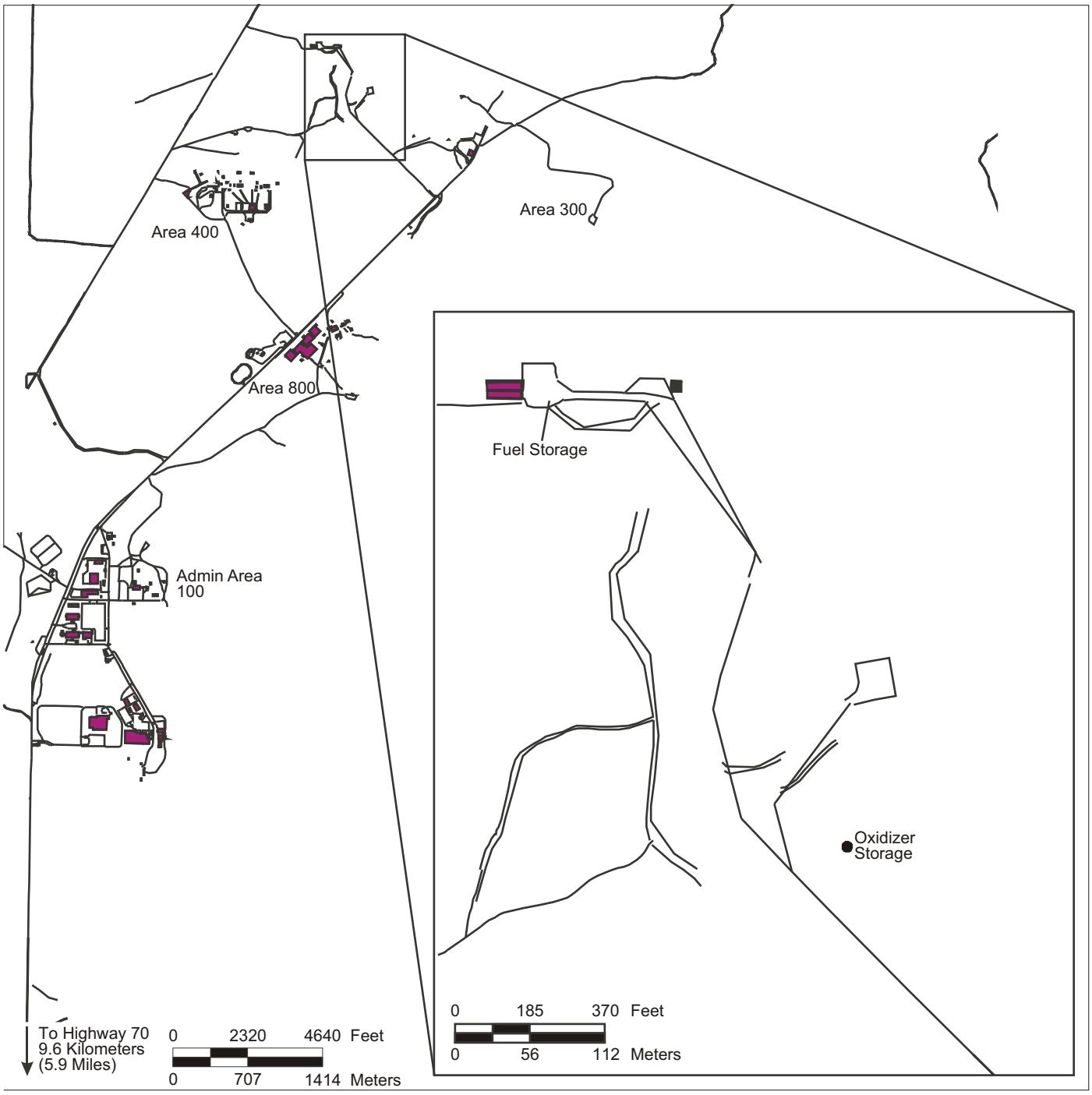
Figure 2-2



LC-36/Aerobee Launch Complex General Layout

Figure 2-3

NORTH



EXPLANATION

Roads

Buildings

NASA White Sands Test Facility Liquid Propellant Storage Area

NORTH

Figure 2-4

2.7 MISSILE FUELING

2.7.1 MISSILE FUELING LOCATIONS

Fueling could be performed at a fixed, permanent facility (LC-36), or it could also be performed at the LPT launch site, provided there is sufficient space. Fuel and oxidizer would be transported separately to the fueling location and loaded at separate times. Empty bulk liquid propellant containers would be available at the fueling area for use in the event that defueling of the missile became necessary. Potential LPT fueling sites at WSMR include:

- LPT Launch Sites (section 2.8)
- LC-36/Aerobee Launch Complex

2.7.1.1 Fueling at Launch Sites

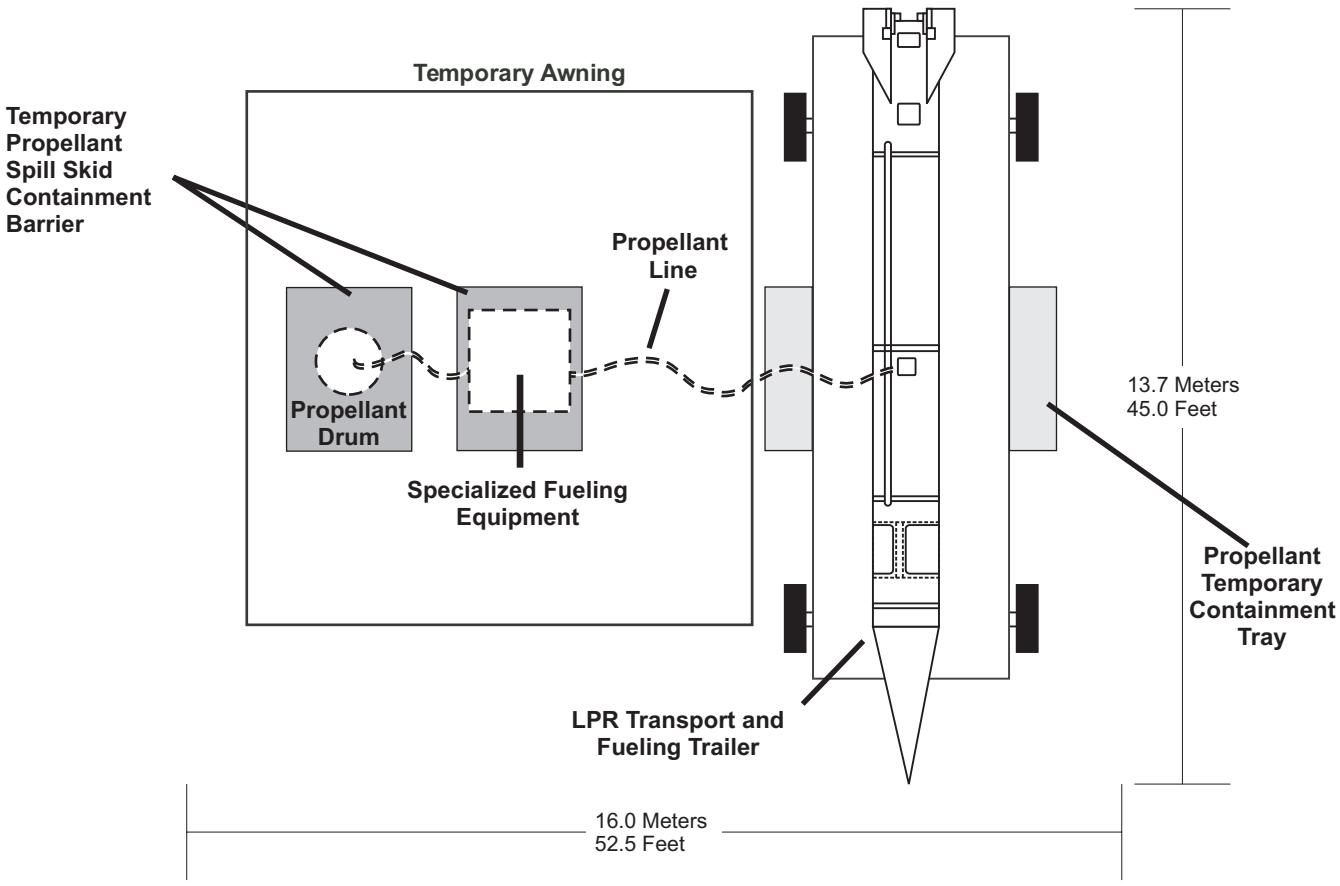
Missile fueling activities at launch sites would use portable equipment and spill containment. Existing spill response plans and liquid propellant transport and handling plans would include appropriate safety measures for the procedure. All planned fueling procedures would be approved by the WSMR Environment and Safety Directorate before beginning activities.

2.7.1.2 Fueling at LC-36/Aerobee Launch Complex

Missile fueling operations could take place at LC-36 (described previously). Portable equipment and spill containment would be used during fueling operations. All planned fueling procedures would be approved by the WSMR Environment and Safety Directorate before beginning activities.

2.7.2 MISSILE FUELING OPERATIONS

LPT missiles would be stored unfueled, and would be fueled before launch, typically over a 3-day period. Specific, standardized procedures for fuel/oxidizer transfer would be developed in accordance with Army requirements for the handling of liquid rocket propellants (Chemical Propulsion Information Agency, 1984). All personnel involved in fueling operations would wear appropriate personal protective equipment and would receive specialized training in liquid propellant safety, handling, spill containment, and cleanup procedures before handling the materials. These procedures would incorporate measures to minimize both the amounts of waste propellants generated during transfer operations and the potential for accidental spills, and would be prepared at least 60 days before launch. In preparation for fueling, the missile would be mounted on a trailer and moved from the missile assembly building to the fueling site (figure 2-5). Containers of propellant would be moved from the fuel and IRFNA storage sites by truck to the fueling site. Oxidizer fueling would be performed on one day, and normally, main fuel fueling would occur the next day. After fueling, the missile would be temporarily staged for



Notional Propellant Transfer Area

Figure 2-5

several days (no more than 30) until transported to the launch area. A safety area of 204 meters (670 feet) would be established around the fueled missile. The initiator fuel would be transferred remotely from a holding vessel on the launch vehicle to the missile approximately 15 minutes before the planned launch. With the initiator fuel added, the explosive safety quantity distance (ESQD) would increase to 381 meters (1,250 feet).

The existing LPT propellant transfer system uses an in-line pump to transfer the main fuel and oxidizer into the LPT. All of the equipment is designed to a minimum ultimate factor of safety of at least 4:1. Materials were selected on the basis of their compatibility with the fuels and oxidizer. In addition, the propellant transfer systems are assembled and configured in accordance with approved engineering drawings and test procedures. Propellant engineers and technicians are trained and experienced. Prior to propellant transfer, a leak test would be performed between the propellant drum and the rocket.

Although total oxidizer and fuel vapor emissions can vary depending on the propellant transfer equipment used and how it is assembled, it is anticipated that only very small amounts (approximately 10 grams [0.4 ounce]) of oxidizer vapors would be released to the atmosphere during the oxidizer transfer operation. A negligible amount of fuel vapors would also be released into the atmosphere during fuel transfers (U.S. Army Space and Strategic Defense Command, 1995). After completion of the transfer operations, the oxidizer transfer system would be flushed with deionized water. This operation is expected to yield approximately 5 grams (0.2 ounce) of nitric oxide gas that would be released into the atmosphere, and 4,164 liters (110 gallons) neutralized deionized water and oxidizer rinsate (<1 percent) that would be collected and disposed of by WSMR per applicable regulations. The main fuel and initiator fuel transfer systems would be flushed with 208 liters (55 gallons) of ethyl alcohol, and the waste alcohol (with approximately 40 grams [1.4 ounces] of fuel in solution) would be collected and disposed of via permitted procedures through the WSMR Hazardous Waste Storage Facility. Although fuel quantities and fueling systems have not been defined for the future LPT, it is anticipated that similar materials would be generated when flushing the hydrogen peroxide oxidizer and the JP-8 fuel.

Containers that are brought to the propellant transfer site would be placed on SpillSkid® pallets to provide secondary containment during propellant transfer operations. Spill containment for the propellant transfer operation would be provided by a temporary containment system that is impervious to each particular fuel and oxidizer. One set of temporary containment barriers would be used for fuel, and a second set would be used for oxidizer. No permanent containment would be constructed.

Should it become necessary to defuel the LPT, the propellant would be transferred into empty bulk liquid propellant containers. The propellant containers would then be transported back to the respective propellant storage areas for reuse in the next LPT. The defueled LPT oxidizer tank would be flushed with deionized water and the LPT fuel tank would be flushed with ethyl alcohol in a manner similar to that described above. The LPT would be transported back to the missile assembly building for reuse or returned to a MDA facility.

2.8 POTENTIAL LPT LAUNCH SITES

Selection of a launch site would be determined by the specific requirements of a test program. The following launch sites at WSMR are considered potential candidates for launching LPTs, as described in the Proposed Action:

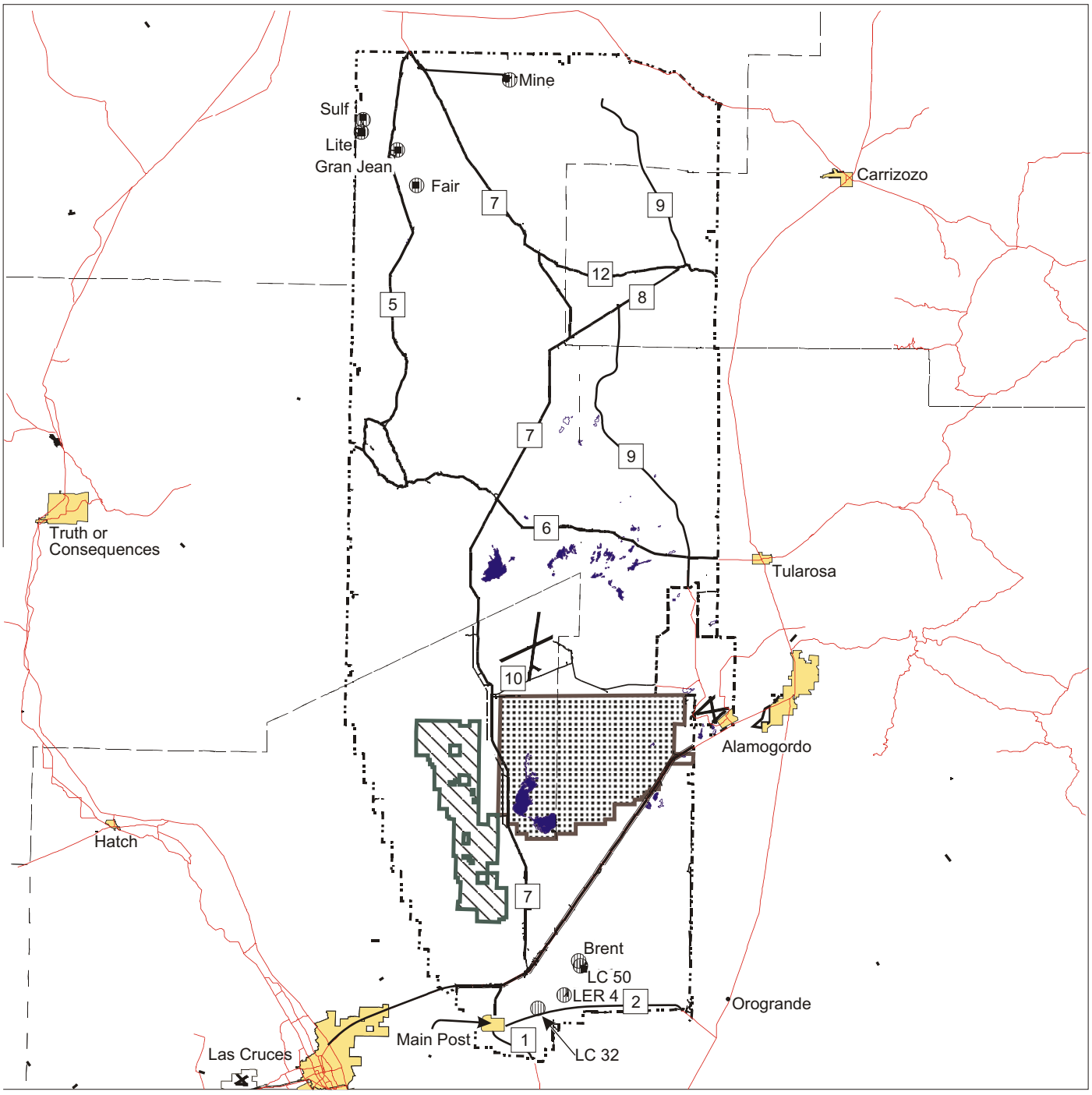
- LC-32
- LC-50
- Brent
- Fair
- GranJean
- Lance Extended Range 4 (LER-4)
- Lite
- Mine
- Sulf

Figure 2-6 shows the location of these sites.

Maximum use would be made of existing infrastructure and facilities at the launch sites. Existing facilities would be modified, if necessary, to support LPT missile system operations. Additional infrastructure requirements may include floodlighting sufficient to support possible nighttime launches, temporary equipment and camera towers, road improvements, fencing, electrical service, potable water, and telephone and data transmission lines. The use of portable ground support equipment may reduce or eliminate some of the fixed facility and infrastructure requirements. Portable equipment that might be used to support LPT missile testing could also include launch control stations, telemetry vans, personnel trailers, and power generators. Additionally, shallow (less than 0.3-meter [1-foot] depth) in-ground placement of thermal and acoustic instrumentation in the immediate vicinity of the missile launcher (within a 50-meter [164-foot] radius) may be required for some test operations. These operations would be considered routine activities for WSMR. If required, supplemental environmental documentation would be prepared.

Launch crew activity in these areas during launch preparation would follow required precautions to protect biological and cultural resources. Personnel would be instructed to avoid all contact with any wildlife that may be encountered. Natural resources surveys may be required at some launch locations before any activities. Cultural resource surveys may be necessary at some launch locations if previously undisturbed areas are used. This survey would be performed in coordination with the WSMR Environment and Safety Directorate upon selection of the launch site.

Any expansion areas would be located to avoid cultural resources. If cultural resources are identified, then mitigation would be developed and coordinated with the WSMR Environment and Safety Directorate.



EXPLANATION

- Roads
- LPT Launch Site
- WSMR Base Boundary
- White Sands National Monument
- San Andres National Wildlife Refuge
- 7 Primary Range Roads

LPT Launch Locations

NORTH

Scale

0 10 19 Miles

0 16 31 Kilometers

05-23-02 WSMR9_Launch Loc

Figure 2-6

To ensure the protection of any historic resources already identified within the project area from unauthorized artifact collection or vandalism, personnel would be briefed before activities begin on the significance of these types of resources and the penalties associated with their disturbance or collection. The personnel briefing would be pre-approved by the WSMR Environment and Safety Directorate.

If, during the course of program activities, historic materials (particularly human remains) are unexpectedly discovered, work in the immediate vicinity of the cultural materials would cease until a qualified historic preservation professional could evaluate the site to determine its significance. In the unlikely event of damage to historic properties occurring as a result of falling missile debris from a launch mishap, an assessment would be conducted to determine the measures appropriate to mitigate the impacts.

2.9 LPT FLIGHT TEST ACTIVITIES

2.9.1 PRELAUNCH ACTIVITIES

Launch activities would begin with the arrival of the launch team approximately 30 days before the scheduled launch. Miscellaneous flight readiness testing would occur during this time. Launch team equipment would consist of the target, launch vehicle, launch control van, pad equipment shelter truck, four 100-kilowatt generators, a 9,000-kilogram (10-ton) crane, support vehicles for equipment and supply transportation, and miscellaneous small equipment and supplies. Typically, one missile would be launched from one launch vehicle per mission. However, some operations may require the presence of a second launch vehicle carrying a fueled missile in the vicinity of the primary launcher, or a second launch vehicle with a missile ready for launch in the event of a dual launch. An average of approximately 25 transient personnel (possible maximum of 40 in the event of a dual launch) would be at WSMR for approximately 45 days to perform flight test operations.

It is currently anticipated that there would be approximately 15 LPT launches in the first 5 years. Table 2-3 presents a notional schedule for a single launch.

Table 2-3: Notional LPT Launch Schedule

Days	Activities
T-30	Missiles, propellants, and equipment arrive at WSMR
T-30 to T-15	Prepare equipment for launch
T-15 to T-1	Countdown dry run, final system checkout, fuel missiles
T-0	Final countdown, launch
T+1 to T+15	Equipment pack-out, data collection and distribution (including leftover propellants and hazardous waste)

Minor mechanical repairs could be performed at existing base repair shops. Diesel refueling operations for motorized vehicles and generators would also be performed. All ground vehicle refueling operations would take place at established refuel points.

In the event of a technical problem with the liquid components of the LPT, bulk liquid storage containers would be available for defueling of the LPT missile. Approximately 60 days before the first launch, these procedures for defueling a liquid propellant missile would be reviewed and approved. Through coordination with the WSMR Environment and Safety Directorate, water would be provided onsite by fire trucks or other means for fire suppression in the event of a mishap.

U.S. Highway 70 is routinely closed during missile tests. A resolution adopted in 1972 (New Mexico Highway Department, 1972) identifies procedures to be followed in establishing roadblocks on designated roads surrounding WSMR. The procedures for road closures would be followed during each flight test.

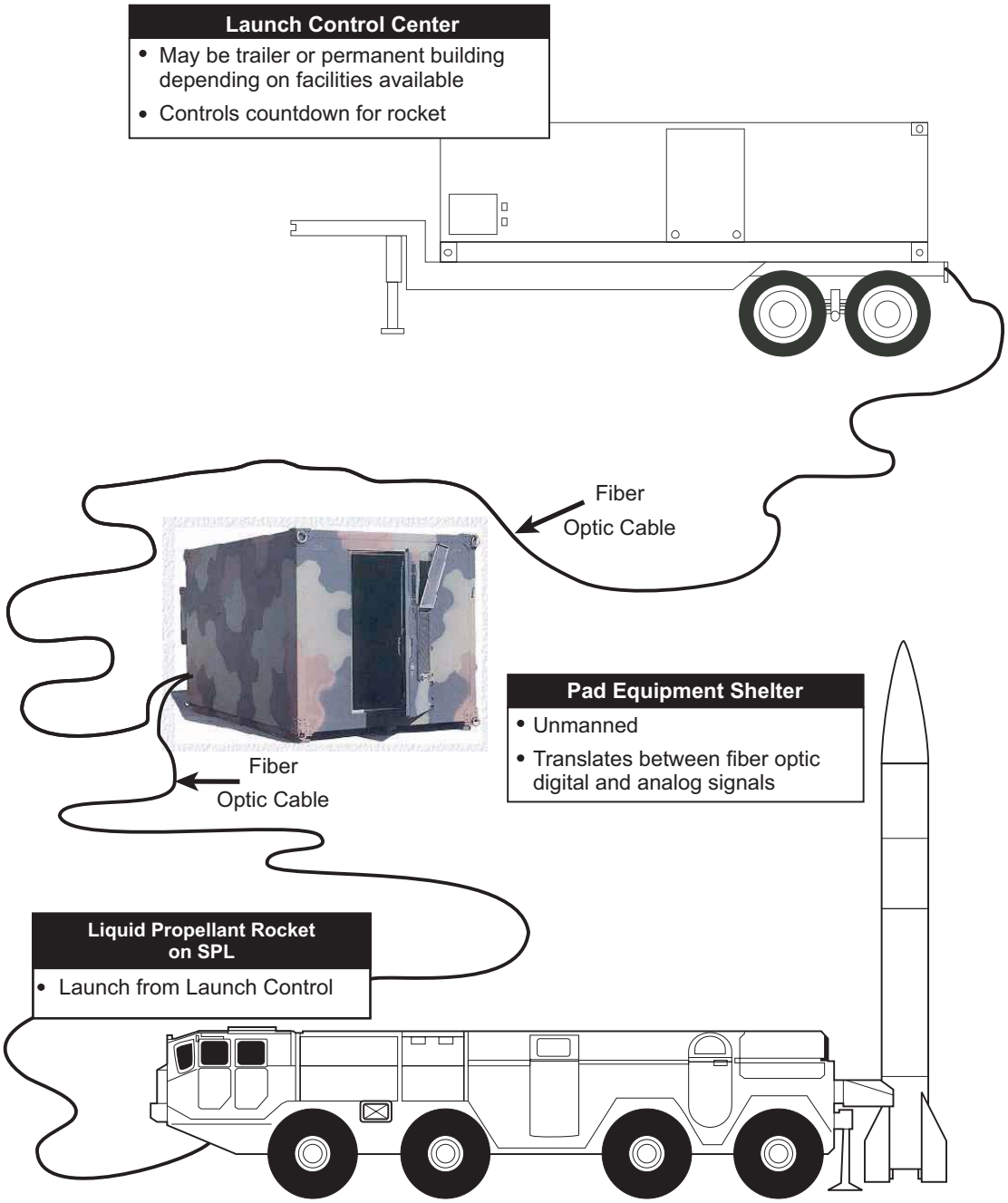
Launch activities would be controlled from the Launch Command Center. The Launch Command Center would either be self-contained in a trailer-mounted shelter, or located in permanent facilities located at the launch site if available. Launch equipment would be located in the pad equipment shelter. It is unmanned during launches and would be located approximately 38 meters (125 feet) from the launch vehicle (figure 2-7).

Shortly before launch, all mission-essential personnel would be evacuated from the launch site by WSMR Range Control to safe areas. All other personnel would be cleared from evacuation areas predetermined by the WSMR Flight Safety Office. Evacuation of personnel is a routine activity on WSMR.

2.9.2 FLIGHT ACTIVITIES

After the evacuation area is verified clear, the launch signal would be given from the launch control area. Standard protective procedures would be followed during test activities to provide hearing protection for workers and to minimize any noise impacts associated with launch activities. Standard operating and safety procedures for missile launching and testing would be implemented to minimize the risk of any adverse health or safety impacts.

Table 2-4 lists the content and expected amounts of various emissions during a single launch, and table 2-5 lists the approximate quantities of propellant remaining after planned shutoff of the propellant for testing at WSMR. Missile design requires that the existing LPT be fully fueled for a flight of any distance. The existing LPT would contain unused propellant upon impact.



Notional Launch Control Layout

Figure 2-7

Table 2-4: LPT Emission Component Masses per Launch

Compound	Approximate Emission Mass in kilograms (pounds)
Carbon Monoxide (CO)	982 (2,170)
Carbon Dioxide (CO_2)	922 (2,030)
Hydrogen (H_2)	38 (84)
Water vapor (H_2O)	961 (2,120)
Nitrogen (N_2)	674 (1,490)
Other	9 (20)

Table 2-5: Propellant Remaining at Missile Impact

Trajectory Ground Range	Main Fuel		Oxidizer	
kilometers (miles)	kilograms (pounds)	liters (gallons)	kilograms (pounds)	liters (gallons)
000 (000)	825 (1,819)	1,022 (270)	2,920 (6,437)	1,836 (485)
125 (77.7)	220 (485)	265 (70)	750 (1,653)	473 (125)
160 (99.4)	175 (386)	227 (60)	600 (1,323)	379 (100)

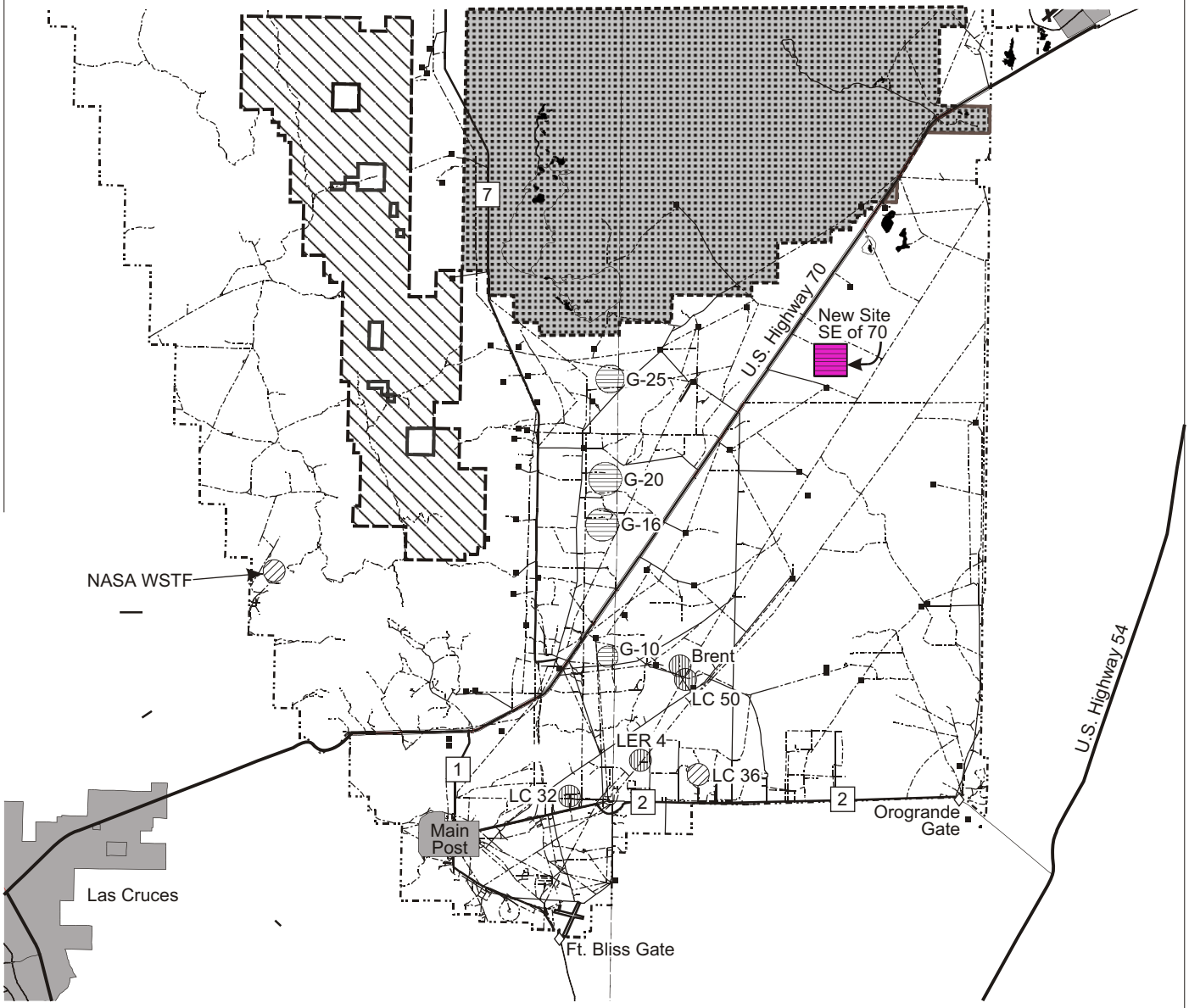
Note: Initiator fuel is consumed at launch.

2.9.2.1 Flight Trajectories

LPTs launched from the northern launch sites would follow a ballistic trajectory and impact on one of the existing G impact areas (G-10, G-16, G-20, or G-25) or a new impact area located southeast of Highway 70, as shown in figure 2-8. LPTs launched from the southern launch sites would follow a ballistic trajectory and impact on one of the existing impact areas (649 Impact Area or AFSWC Target), one of two new impact areas north of the 649 Impact Area, or a new impact area located north of the Oscura bombing range, as shown in figure 2-9. Prior to launches from Mine site, or other sites that would result in a trajectory that crosses White Sands pupfish habitat, the WSMR Environment and Safety Directorate would coordinate with the proponent and WSMR flight safety to review flight termination considerations for the pupfish. The New Mexico Game and Fish Department would also be notified of the planned launches.

2.9.2.2 Payload Description

The payload section of the LPT can be configured to contain instrumentation or various types of experiments. Instrumentation payloads would impact along with the missile body. Experimental payloads could be a single object or multiple objects. Some payloads could contain a beacon to aid in recovery. Hermetically sealed lithium batteries are generally used to power these types of beacons. Experiment objects would impact within one of the existing impact areas shown in figures 2-8 and 2-9.



EXPLANATION

- Roads
- LPT Launch Site
- LPT and Aerial Dispersion Experiment Impact Area
- LPT Propellant Storage Site
- 7 Range Road
- Instrumentation Sites
- WSMR Base Boundary
- White Sands National Monument
- San Andres National Wildlife Refuge

Scale

NORTH

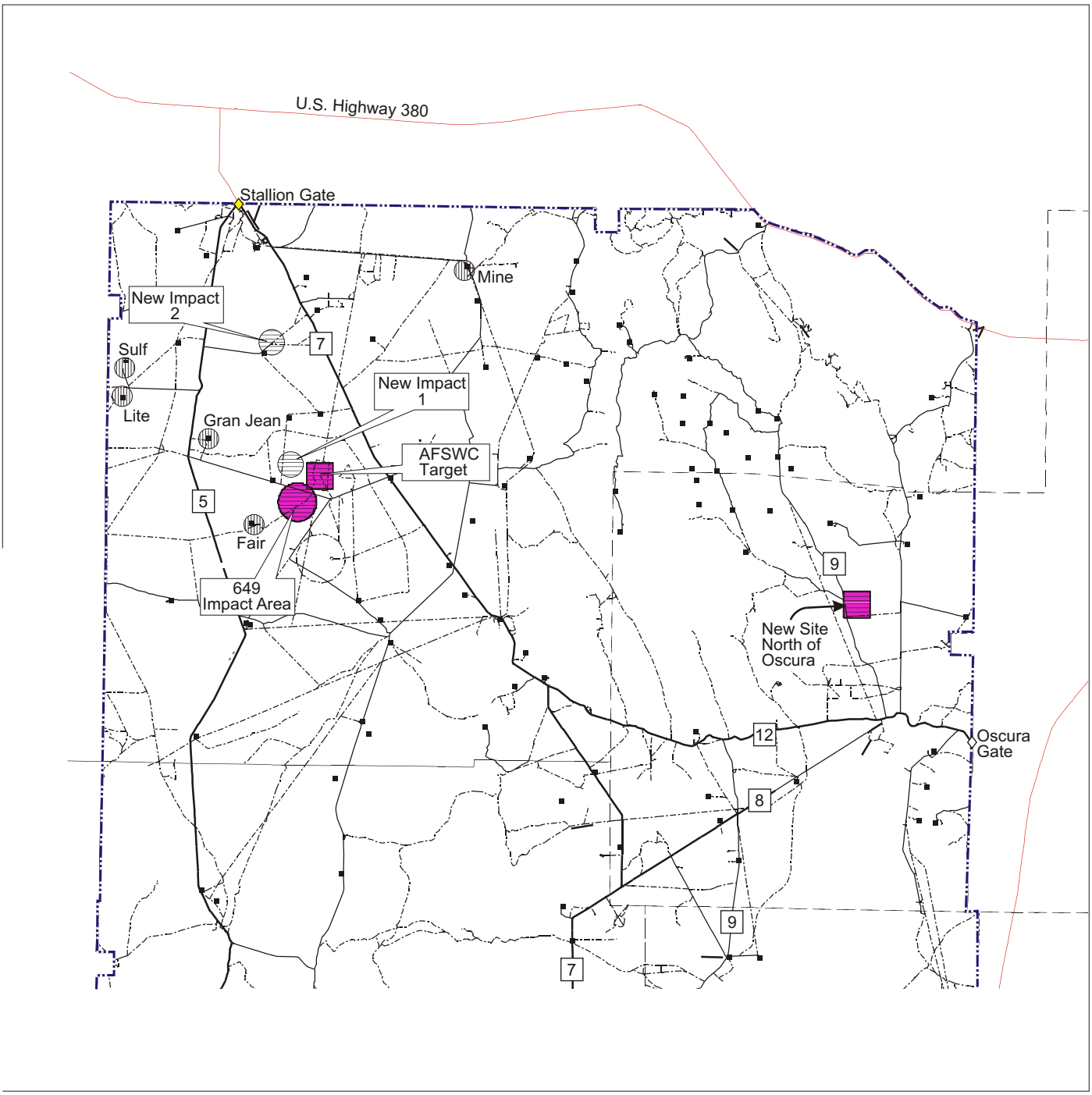
0 2.2 4.4 Miles

0 3.6 7.1 Kilometers

05-23-02 WSMR10_Impact Areas

LPT Launch Sites, Propellant Storage, and Missile Impact Areas-South Range

Figure 2-8



EXPLANATION

- Roads
- Instrumentation Sites
- LPT Launch Site
- LPT and Aerial Dispersion Experiment Impact Area
- WSMR Base Boundary
- 7 Range Road

Scale

NORTH

0 2.2 4.4 Miles

0 3.6 7.1 Kilometers

05-23-02 WSMR8_Impact Areas

LPT Launch Sites and Missile Impact Areas-North Range

Figure 2-9

2.9.2.3 Aerial Dispersion Experiment

Aerial dispersion experiments involve the viewing and dispersion analysis of multiple objects that are released from an LPT payload. For LPTs with aerial dispersion experiment payloads, after the LPT begins its descent, the experiment would be triggered. For a typical aerial dispersion experiment, 25 to 50 metal experiment objects would impact in one impact area, and the experiment's mounting structure in the payload section would impact the ground with the spent booster in another impact area. This impact would be within an area that has been cleared for whole body missile impacts. A typical aerial dispersion experiment would include launch of the LPT from LC-50, impact of the 25 to 50 experiment objects in the 649 Impact Area, and impact of the spent missile body in one of the new impact areas north of the experiment impact location.

Some experiments would use approximately 500 grams (1.1 pounds) of explosive to trigger the experiment. A certified Explosive Ordnance Disposal (EOD) technician would inspect the mounting structure after its ground impact and would render safe any remaining explosive materials. It is anticipated, however, that all explosives would be fully expended during the experiment. In some cases asbestos used to insulate the experiment, may remain in the payload section. The LPT with the payload section, and the experiment objects, would be recovered as described in section 2.10.

LPTs used in aerial dispersion experiments may include the use of submunitions and simulated chemical/biological agents as payloads. These agents would be used by MDA to test lethality of LPTs with different types of payloads. Lethality testing involves conducting a kill assessment to evaluate the effectiveness of a test. Although there are presently no plans to use submunitions and simulated chemical/biological agents as payloads, they may be used in future testing of LPTs at WSMR. No information is available about the range of potential submunitions and/or simulants that may be used. Additional environmental analysis would be performed, as needed, for any future tests involving lethality testing components.

2.9.2.4 Impact Areas

Primary impact areas, identified to date for specific tests, include the 649 Impact Area and the two new impact areas north of the 649 Impact Area. Secondary impact areas, evaluated in this EA but not yet scheduled for use, include the Air Force Space Warfare Center (AFSWC) Target, the G Impact Areas, the new impact area south of 70, and the new impact area north of Oscura. The impact areas would be approved by WSMR Flight Safety and coordinated with the WSMR Environment and Safety Directorate before launch. Impacts would be avoided in areas of biological or cultural significance. LPT flight trajectories and missile impact areas not covered within the analysis presented in this EA would need to be analyzed in future supplemental documentation prepared by project offices associated with such testing activities.

2.9.2.5 Sensors

Several helicopters and fixed wing aircraft could generally be used to observe LPT missile flights. These support aircraft would stage at various airports using existing facilities.

Existing WSMR range radar and telemetry would be used to collect flight and experiment data. In addition, some experiments would utilize HAWK and/or Patriot radars located at existing instrumentation sites. These radars are often used to collect data for various missile flight tests. Use of these radars at WSMR has been evaluated in several previous environmental documents.

2.9.2.6 Flight Termination

WSMR Flight Safety would have the option to terminate flight of the LPT missile by the FTS at any time during boost phase. The FTS currently in place on the existing LPT is a fuel cutoff system. The FTS uses the same mechanism that forces engine cutoff in a typical shutdown. Normally, when the velocity is reached to fly the target ballistically to the desired (preprogrammed) impact point, the missile's thrust termination system fires a set of electro-explosive devices that precisely cut off propellant flow to the engine. If WSMR Flight Safety were to detect a sufficiently off-nominal condition, a flight termination command would be sent to the missile. The FTS would ensure that the missile would not impact off-range or in populated on-range areas. Redundant FTS receiver/decoders and destruct boxes in the missile instrumentation section would send the destruct pulse to fire electro-explosive devices to activate valves to stop all fuel and oxidizer flow to the engine, and vent engine chamber pressure. The future LPT FTS has not been designed but is expected to be a propellant cutoff system using solenoid valves in the propellant feed lines and a shaped charge to disperse the propellants at altitude.

Test mishaps for target missiles are defined in terms of two scenarios: missile failure on the launch pad, and termination of a flight after the missile has left the launch pad. Missile failure on the launch pad would be characterized by either a detonation of the missile or a deflagration in which the propellant explodes and burns. An ESQD surrounding the launch site would be calculated based on the equivalent explosive force of all propellant and pyrotechnic materials contained in the flight vehicle. For the current LPT a safety area of 204 meters (670 feet) would be established around the fueled missile. Approximately 15 minutes before the planned launch, with the initiator fuel added, the ESQD would increase to 381 meters (1,250 feet). All hazardous debris resulting from a missile failure on the pad would be contained within the ESQD. Provisions would be made for the availability of fire suppression, hazardous materials emergency response, and emergency medical teams during launch operations.

Termination of a flight after it has left the launch pad would occur in the event of an off-course flight. The FTS would be activated, terminating the flight vehicle’s thrust, and the missile would then follow a ballistic trajectory and impact on the ground.

Although it is extremely unlikely, in the event of a missile failure coupled with an FTS failure, there is the possibility that an errant missile could impact off range. Off range

impact would be handled in accordance with RCRA emergency response requirements in accordance with the Military Munitions Rule. The LPT project office emergency response SOP would activate the WSMR Emergency Operations Center (EOC). The EOC would activate the in-place notification rosters for the appropriate WSMR Disaster Plan Annex, depending on the nature of the off range impact area. The EOC activation is the process for involving the functional area specialists who are charged with assuring that environmental and health & safety requirements are met. The MDA, as the proponent of the Proposed Action, would be responsible for clean-up operations and would coordinate recovery actions with the appropriate agencies through the WSMR Environment and Safety Directorate.

2.10 POSTFLIGHT ACTIVITIES

The WSMR Environment and Safety Directorate would be notified before recovery activities begin. WSMR would supply a debris-recovery team to locate and recover the debris. The recovery team would wear appropriate protective clothing during recovery to minimize the potential for exposure to potentially hazardous materials. Individuals involved in WSMR recovery actions would be trained before recovery activities begin. The WSMR Environment and Safety Directorate would coordinate debris recovery in areas of sensitive resources, in accordance with WSMR guidance and technical support documents, to minimize intrusion and disturbance in the area.

Missile and aerial dispersion experiment debris, and oxidizer or fuel released after a test or termination, would be handled in accordance with the WSMR Installation Spill Contingency Plan (Annex G, Appendix I of the WSMR Disaster Control Plan) (White Sands Missile Range, 1997). This plan establishes responsibility, outlines personal duties, and provides resources and guidelines for use in the control, clean up, and response for spills. Release of materials above threshold levels would be reported to the U.S. Environmental Protection Agency (U.S. EPA) and to state and local level agencies with emergency planning authority as mandated by the Emergency Planning and Community Right to Know Act of 1986. In accordance with the Military Munitions Rule, the WSMR Environment and Safety Directorate would determine what range clearance and remediation actions are necessary to support WSMR operations.

Missile and aerial dispersion experiment debris would be rendered safe, loaded onto a truck, and transported to the range residue accumulation point at the former liquid propellant storage site. If access to the debris is not possible with a vehicle, then the debris would be carried by helicopter sling to a nearby road for transport to the range residue accumulation point. All debris would be characterized to determine if it is hazardous waste. Hazardous waste would be disposed of via permitted procedures through the WSMR Hazardous Waste Storage Facility. There would be no on-site treatment of hazardous waste except in the event of an emergency response requirement as allowed in the WSMR RCRA permit and U.S. EPA regulations.

The majority of recovery operations would utilize existing roads and recovery by foot. Off-road vehicle recovery operations would be undertaken only if necessary, and would be

coordinated with the WSMR Environment and Safety Directorate and other required WSMR organizations. Recovery operations would be carried out in accordance with the WSMR *Standard Operating Procedure for Environmental Protection During Recovery Action*. This SOP focuses on guidelines for avoidance of known sensitive areas on WSMR (e.g., Salt Creek and other White Sands pupfish habitat, San Andres National Wildlife Refuge, and Trinity Site National Historic Landmark) but also provides specific guidance for recovery in areas of unknown natural and cultural resources sensitivity. Sensitive areas are delineated in the text of the SOP and are graphically depicted as areas to be avoided or treated with higher levels of caution and review approval. Recovery operations would be limited to necessary vehicles and off-road access would follow the same entry route, to the extent possible, to complete the operation with minimal disturbance (White Sands Missile Range, 1998a). Restoration of the impact site would be conducted on a case-by-case basis in coordination with the WSMR Environment and Safety Directorate.

To further minimize possible detrimental effects, WSMR recovery procedures in areas with a high probability of threatened or endangered species or cultural resources would include a qualified biologist and archaeologist with each recovery team (if determined necessary by the WSMR Environment and Safety Directorate). If, during debris recovery, it is determined that there is a potential to disturb sensitive biological or cultural resources then activities would be temporarily halted until appropriate Federal or state agencies could be consulted by the WSMR Environment and Safety Directorate. Range personnel would be instructed concerning the prohibition on collecting cultural resources materials. Planned trajectories from an anticipated mission do not predict any debris falling on the San Andres National Wildlife Refuge, White Sands National Monument, or Bureau of Land Management land. However, if debris did land on these areas, consultation with the WSMR Environment and Safety Directorate and the affected agencies would occur before recovery operations commenced. As part of the postlaunch activities, approved procedures would be used to decontaminate any equipment as necessary. Following launches, all associated vehicles and equipment would be returned to their respective locations. Unused propellants would be returned to the propellant storage areas for future use. Hazardous waste would be disposed of via permitted procedures through the WSMR Hazardous Waste Storage Facility.

2.11 ALTERNATIVES CONSIDERED BUT NOT CARRIED FORWARD

2.11.1 ALTERNATIVE TEST RANGE

An overland test range is required for aerial dispersion experiments, since part of the test objective is to observe dispersion patterns of dispersed objects. Initially, WSMR was determined not to be large enough to accommodate the trajectories required for these tests. PFRR, Alaska, is an overland range that was originally considered the preferred alternative for some of the initial LPT tests that include dispersion experiments in the payload. One of the limitations for using the PFRR is the requirement to conduct tests when the ground and surface waters are frozen. This limits testing to the December to April timeframe. Tests that were originally planned for April 2002 have been delayed, and therefore could not be conducted at PFRR. Dispersion experiments require instrumentation

at the impact area. The remote location of impact areas at PFRR would require airlifting the instrumentation and support equipment, and establishing remote base camps. However, logistical support from Alaska-based military units was limited by ongoing military operations supporting Operation Enduring Freedom. A critical radar asset was also not available due to wartime requirements. Obtaining alternate logistic and radar support within the December to April testing window was not feasible, and the delays incurred if the experiments were kept at PFRR would unacceptably increase the cost and mission risks to the program. In addition, further evaluation has shown that the relatively short trajectories at WSMR would meet the test requirements. Due to the seasonal, cost, and logistics constraints involved in the PFRR alternative and the revised trajectory requirements, PFRR was not carried forward.

2.11.2 ALTERNATIVE ACTIVITY LOCATIONS AT WSMR

2.11.2.1 WSMR Former Liquid Propellant Storage Facility

Liquid propellant storage at the WSMR former liquid propellant storage facility was not carried forward because of site conflicts. Two 381-meter (1,250-foot) ESQD arcs cover a portion of the facility, and additional coordination would be required with the Army Tactical Missile System project office, operators of the radiography bunkers, and the WSMR Environment and Safety Directorate. Therefore, selection of this location for LPT liquid propellant storage activities was not carried forward for analysis in this EA.

2.11.2.2 Missile Fueling at WSTF

Missile fueling at WSTF was not carried forward because it would require transportation of the fueled missile over public roads, and because the longer distances involved in transportation from WSTF to candidate launch sites on WSMR could create unavoidable hazards.

2.11.2.3 LPT Launches from LC-94

LC-94 is located in the Northern Call-up area (see figure 1-1) and is similar in design to LC-32. The complex has electricity, communications, survey coordinates for a launcher, ground support equipment, and program-specific instrumentation.

This complex is located in the Firing-in-Extension area, which consists of privately owned land as well as Bureau of Land Management and State of New Mexico controlled lands. Launches from LC-94 could require substantial additional coordination with private land owners, public land managers (Bureau of Land Management), and other regulatory agencies, and land use agreements that would increase the cost and delay the LPT program schedule. This would not support initial LPT testing mission requirements. Therefore, selection of this location for LPT launch activities was not carried forward for analysis in this EA.

2.11.2.4 LPT Launches from McGregor Range

LPT launches from McGregor Range, Fort Bliss, were also considered as an alternative. However, launches from this location could also require substantial additional coordination with regulatory agencies and increase the cost and delay the LPT program schedule. This would not support initial LPT testing requirements. Therefore, selection of this location for LPT launch activities was not carried forward for analysis in this EA.

2.12 ALTERNATIVE TO THE PROPOSED ACTION

2.12.1 NO-ACTION ALTERNATIVE

Under the No-action Alternative, MDA would not proceed with LPT missile activity at WSMR. Flight test information for LPT missiles, needed for development of defensive missile sensors and other emerging technology, would not be collected from test activities at WSMR. Current testing and support activities at WSMR, involving a wide range of sensors and specialized equipment and facilities, would continue.

Liquid propelled Lance missiles would continue to be launched at WSMR. Characteristics of the liquid propellants used in the Lance missile (UDMH fuel and IRFNA oxidizer) are included in appendix D. Environmental analysis for the use of the Lance missile at WSMR is included in the *Lance Missile Target Environmental Assessment* (Cortez III Environmental, 1996). The Executive Summary from that EA is included as appendix E.

THIS PAGE INTENTIONALLY LEFT BLANK

3.0
AFFECTED ENVIRONMENT

3.0 AFFECTED ENVIRONMENT

This section describes the environmental characteristics that may be affected by the Proposed Action at the alternative fuel storage, launch sites, evacuation area, and impact areas. The affected environment is described succinctly in order to provide a context for understanding the potential impacts. Those components of the affected environment that are of greater concern relevant to the potential impacts are described in greater detail.

Available literature (such as EAs, environmental impact statements [EISs], and base master plans) was acquired and data gaps (questions that could not be answered from the literature) were identified. To fill the data gaps and to verify and update available information, installation personnel and Federal, state, and local regulatory agencies were contacted. Cited literature, telephone interviews, and referenced material are presented in section 5.0.

Because of the extent of test activities involved, site visits to WSMR were conducted to review existing facilities proposed for test uses and to collect baseline data.

Environmental Resources

Eleven broad environmental components were considered to provide a context for understanding the potential effects of the Proposed Action and to provide a basis for assessing the severity of potential impacts. The data presented are commensurate with the importance of the potential impacts, with attention focused on the key issues. Several of the environmental components are regulated by Federal or state environmental statutes, many of which set specific guidelines, regulations, and standards. These Federally mandated or state-mandated standards provide a benchmark that assists in determining the significance of environmental impacts under the NEPA evaluation process. The 11 areas of environmental consideration, discussed briefly as follows, are air quality, airspace, biological resources, cultural resources, geology and soils, hazardous materials and waste, health and safety, land use, transportation and infrastructure, noise, and water resources.

Socioeconomics was not considered beyond an initial look, since personnel would be drawn from the existing workforce, with minimal impacts to socioeconomics in the affected region. Environmental Justice impacts are discussed in section 4.19.

Air Quality. Existing information on air quality was reviewed, with particular attention paid to background ambient air quality compared to the primary National Ambient Air Quality Standards (NAAQS) and New Mexico Ambient Air Quality Standards, to identify air quality issues. In addition, information was obtained on whether the installation was located in an attainment or nonattainment area.

Airspace. Existing information on airspace was reviewed to identify any known conflicts between existing and future airspace restrictions.

Biological Resources. Existing information on plant and animal species and habitat types in the vicinity of the sites was reviewed, with particular attention paid to the presence of any protected species, especially Federal or state threatened or endangered species.

Cultural Resources. Existing information on cultural resources and the potential for the presence of resources eligible for inclusion in the National Register of Historic Places (National Register) was reviewed.

Geology and Soils. Existing information on topographic, geologic, and soil resources at WSMR was reviewed to determine if there are any physical resource concerns.

Hazardous Materials and Waste. A review of existing management practices was conducted in order to determine WSMR's capability to handle any additional hazardous materials and waste. Records were also reviewed to determine any potential problems with the use, handling, storage, treatment or disposal that may occur from specific activities.

Health and Safety. Existing environmental documents were reviewed and installation personnel were contacted to determine if public and occupational health and safety concerns are an issue. Safety regulations were also reviewed with regard to hazardous materials and ordnance storage, handling, and disposal.

Land Use. Base master plans, environmental management plans, resource management plans, and other existing documents, including Memorandums of Understanding and evacuation agreements, were reviewed to identify any known conflicts between existing and future facilities, land uses, and proposed test activities.

Noise. Existing environmental documents were reviewed and installation and regulatory agency personnel were contacted to determine if noise concerns are an issue.

Transportation and Infrastructure. Existing information on the capacity and current demands of infrastructure elements (electricity, alternate power, solid waste, sewage treatment, water supply, public services, and transportation) at WSMR were examined to identify any infrastructure constraints to conducting the proposed activities.

Water Resources. Existing information on groundwater and surface water quality and supply was reviewed to identify potential water resource concerns.

3.1 AIR QUALITY

Existing information regarding air quality was reviewed to identify air quality issues. Particular attention was given to background ambient air quality compared to the primary NAAQS and airborne concentrations of other potential hazardous air pollutants. In addition, information was obtained regarding the attainment status of the area in question (attainment or non-attainment for the NAAQS). WSMR is considered a major source of air pollutants and operates in accordance with Title V Operating Permit No. P085. As such, it is also operating in compliance with the Federal Clean Air Act.

Air quality in a region is described by the concentration of various pollutants in the atmosphere, expressed in units of parts per million by volume or micrograms per cubic meter. Pollutant concentrations are a result of the type and amount of pollutant emitted, the size and topography of the air basin, and the meteorological conditions. Pollutants may be man-made (e.g., vehicle exhaust, industrial emissions, structural fires) or of natural origin (e.g., wind-blown dust, volcanic gases, wildfires).

Significance of air pollution concentrations is determined by comparison with established Federal, state, or local regulatory standards. These standards have been developed to protect public health and welfare. For pollutants not covered in the regulatory standards other health-related guidance is used to determine the significance of potential pollution concentrations.

Region of Influence

The region of influence (ROI) for the air quality analysis would be the air basin surrounding the areas in which the proposed activities would take place, including fuel storage locations, launch preparation sites, launch sites, and impact sites. The Proposed Action would take place at locations throughout WSMR. As such, the ROI would be the air basin surrounding WSMR.

Affected Environment

Most of WSMR is located within the Tularosa Basin. The climate of the Tularosa Basin is typical of arid regions at low latitudes. Rainfall varies with elevation, but averages approximately 25 centimeters (10 inches) annually. Several months without rain are not unusual. April and May are typically the driest months in terms of rainfall, and half the annual precipitation is in the form of afternoon and evening thunderstorms in July, August, and September. Annual snowfall totals average approximately 20 centimeters (8 inches).

The prevailing winds are from the west except during July and August when the wind often has a strong southerly component, which contributes to the formation of summer thunderstorms during that time.

According to U.S. EPA guidelines, an area with air quality that meets the NAAQS is designated as being in attainment. Those areas that fail to meet the NAAQS are

designated as being in nonattainment. An area that is not monitored for NAAQS is designated as unclassifiable, and is assumed to be in attainment.

Otero County is in attainment for state and Federal standards. Doña Ana County is currently considered to be in attainment with the National Air Quality Standards. However, the Air Quality Bureau has recorded exceedances of the standard for particulate matter with a mean aerodynamic diameter less than or equal to a nominal 10 microns (PM-10) in the county. In response to this exceedance, a Natural Events Action Plan for Doña Ana County has been prepared and submitted to the U.S. EPA for approval. As part of this plan, WSMR has signed a Memorandum of Agreement with the New Mexico Environment Department.

WSMR operates under an approved Title V Air Permit. Air pollution sources on the range include mobile sources such as exhaust from aircraft, helicopters, missiles, cars, and trucks, and non-mobile sources such as boilers, generators, paint booths, woodworking shops, sandblasting, and fuel storage and pumping facilities.

3.2 AIRSPACE

Airspace, or that space that lies above a nation and comes under its jurisdiction, is finite, having dimensions of height, depth, width, and scheduled time. Scheduled time is an essential element of airspace management and air traffic control. Under Federal law, the Federal Aviation Administration (FAA) is charged with the safe and efficient use of U.S. airspace in accordance with established criteria and limits. This service is provided through the National Airspace System.

Region of Influence

The ROI for airspace includes the WSMR restricted area airspace complexes.

Affected Environment

The R-5107 complex of special-use airspace covering WSMR was especially chartered to protect nonparticipating aviation from potentially hazardous military operations, including missile testing. The special-use status enables the airspace to be utilized for military purposes without interference. The WSMR National Range Operations Directorate maintains close coordination with the FAA Air Route Traffic Control Center and Holloman Air Force Base (AFB).

WSMR controls a complex of 19 restricted areas. Any aircraft that have not been authorized and scheduled by the controlling agency are prohibited from entering active restricted airspace. During part of the day, WSMR may return some of the restricted airspace to FAA control for use by aircraft under a shared-use agreement between WSMR and the FAA. Missile firings, which include air-to-air, air-to-surface, surface-to-surface, and surface-to-air, are some of the major operations performed in the airspace. All areas are joint-use except R-5107B, which is in continuous use by WSMR and is not released

back to the FAA. Many of the restricted areas are used extensively by Holloman AFB for advanced training missions. (White Sand Missile Range, 1998a; U.S. Army Space and Strategic Defense Command, 1995a)

Some of the airspace in the ROI is controlled by the Holloman AFB radar approach control facility, by agreement with the FAA through the Albuquerque Air Route Traffic Control Center. The radar approach control airspace has been divided into five areas for recall purposes when conducting testing operations. Depending on the airspace and safety requirements of a particular WSMR mission, one or more of these areas can be recalled by WSMR for a specified period of time. WSMR recalls portions of the radar approach control areas for research and development missions, which has the effect of limiting instrument approaches to Holloman from the north, limiting departures to the north directly into WSMR airspace, modifying visual flight rules arrivals from the north, and tightening instrument flight rules departures to the southwest (U.S. Army Space and Missile Defense Command, 1997).

3.3 BIOLOGICAL RESOURCES

Existing information on plant and animal species and habitat types in the vicinity of the sites that would be used for LPT activities was reviewed, with particular attention paid to the presence of any protected species, especially Federal or state threatened or endangered species. For this analysis, scientific names are only provided the first time that protected species are mentioned in the text.

Region of Influence

The ROI for biological resources encompasses areas proposed for use by the LPT program including launch sites, fuel storage sites, and debris impact areas.

Affected Environment

WSMR is located in the northern Chihuahuan Desert and features a diverse biotic community composed of grasslands, shrublands, and woodlands. More than 200 species of birds have been observed at WSMR, including migratory waterfowl and raptors. Seventy-nine mammal species have been documented on WSMR, ranging from large mammals such as the introduced African oryx to rodents.

Vegetation

The eastern and western edges of the San Andres Mountains feature a series of belt-like soil/vegetation zones associated with increasing elevation. In the Oscura Mountains much of the habitat above 2,195 meters (7,200 feet) is dominated by pinyon pine-related vegetation such as Gambel oak, grama, and mountain mahogany. Along the western edge of the Tularosa Basin and the eastern edge of Jornada del Muerto are scattered grasslands associated with clay loam soils that receive runoff from the mountain slopes. Higher in elevation, piedmont slopes feature a distinctive vegetation zone consisting almost entirely of creosote bush on coarse sand and gravel soils. Within the mountains, the highest

elevations are composed of exposed rock cliffs with thin, stony soils in crevices and alluvial slopes. Scattered pinyon pine and alligator juniper are present, with ground cover of a variety of grama grasses. Thickets of oak and many species of small shrubs also occur on some high mountain slopes. Dense growths of vegetation including oak, cottonwood, velvet ash, and the non-native salt cedar are associated with the canyon springs. On the lower slopes within the mountains, the thin, stony soil supports sparse grasses and a variety of shrubs and cacti. (White Sands Missile Range, 1998a)

Wildlife

More than 200 species of birds have been observed at WSMR, although less than half of the species are known as regular residents. Bird species diversity is directly related to characteristics of available vegetation. Dry habitat dominated by creosote has the lowest number of species. The most common birds on WSMR include the black-throated sparrow, northern mockingbird, mourning dove, and western kingbird. Scrub and pinon jays and rufous-crowned sparrows are located in higher elevated areas of the range that support forest habitat. Many species of migratory waterfowl (ducks and geese) and shorebirds (gulls, terns) are winter occupants of wastewater ponds, ephemeral playas, and spring-fed streams in the Tularosa Basin, mountains, and the Jornado del Muerto Basin. The western snowy plover breeds in New Mexico and has been reported to summer in the Tularosa Basin. A variety of raptors are common in mountain and basin areas, including Swainson's hawk, red-tailed hawk, northern harrier, American kestrel, prairie falcon, golden eagle, great horned owl, and burrowing owl. Mourning dove, Gambel's quail, and scaled quail are the most abundant game birds present at WSMR. (White Sands Missile Range, 1998a)

Field surveys and literature reviews have documented the presence of 79 mammal species at WSMR. This relatively high number is a result of the diversity of landforms and vegetation types on WSMR. Native large mammals present on WSMR include mule deer, pronghorn antelope, and elk. Introduced African oryx occur in every habitat type on WSMR and in large concentrations in the basin areas east and north of Rhodes Canyon Range Center. Common predatory mammals of the area include coyote, mountain lion, bobcat, and badger. The mountain lion population of the San Andres Mountains was the subject of a long-term study funded by the New Mexico Department of Game and Fish. The small mammal communities include 15 common rodent species (kangaroo rat, deer mouse) and 2 rabbit species that occur in various vegetative zones. (U.S. Army Space and Strategic Defense Command, 1994b; White Sands Missile Range, 1998a)

An abundant, diverse group of reptiles is common on WSMR. Lizards are the most frequently observed reptile on WSMR. Snake species are also abundant. The Texas banded gecko, roundtail horned lizard, checkered whiptail, bullsnake, blackneck garter snake, Plains blackhead snake, and western diamondback rattlesnake are found in the majority of habitat on WSMR. Few amphibians are found on WSMR, only a total of 10 species. (White Sands Missile Range, 1998a)

Threatened and Endangered Species

Threatened and endangered species in the ROI include plants and animals listed as threatened, endangered, or candidates for listing by the U.S. Fish and Wildlife Service (USFWS). Appendix C contains a list of Federally endangered, threatened, and candidate species that may be found in locations where the Proposed Action would occur.

The following Federally threatened and endangered plants have the potential to occur on WSMR: the threatened Sacramento Mountain thistle (*Cirsium vinaceum*), and endangered Kuenzler's hedgehog cactus (*Echinocereus fendleri* var. *kuenzleri)*, Todsen's pennyroyal (*Hedeoma todsenii*), Sneed's pincushion cactus (*Coryphantha sneedii* var. *sneedii*), and Sacramento prickle-poppy (*Argemone pleiacantha* ssp. *pinnatisecta*).

Of these five plants, Todsen's pennyroyal is the only Federally listed plant species known to occur on WSMR. It is located in only 3 known populations within the San Andres Mountains on WSMR and 15 sites in the Sacramento Mountains (University of New Mexico, 2001). The localities of these known populations are outside areas potentially affected by the program, but the presence of additional undiscovered populations within the San Andres Mountains is possible. (White Sands Missile Range, 1998a)

There have been occasional sightings of bald eagles (*Haliaeetus leucocephalus*) over WSMR, but there is no nesting habitat available. There are historical records of the endangered least tern's (*Sterna antillarum athalassos*) occurrence on WSMR, but it is now listed as a rare visitor to the vicinity (New Mexico Department of Game and Fish, 2001). The endangered southwestern willow flycatcher (*Empidonax traillii extimus*) and threatened piping plover (*Charadrius melodus circumcinctus*) have not been sighted on WSMR; however, suitable habitat may be present. The mountain plover (*Charadrius montanus*), proposed for listing as threatened (U.S. Fish and Wildlife Service, 2001a), has a summer range that includes portions of the Tularosa Basin, and it has been observed on WSMR. The threatened Mexican spotted owl (*Strix occidentalis lucida*) has been sighted on WSMR, and appropriate habitat may be present. (White Sands Missile Range, 1998a)

There have been three reported sightings of the Federally endangered northern Aplomado falcon (*Falco femoralis septentrionalis*) on or near WSMR since 1991. The most recent confirmed sighting occurred in August 1992, just east of San Antonio near WSMR's northern range. Two unconfirmed reports during a 1994 survey period indicated falcons in the vicinity of the Black and Rita sites located along the eastern boundary of WSMR. (U.S. Department of the Interior, 1994)

Systematic efforts to monitor the occurrence of the northern Aplomado falcon have been conducted on WSMR since 1992 (U.S. Army White Sands Missile Range, 1996). These monitoring efforts have been conducted under the direction of the WSMR Environment and Safety Directorate using methodology approved by the USFWS. Surveys, as described in USFWS methodology (U.S. Fish and Wildlife Service, 1999), are conducted every 2 weeks during the months of April through September. Survey areas are located in the northern half of WSMR within areas identified as suitable Aplomado falcon habitat.

The Federally endangered Mexican gray wolf (*Canis lupus baileyi*) has not been sighted on WSMR, although the region constitutes part of its natural habitat (White Sands Missile Range, 1998a). WSMR is within the historical range of the Mexican wolf and is a viable alternative reintroduction site for recovery of the species. However, since the area is experiencing a decline in mule deer, native prey for the wolf, WSMR is only being considered as an alternative site if the reintroduction objective of 100 wolves cannot be achieved on the Blue Range area in western New Mexico and eastern Arizona (U.S. Fish and Wildlife Service, 2001b).

Two species, while not listed by the USFWS as threatened or endangered, are considered, at the request of the New Mexico Department of Game and Fish, when proposing projects on WSMR: desert bighorn sheep *(Ovis canadensis mexicana)* and White Sands pupfish (*Cyprinodon tularosa*). Desert bighorn sheep, a state group 1 endangered species, occupy the upper reaches of the San Andres Mountains, appearing individually and in small bands. The population had remained stable at 20 to 30 individuals after a scabies outbreak decimated the herd in the late 1970s, but today only a single ewe remains, and mountain lions have killed at least 6 of the last 10 radio-collared rams (New Mexico Department of Game and Fish, 2000). However, five new radio-collared rams have recently been introduced into the herd and are being tracked by the USFWS (White Sands Missile Range, 2000).

The White Sands pupfish, which is listed as endangered by the State of New Mexico, is the only fish known to occur naturally on WSMR. It has been documented in the waters of Salt Creek, Lost River (ephemerally in the Lost River Basin), Malpais and Mound springs, and Malone Draw. The population appears relatively stable within its limited range. (U.S. Army Space and Strategic Defense Command, 1994b; U.S. Department of the Interior, 1996)

A Cooperative Agreement for the protection and maintenance of the White Sands pupfish exists among the U.S. Army (WSMR), the U.S. Air Force (Holloman AFB), the National Park Service (White Sands National Monument), the USFWS, and the New Mexico Department of Game and Fish. This agreement provides for protection and maintenance of viable populations of White Sands pupfish in its natural habitat on WSMR, Holloman AFB, and the White Sands National Monument. (U.S. Army White Sands Missile Range, et al., 1994) In addition, the WSMR Integrated Natural Resources Management Plan specifies a pupfish habitat monitoring program will be established. The monitoring parameters and funding plan are currently being developed by the WSMR Environment and Safety Directorate and will be coordinated with the agencies that are a part of the cooperative agreement.

Additional species listed by the State of New Mexico such as the state threatened Alamo penstemon (*Penstemon alamosensis*) and Sandberg's pincushion cactus (*Escobaria sandbergii)*, and the state endangered Mescalero milkwort (*Polygala rimulicola mescalerorum*) are provided in appendix C, tables C-3 and C-4.

Environmentally Sensitive Habitat

Several sensitive areas are located within WSMR or adjacent to its boundaries. Sensitive wildlife habitats occurring within the ROI include White Sands pupfish habitat, raptor nesting areas, wetlands and riparian habitats, and other regionally valuable habitats such as grama grasslands and pinyon-juniper woodland. Only 0.4 percent of WSMR has been mapped as jurisdictional wetlands, which are dispersed throughout the range. Limited water resources render most aquatic habitats critical as habitat for wildlife including the pupfish, particularly Salt Creek and its tributaries, Malpais and Mound springs, Lost River, and Malone Draw. (U.S. Army Space and Strategic Defense Command, 1994a) The San Andres National Wildlife Refuge, an area that provides habitat for a variety of sensitive species, was established in 1941 by Executive Order 8646 for the conservation and development of natural wildlife resources. The refuge supports a population of state-endangered desert bighorn sheep, as well as mule deer, mountain lions, golden eagles, and gray vireos. The refuge is within WSMR boundaries and operates under a co-use agreement. All missions with the potential to impact protected wildlife within the refuge are subject to review by the USFWS Refuge Manager. Natural resources management is the responsibility of the USFWS. (U.S. Army Space and Strategic Defense Command, 1997)

The Jornada Experimental Range is operated under a co-use agreement between the U.S. Army and the Crops Research Division of the Agriculture Research Service. Livestock grazing is permitted on a small co-use area within WSMR boundaries. (U.S. Army Space and Strategic Defense Command, 1997)

3.4 CULTURAL RESOURCES

Cultural resources are prehistoric or historic sites, structures, districts, artifacts, or other physical evidence of human activity considered important to a culture, subculture, or community for scientific, traditional, religious, or other reasons. For ease of discussion, cultural resources have been divided into archaeological resources (prehistoric and historic), historic buildings and structures, and traditional resources (e.g., American Indian).

Numerous laws and regulations require that possible effects on cultural resources be considered during the planning and execution of Federal undertakings. These laws and regulations stipulate a process of compliance, define the responsibilities of the Federal agency proposing the action, and prescribe the relationship among other involved agencies (e.g., the State Historic Preservation Officer [SHPO], Tribal Historic Preservation Officers, and the Advisory Council on Historic Preservation). The primary laws that pertain to the treatment of cultural resources during environmental analysis are the NEPA, the National Historic Preservation Act (especially section 106), the Archaeological Resources Protection Act, the American Indian Religious Freedom Act, and the Native American Graves Protection and Repatriation Act; the treatment of paleontological resources is governed by Public Law 74-292 (the National Natural Landmarks Program).

In addition, Army Regulation 200-4 and several agreement documents affect the management of cultural resources on WSMR: a Programmatic Memorandum of Agreement among WSMR, the New Mexico SHPO, and the Advisory Council on Historic Preservation (1985) addressing the protection and management of historic and prehistoric properties on the range; a Memorandum of Understanding with the SHPO addressing land use management for the Trinity National Historic Landmark; a Memorandum of Understanding with the National Park Service regarding overflight and recovery activities within the White Sands National Monument; a cultural resources management plan (U.S. Army Materiel Readiness and Development Command, 1983); and a Historic Preservation Plan (U.S. Army Corps of Engineers, 1988; White Sands Missile Range, 1998a).

Only those cultural resources determined to be potentially significant under the given legislation are subject to protection from adverse impacts resulting from an undertaking. To be considered significant, cultural resources must meet one or more of the criteria established by the National Park Service that would make that resource eligible for inclusion in the National Register. Sites not yet evaluated must be considered potentially eligible for inclusion in the National Register and, as such, are afforded the same regulatory consideration as nominated properties.

Region of Influence

The ROI for cultural resources (synonymous with the area of potential effect under cultural resources legislation) encompasses all areas of potential ground disturbance, including LPT launch sites, fuel storage areas, and debris impact areas on WSMR.

Affected Environment

Archaeological Resources (Prehistoric)

The physiography and climate of WSMR have supported a cultural resources chronology that extends into the past for approximately 11,000 years. Major divisions of prehistoric occupation in the WSMR region are: the Paleo-Indian period (approximately 9,000 B.C. to 6,000 B.C.), the Archaic period (approximately 6,000 B.C. to A.D. 400), and the Formative period, both Rio Abajo and Jornada Mogollon (approximately A.D. 400 to A.D. 1400). The Historic Period (Protohistoric and Euroamerican) is generally accepted as beginning around 1540 when the Spanish began exploration and occupation of the New Mexico area.

Approximately 3,746 sites have been recorded, the majority of which date to the archaic and Formative Period. Site types include Paleo-Indian hunting and butchering sites distinguished by lanceolate spear points, sites indicating an increased reliance on the bow and arrow and the development of ceramics, and sites which exhibit a transition from jacals and pithouses into aboveground adobe pueblo architecture and complex pottery designs.

Because of the large number of prehistoric archaeological sites identified within WSMR, as well as the immense area that remains unsurveyed, the number of National Register-listed or -eligible prehistoric properties has not been determined. Previous evaluations of

significance do indicate the presence of eligible sites within the ROI. Based on relatively comprehensive surveys of an area south of WSMR, the number of potential sites on the range is predicted to be 27,000 (U.S. Department of the Army, 1985a). (White Sands Missile Range, 1998a)

Historic Resources and Structures

Very little is known of the cultural development in the area of WSMR from 1400 to 1540. Between 1540 and 1846, New Mexico was under Spanish rule, but there is little physical evidence of permanent settlement from that time period remaining on WSMR. There is also some indication that native peoples were exploiting plant and animal resources along the Rio Grande on a seasonal basis.

Euroamerican settlement is primarily characterized by the beginning of homesteading, ranching, and mining, and there are several hundred such sites scattered throughout WSMR. A survey of historic ranches conducted in the mid-1980s indicated numerous potentially significant sites. Additional sites, most of which are located near the Main Post, represent military occupation of the area and include Plywood City, a Cold War-period site; Sierra Chapel, a World War II temporary, mobilization-type facility; and rocket engine test facilities associated with the Werner Von Braun era. Several hundred additional sites related to the Cold War period are currently being evaluated for Cold War status.

A review of the National Register and New Mexico State Register of Cultural Properties indicates that there are only two National Register-listed properties within the WSMR boundaries: the Trinity Site, which is both a National Register-listed site and a National Historic Landmark, and LC-33, which is also a National Register-listed site and a National Historic Landmark. Three New Mexico state-registered sites are located adjacent to WSMR or within the White Sands National Monument. The White Sands National Monument Historic District is also listed in the National Register.

Traditional Resources/Consultation

Traditional resources can include archaeological sites, burial sites, ceremonial areas, caves, mountains, water sources, plant habitat or gathering areas, or any other natural area important to a culture for religious or traditional reasons. Significant traditional sites are subject to the same regulations and are afforded the same protection as other types of historic properties. Some of the recorded and unrecorded sites described above could also be considered traditional sites or could contain traditional resources elements.

Traditional resources within WSMR are expected to be associated with the Mescalero Apache Tribe, whose lands are on the northeastern periphery of WSMR, the Lipan Apache Tribe, and the Chiricahua Apache. Traditional cultural properties are known to exist in the WSMR region, and Apache tribal leaders indicate that the Oscura Mountains (located in the northern portion of WSMR) are used for traditional religious purposes. Salinas Peak, in the San Andres Mountains, is a sacred mountain for the Chiricahua Apache. WSMR is currently working on a Memorandum of Agreement with the Mescalero Apache Tribe.

Because of the large number of cultural resource sites identified within WSMR, the immense area which remains unsurveyed, and the reticence of traditional cultural leaders to reveal the locations of these types of sites, the number of National Register-listed or -eligible traditional properties has not been determined. Previous evaluations of significance do indicate the presence of eligible sites, some of which may be traditional or contain traditional components. However, the total number and distribution of significant sites are not currently available. (White Sands Missile Range, 1998a)

National Natural Landmarks

There are no National Natural Landmarks within WSMR.

3.5 GEOLOGY AND SOILS

This section describes the geologic setting and soils found on WSMR with specific references, where available, to the potential launch and impact sites.

Region of Influence

The ROI for geology and soils includes the areas within the WSMR boundaries.

Affected Environment

WSMR is located within the Basin and Range geologic province. Down-dropped basins (such as the Tularosa Basin and Jornada del Muerto), mountain ranges, volcanic and clastic (sand, gravel, and clay) rocks which fill the basins, and normal faulting zones have resulted from extension in the crust. Rock units found on the mountains are distinct from those found within the basins. Mountain range rocks include Paleozoic- and Mesozoic-era (225 to 65 million years ago) sedimentary rocks and mid-Tertiary-aged igneous intrusive and volcanic rocks. The basins and valleys within WSMR are filled with relatively thick clastic, evaporitic (specifically gypsum), and/or volcanic deposits. (U.S. Army Space and Strategic Defense Command, 1995a) Gypsum, oil and natural gas, groundwater, and minerals are potential geologic resources found at WSMR.

Paleontological resources include fossilized remains of plants and animals, casts or molds of the same, or trace fossils such as impressions, burrows, or tracks. Within the WSMR boundary, only one paleontological site, consisting of prehistoric mammal tracks, has been recorded.

Thirty Soil Conservation Service soil series have been identified and mapped on WSMR (U.S. Department of the Army, 1985a). Each series is characterized by differing composition, slope, surface texture, and source material resulting in varying susceptibility to erosion. Soils identified at WSMR include the gypsum dunes and lake bed deposits of the White Sands National Monument and Lake Lucero area, the rocky soils associated with the rough slopes and foothills of the neighboring mountains, and the sandy loams of the Tularosa Basin and the Jornada del Muerto. Soils are generally dry and susceptible to wind

erosion. (U.S. Department of the Army, 1985a, U.S. Army Space and Strategic Defense Command, 1995a)

3.6 HAZARDOUS MATERIALS AND HAZARDOUS WASTE MANAGEMENT

Hazardous materials and wastes are defined and regulated under several U.S. laws. They are required to be managed in a way that protects human health and the environment.

Region of Influence

The ROI for hazardous materials and hazardous waste at WSMR would extend to all locations where these substances are used, stored, transported, or disposed. Even when disposal does not occur on-site, waste generators are responsible for waste disposed off-site.

Affected Environment

Hazardous Materials Management

Many organizations and private contractors at WSMR are responsible for the management of hazardous materials. The WSMR Environment and Safety Directorate has primary responsibility for compiling and tracking hazardous materials information. The WSMR Hazardous Materials Minimization Center purchases and dispenses the majority of hazardous materials used on WSMR. Organizations purchase the materials, use what they need, then return the unused portion. This process is designed to minimize the amount of hazardous materials on-base and also to ensure its use.

Individual users of hazardous materials are responsible for safe storage and handling of the materials they obtain and all must adhere to DOT hazardous materials transportation regulations. The WSMR Environment and Safety Directorate is responsible for inspecting all hazardous materials storage facilities at WSMR, documenting the findings, verifying corrective actions, and maintaining accurate records as required by Army Regulation 420-90, Fire Protection. The WSMR Explosive Ordnance Disposal section handles all ordnance and ordnance by-products. Hazardous materials used in support activities include various cleaning solvents, paints, cleaning fluids, pesticides, fuels, coolants, and other materials. Hazardous materials used in range tests include those listed above as well as explosives and propellants.

The WSMR Installation Spill Contingency Plan (Annex G, Appendix I of the WSMR Disaster Control Plan [White Sands Missile Range, 1997]) establishes responsibility, outlines personnel duties, and provides resources and guidelines for use in the control, clean-up, and emergency response for spills. Releases of materials above threshold quantities are reported to the U.S. EPA, and to state and local level agencies with emergency planning authority as mandated by the Emergency Planning and Community Right to Know Act of

1986. Material and Safety Data Sheets are kept at the use and storage sites of each material.

NASA WSTF is responsible for managing hazardous materials at the WSTF facility. The NASA WSTF environmental staff has primary responsibility for compiling and tracking hazardous materials information. The NASA WSTF environmental compliance department is responsible for inspecting all hazardous materials storage facilities at WSTF, documenting the findings, verifying corrective actions, and maintaining accurate records. WSTF ordnance is stored in five buildings in the 100 area.

Hazardous Waste Management

WSMR and NASA WSTF are responsible for tracking hazardous wastes; for proper hazardous waste identification, storage, transportation, and disposal; and for implementing strategies to reduce the volume and toxicity of the hazardous waste generated.

WSMR was issued a Part B RCRA permit in October 1989. The WSMR Environment and Safety Directorate implements the WSMR hazardous waste tracking system, which tracks hazardous wastes from the generator of the waste through the accumulation and storage sites until they are shipped off the range by an authorized contractor. All hazardous waste is disposed of via permitted procedures through the WSMR Hazardous Waste Storage Facility.

Hazardous waste generated at NASA WSTF is managed separately from WSMR. The environmental staff at NASA WSTF obtains permits and manages satellite waste accumulation areas and tracks each waste stream using profile sheets. There are currently approximately 30 satellite accumulation points at NASA WSTF. NASA WSTF has several treatment facilities including an evaporation tank unit, a waste fuel treatment unit, and an open detonation unit. Wastes not treatable at NASA WSTF are shipped off range to an authorized contractor.

3.7 HEALTH AND SAFETY

Health and safety includes consideration of any activities, occurrences, or operations that have the potential to affect the well-being, safety, or health of workers or members of the public.

Existing environmental documents were reviewed to determine if public and occupational health and safety concerns are an issue. Applicable safety regulations were also reviewed with regard to hazardous materials and ordnance storage, handling, recovery, and disposal.

Region of Influence

The standards applicable to evaluation of health and safety effects differ for workers and the public, thus it is useful to consider each separately.

Worker Safety

This ROI includes only the immediate work location, because personnel working even at nearby locations cannot be considered to be knowledgeable of hazards associated with tasks with which they are not involved. Thus, the ROI for worker safety is limited to a very small area and would not extend beyond WSMR or WSTF boundaries.

Public Safety

During missile flight operations the ROI would include not only the launch and intended impact areas but also all locations along the flight corridor (which are potentially subjected to unplanned impacts or explosion). The ROI for public safety includes the entire WSMR facility as well as off-base areas that may be affected by the Proposed Action or related mishaps.

Affected Environment

WSTF provides a Safety and Health program for all employees, and ensures that visitors are advised of potential hazards present at the facility. The Quality Assurance, Reliability, and Safety Office is responsible for implementing occupational and system safety requirements, identifying potential health and safety hazards, and developing controls to protect employees and facility assets. WSTF Emergency Services provides emergency response to fire, explosion, chemical release, and associated medical emergencies.

WSMR is engaged in the ongoing test and evaluation of a variety of DoD missile flight systems and related equipment. WSMR has implemented a comprehensive safety program to identify, evaluate, and mitigate potential workplace hazards such as exposure to toxic materials used in ongoing operations and the handling and use of explosive and flammable materials. Standardized procedures have been developed on the range for the planning, safety evaluation, and conduct of flight testing. The Flight Safety Office evaluates the flight hazards from all types of weapon systems to protect the public, personnel, and facilities from flight hazards. Any program involving missile flight safety must undergo a thorough safety review, a risk analysis, and preparation of SOPs. The documentation is reviewed by project directors and WSMR Missile Flight Safety. Missile firings cannot be scheduled or conducted without the final approval of the WSMR Missile Flight Safety Office. (White Sands Missile Range, 1998a)

WSMR Flight Safety determines the dimensions of the safety zone surrounding the launch and impact area, determines which areas of WSMR are evacuated for each mission, determines activation of the flight-termination system in the event of missile failure, and oversees the testing of missiles. Areas that are exposed to hazardous missile debris, potentially including co-use portions of WSMR, are evacuated even though the risk may be minimal without evacuating. Flight Safety ensures that the public is not exposed to unacceptable levels of risk. Launch activities include a thorough safety review, risk analysis, and SOP preparation. Before launch, positive control of hazardous areas is established. A launch can proceed only after all required safety evacuations have been accomplished in order to ensure that no unauthorized personnel are present in hazardous areas. (Leyva, 2000)

Launch complexes and impact areas are located in remote areas of the base. The flight paths do not overfly the Main Post where the majority of WSMR personnel are located. Mission-essential personnel are instructed in safety procedures and equipped with necessary safety devices such as hearing protection.

3.8 LAND USE

White Sands Proving Ground was established in 1945 and became WSMR in 1957. It is used today for testing and developing missile technology. It is the largest overland testing facility in the continental United States and is administered by the U.S. Army. Resources are available for all branches of the Armed Forces and government agencies. Facilities are also available, on a limited basis, for foreign governments, and private industries, both American and foreign. (Cortez III Environmental, 1996)

Region of Influence

The ROI for land use and recreational resources encompasses all WSMR and portions of the Western Call-up area (see figure 1-1).

Affected Environment

As a national test range, WSMR contains an extensive complex of launch sites, impact areas, instrumentation sites, facilities, and equipment. Missile launch sites are located throughout the range. Although numerous missile impact areas have been designated and are specified for missions, almost any nonrestricted or restricted area of the range could be used for missile impact. A variety of instrumentation systems are used during missile testing. These systems, together with the launch complexes, impact areas, and control centers, are linked by an extensive network of timing and communications systems. WSMR has over 1,000 instrumentation sites and approximately 700 types of optical and electronics instrument systems. The NASA White Sands Space Harbor is also located on the range. It is used for shuttle flight practice and is fully manned during two shifts each day. The range provides experimental payload and missile component recovery, target support, air-to-ground multiple target control, calibration and standards, ordnance and propellant storage, geodetic surveying, and photography. (U.S. Army Space and Strategic Defense Command, 1995a)

The Western Call-up area, located to the west of the range, was established in 1960 in connection with critical military testing. A supplemental agreement with private landowners in the call-up area was established in 1963. This agreement allows a maximum of 20 evacuations per year for all WSMR activities. Land use in the Western Call-up area consists primarily of livestock grazing and recreation. The call-up area is temporarily evacuated for public safety, military security, and in some instances missile impact. Residents evacuated during tests are compensated for their time and inconvenience. (U.S. Army Space and Strategic Defense Command, 1995a)

The WSMR National Range Operations Directorate mails notices of upcoming evacuations to affected ranchers 30 days before applicable missions, followed by a second notice mailed 14 days before the missions. A final notice is hand-delivered 3 days before the planned evacuation. Ranchers are notified by phone or in person up to 24 hours in advance if the mission is canceled. No public notification of evacuations is issued to protect the landowners from possible looting. Residents leave their homes for a specified time, generally a maximum of 12 hours. "ALL CLEAR" notices are broadcast from area radio stations upon completion of the launches. The Bureau of Land Management and the state are notified on the same schedule and are expected to pass the information along to hunters, tourists, and miners on their property. Private landowners do the same thing for other people on their land. (U.S. Army Space and Strategic Defense Command, 1995a)

The WSMR boundaries encompass the White Sands National Monument, San Andres National Wildlife Refuge, and two National Historical Landmarks—Trinity Site and Launch Complex 33. Portions of Holloman AFB, Jornada Experimental Range, and NASA are located in co-use areas with WSMR. Agencies and organizations use the shared land for a variety of purposes, including conservation, recreation, research, and livestock production.

White Sands National Monument is used by the public as a recreation area. WSMR is allowed to use the western portion of White Sands National Monument for overflight. Under the cooperative agreement between WSMR and White Sands National Monument, the monument is an area of no planned impacts. Recovery operations are conducted in accordance with environmental guidelines established by the National Park Service. In instances when the monument is determined to lie in the hazard area for WSMR flight tests, temporary evacuation is permitted. No impacts, however, are planned within the monument.

The primary mission of San Andres National Wildlife Refuge is to protect habitat for desert bighorn sheep, a state endangered species. Public use of the Refuge is restricted and must be coordinated with WSMR. Scientific research is conducted within the Refuge boundaries.

The public is permitted access to the two National Historical Landmarks located within the WSMR boundary (Trinity Site and Launch Complex 33), on special occasions, such as anniversaries of historical events on WSMR. Additional public access is provided on a limited basis and includes events such as visits to Rhodes Grave, monthly visits to Lake Lucero, mountain biking, hot air balloon events, the Bataan Death March, and other special request tours. Access is organized and scheduled through the WSMR Public Affairs Office, which also provides an escort to and from the site.

Other activities permitted within the boundaries of WSMR include a number of special hunts during the year (e.g., oryx, pronghorn, and deer), general hunting, scheduled tours through the Public Affairs Office, biological research, (e.g., mountain lion, oryx, springs), and non-military testing (e.g., vehicle airbags, laser, electromagnetic radiation exposure). Approvals of these activities are done in accordance with the mission statement of WSMR. (Cortez III Environmental, 1996)

3.9 NOISE

Sound waves can vary over an extremely large range of amplitudes, frequencies, and speeds of propagation. The decibel (dB), a logarithmic unit of measure that accounts for the large variations in amplitude, is the accepted standard unit for the measurement of sound. Sound levels that incorporate frequency-dependent amplitude adjustments established by the American National Standards Institute (American National Standards Institute, 1983) are called weighted sound levels. The human ear is not equally sensitive to all frequencies throughout the spectrum. Noise measurements that are weighted to emphasize those frequencies within human sensitivity are called A-weighted (dBA). C-weighted decibels use much the same process, except that they emphasize low frequency sound. The lower frequencies are the portion of the sound spectrum that cause windows and structures to vibrate.

Noise is usually defined as unwanted sound. Noise levels change with time. Therefore, descriptors that take this variance into account were developed to compare levels over different time periods. The two common descriptors used in this analysis are the annual average day-night sound level and maximum sound level (L_{max}).

OSHA regulation 1910.95 establishes a maximum noise level of 90 dBA for a continuous 8-hour exposure during a working day and higher sound levels for shorter exposure time in the workplace. The relationship allows a 5-dBA increase in level for a 50 percent reduction in exposure time. In actual use, the effect is a continuous function up to a limit of 115 dBA, which is generally considered the sound level at which humans will experience pain. Under OSHA regulation 1910.95, exposure to impulse or impact noise should not exceed a 140-dBA peak sound pressure level. The 140-dBA level is advisory rather than mandatory. In addition, when information indicates that any employee's exposure may equal or exceed an 8-hour time weighted average of 85 dB, the employer shall develop and implement a monitoring program.

For missile launches, which are less than a minute in duration, the OSHA standard of 115 dBA within a 15-minute duration applies.

The Noise Control Act (1972) was enacted to promote an environment free from noise that jeopardizes public health and welfare. This act designated the U.S. EPA as coordinator for all Federal noise control programs. However, the U.S. EPA discontinued their noise pollution program. Noise standards are now under the control of a variety of Federal, state, and local agencies.

Region of Influence

Based on the requirement to administer a continuous effective hearing conservation program for employees exposed to an 8-hour time weighted noise level average of 85 dBA, the ROI for noise at WSMR is defined as the area within the L_{max} = 85-dB contour. Based on similar launches at Kwajalein Atoll, the L_{max} = 85-dB contour would extend approximately 1,277 meters (4,190 feet) from the launch site.

Affected Environment

In the vicinity of WSMR, U.S. Air Force flights, supersonic combat training, U.S. Army helicopter flights, missile launches, ordnance explosions, aircraft drone overflights, gun firing, general vehicle traffic, and low-altitude military jet traffic are the existing primary sources of noise (U.S. Department of the Army, 1985b). Currently, numerous missiles are launched from WSMR. Additionally, supersonic flight training occurs over most of WSMR. The noise environment for WSMR has most recently and thoroughly been described in the *White Sands Missile Range Range-Wide Environmental Impact Statement* (White Sands Missile Range, 1998a). Traffic, loudspeakers, and mechanical activities are the primary sources of noise except for the few seconds during the missile launch.

Current WSMR activities generate a range of noise levels on the ground. Generally, flight activities are at a high enough altitude and a low enough frequency to generate sound levels anticipated to be no greater than 70 dBA. Average sonic boom levels from supersonic air combat training are expected to be in the range of 50 to 60 dB. The U.S. Army range support helicopter is the UH-1H, which has an anticipated sound level no greater than in the low 80-dBA range. Other representative activities include a Hawk missile launch generating peak sound pressure levels of 149.8 dB, a QF-100 full-scale aircraft target drone producing single-event noise levels of 95.7 dBA, vehicular traffic typically rated at 70 dBA, and low-altitude military jet traffic producing estimated noise levels of 65 to 70 dBA at ground level directly below the aircraft. (White Sands Missile Range, 1998a)

Ambient noise levels at the WSMR Main Post area, the WSMR property boundary, and the San Andres National Wildlife Refuge have been estimated to be 55 to 65, 45 to 55, and 45 dBA, respectively. (White Sands Missile Range, 1998a)

Noise is also an impact factor for wildlife resources as well. Since there are no absolute standards of short-term noise impacts to potentially noise-sensitive species, a short-term maximum noise exposure of 92 dB has been suggested as a significance cut-off for impacts (U.S. Army Strategic Defense Command, 1990).

3.10 TRANSPORTATION AND INFRASTRUCTURE

Transportation includes the primary transportation routes on WSMR and potentially affected highways in the vicinity. Infrastructure elements include facilities and systems that provide power, water, wastewater treatment, fire, health, and police services and collection and disposal of solid waste to the affected installation. It is assumed that the 25 temporary personnel involved with the proposed program would obtain lodging in local motels or hotels. This number represents a small influx of personnel, and no attempt has been made to describe existing infrastructure conditions and capacities in the surrounding communities.

Region of Influence

The ROI for transportation and infrastructure analysis is WSMR and portions of the Western Call-up Area.

Affected Environment—Transportation

U.S. Highway 70 is the only U.S.-designated highway in the ROI. U.S. Highway 70 provides Las Cruces and Alamogordo access to WSMR via Range Road 1. U.S. Highway 70 is in good condition with traffic volumes averaging approximately 8,740 vehicles per day.

WSMR has seven primary access points. U.S. Highway 70 provides direct access to the Small Missile Range gate and to Range Road 1 via the Las Cruces and El Paso gates. Visitors and their vehicles are subject to inspections before entering the range. In addition to the main access points, there are approximately 87 other entrances throughout the range. These access points provide limited access and are protected by locked gates. (White Sands Missile Range, 1998a)

WSMR's road network is extensive, but in a relatively poor condition. There are three classifications of the road types on WSMR: major roads, secondary roads, and trails. The major roads are two lane roads that are paved, graded, and maintained as funding permits. All the major roads on WSMR have the capacity to support 1,200 cars per hour for each lane. The major roads serving WSMR are Range Roads 1, 2, 6, and 7. Range roads 5, 8, 9, 10, and 12 are also used on a regular basis (figure 2-6). Range Road 1 extends in a north-south direction for approximately 9.7 kilometers (6 miles). This road provides access to the Main Post area from the Las Cruces gate by way of U.S. Highway 70, and from the El Paso gate. Range Road 1 supports an average of 5,500 vehicles per day. Range Road 2 extends along the southern boundary of WSMR in an east-west direction from Orogrande Range Camp to the Main Post area for approximately 32 kilometers (20 miles). Range Road 2 supports an average of 3,500 vehicles per day. Range Road 6 extends in an east-west direction from the Tula gate to Rhodes Canyon Range Center and on to the western boundary of WSMR for 39 kilometers (24 miles). Range Road 6 supports an average of 200 vehicles per day. Range Road 7 extends in north-south direction from Stallion Range Center to the Small Missile Range at U.S. Highway 70 for approximately 190 kilometers (118 miles). (White Sands Missile Range, 1998a)

Approximately 966 kilometers (600 miles) of secondary roads serve the WSMR network. Secondary roads on WSMR are unpaved roads that are graded and maintained as funding permits. The WSMR road network has approximately 2,414 kilometers (1,500 miles) of bladed trails. These unpaved trails are bladed but not maintained on a regular basis.

Highway 70, which crosses the southern part of WSMR, is in the evacuation area for flight tests originating in south WSMR. Therefore, Highway 70 is temporarily closed during flight test activities on a routine basis. Closure due to launches is a common occurrence and is well understood and anticipated by local motorists between Las Cruces and Alamogordo. Prominent notices are posted beside the road in both directions. An agreement with the

state of New Mexico allows WSMR to establish planned roadblocks lasting 60 minutes (with extension to 1 hour and 10 minutes) on U.S. Highway 70. U.S. 70 averages one roadblock per week, and the average annual daily traffic count is 8,740 in the WSMR area (U.S. Army Space and Strategic Defense Command, 1995a).

Affected Environment—Infrastructure

Electrical distribution and generation systems are supported by the WSMR Installation Support Directorate. Department of the Army Pamphlet 420-9 delegates responsibility for operation, maintenance, repair, and minor construction of the installation's utility plants and systems.

Electrical service at WSMR is provided by El Paso Electric Company, Sierra Electric Cooperative, Socorro Electric Cooperative, and Otero County Electric Cooperative. The WSMR electrical system consists of 919 kilometers (571 miles) of overhead distribution, 58 kilometers (36 miles) of underground distribution, and 12 substations.

El Paso Electric Company serves the central and southern Range areas, whereas Socorro Electric Cooperative is the predominant service in the north Range. El Paso Electric Company owns, operates, and maintains distribution voltage facilities throughout WSMR. El Paso Electric Company serves the majority of the southern Range area of WSMR with 345-and 115-kilovolt (kV) transmission lines and 14.0 and 24.9-kV distribution lines. Sierra Electric Cooperative owns and operates an electric distribution system originating at Cuchillo Substation near Truth or Consequences, New Mexico, and extending into WSMR via its east system. Distribution into the north Range is provided through a 14.4/24.9-kV line from Cuchillo to Salinas Peak Camp and to Rob site. Socorro Electric Cooperative owns and operates an electric distribution system that originates at Socorro Substation (115/69-kV transformer) and extends to the general area of Mockingbird Gap. A 69-kV subtransmission line runs from Socorro to a transformer location near San Antonio. This line is operated at 24.9 kV and has a 10-megawatt-load-carrying capacity. From San Antonio to Stallion Range Camp, the line is rated at 24.9 kV and is operated at that voltage. The Socorro Electric Cooperative system extends into the WSMR north range from Stallion Range Camp through a 14.4/24.9-kV system extension. Otero County Electric Cooperative owns and operates an electric distribution system that originates at Alamogordo Substation (115/69-kV transformer) and extends through a 14.4/24.9-kV distribution line to Oscura Range Camp. This line is a direct service feed to the U.S. Army facilities at Oscura Range Camp, and there is no Otero County Electric Cooperative-owned transformer at the termination point.

A number of generators are available for use at WSMR. All generators are considered portable, although some are semi-permanently stationed. Generators range in their output capability from 10 to 700 kilovolt-amperes. Generators are typically maintained annually when in use in order to ensure longevity, peak performance, and reduced costs of replacement.

The water supply sources for WSMR are obtained mainly from wellfields. Currently 11 wells from 4 adjacent watersheds serve the Main Post with the capacity of servicing

14,500 people. The main source of water in north WSMR is groundwater, which must be treated before storage and distribution. (White Sands Missile Range, 1998a)

Two main wastewater facilities are located on WSMR. These are the wastewater treatment plants, which service the Main Post and the evaporative lagoons in northern WSMR. The Main Post facility operates at 50-percent capacity, and the northern range plant operates at 20-percent capacity. (White Sands Missile Range, 1998a)

Solid waste handling systems consist of landfills and waste collection and transport. There are two operating landfills on WSMR located on the Main Post and Stallion Range, and one landfill in the NASA area. (White Sands Missile Range, 1998a)

WSMR provides fire protection, emergency, health, and police services. Additional services are available in neighboring communities such as Las Cruces and Alamogordo. WSMR provides two Fire Protection units that service the entire installation. The Main Fire Department, which services the southern portion of the base, and the Stallion Fire Station, which is responsible for fire protection in the northern portion of the base. Fire Protection personnel from the main station are part of the installation Response Team. The installation Response Team is capable of performing cleanup efforts at the scene of an oil or hazardous substance discharge on WSMR and has undergone extensive training to handle special hazard situations (White Sands Missile Range, 1998a). WSMR maintains and upgrades infrastructure to provide for varied potential future activities.

3.11 WATER RESOURCES

Water resources include both surface water and groundwater. The Clean Water Act and the Safe Drinking Water Act were enacted by Congress to protect these resources. The U.S. EPA and the State of New Mexico have also established water quality standards to protect water resources. This section provides an overview of baseline water resource conditions.

Region of Influence

The ROI for water resources is the area included within the WSMR boundaries, particularly impact areas.

Affected Environment

Surface Water

Average annual precipitation for WSMR is approximately 25 centimeters (10 inches), with over half of this occurring from June to September. Nearby mountains receive more precipitation (from 30 to 50 centimeters [18 to 20 inches]). Surface runoff at WSMR generally occurs as a result of springs, snow-melt from the mountainous areas surrounding the Tularosa Basin, and summer thunderstorms. Most runoff occurs slowly due to gentle slopes with rapid percolation into alluvial soils. The potential for flash floods exists, but

floods have only occurred infrequently. (White Sands Missile Range, 1998a; U.S. Army Space and Strategic Defense Command, 1995a)

Perennial surface water includes Mound Springs, Lake Lucero, Malpais Springs, Three Rivers, and Salt Creek. Numerous intermittent drainages and water bodies also occur on WSMR.

WSMR has applied for a Storm Water Multi-sector General Permit and is in the process of preparing data submissions to the U.S. EPA.

Groundwater

Water for WSMR is supplied almost exclusively by wells that tap alluvial aquifers. Most potable water occurs near the edge of the Tularosa Basin where runoff from the mountains percolates through alluvial fan deposits. The total estimated volume of water in the Tularosa Basin is 5,181 billion cubic meters (m^3) (4.2 billion acre-feet). This includes freshwater from the alluvial fans, a transition zone of slightly saline to very saline water, and the remaining majority of the basin that is saturated with brine. The freshwater portion is only approximately 4 percent of the total volume. The water quality of many of the freshwater aquifers is decreasing due to increasing salinity. (White Sands Missile Range, 1998a; U.S. Army Space and Strategic Defense Command, 1995a)

Water supply sources are a critical concern in many areas of WSMR. Freshwater aquifers are in a state of overdraft resulting in declining water tables and degraded water quality. The volume of groundwater pumped in the Main Post area decreased from approximately 3.5 million m^3 (925 million gallons) in 1967 to 3.3 million m^3 (872 million gallons) in 1992. Water use in other areas varies from year to year according to missions in operation. (White Sands Missile Range, 1998a; U.S. Army Space and Strategic Defense Command, 1995a)

Depth to water in the basin floor of the southern WSMR area ranges from approximately 30 to 76 meters (100 to 250 feet) below ground surface. Depth to groundwater in the Jornada del Muerto basin floor is estimated to be approximately 30 to 61 meters (100 to 200 feet) below ground surface. (White Sands Missile Range Environment and Safety Directorate, 2000a,b)

THIS PAGE INTENTIONALLY LEFT BLANK

4.0
ENVIRONMENTAL CONSEQUENCES

4.0 ENVIRONMENTAL CONSEQUENCES

This section describes the potential environmental consequences of the proposed activities by comparing these activities with the potentially affected environmental components. Sections 4.1 through 4.11 provide discussions of the potential environmental consequences of these activities. Potential impacts are discussed in terms of flight preparation, prelaunch activities, flight activities, and cumulative impacts. In the interest of brevity, where potential impacts are not likely, little or no discussion of analyses will be included. Likewise, where potential impacts and possible mitigations are similar across alternatives, they will be discussed in detail only once. The amount of detail presented in each section is proportional to the potential for impacts. Sections 4.12 through 4.19 provide discussions of the following with regard to proposed LPT program activities: environmental effects of the No-action Alternative; adverse environmental effects that cannot be avoided; conflicts with Federal, state, and local land use plans, policies, and controls for the area concerned; energy requirements and conservation potential; irreversible or irretrievable commitment of resources; relationship between short-term use of the human environment and the maintenance and enhancement of long-term productivity; natural or depletable resource requirements and conservation potential; and Federal Actions to Address Environmental Justice in Minority Populations and Low-income Populations (Executive Order 12898).

To assess the potential for and significance of environmental impacts from the proposed program activities, a list of activities was developed (section 2.0) and the environmental setting was described, with emphasis on any special environmental sensitivities (section 3.0). Program activities were then compared with the potentially affected environmental components to determine the environmental impacts of the proposed LPT activities.

To help define the affected environment and determine the significance of program-related effects, written, personal, and telephone contacts were made with applicable agencies. Section 7 provides a list of all agencies contacted.

WSMR maintains liaison with local, state, and Federal agencies regarding proposed and ongoing range activities to support a wide range of customers. Based upon these continuing consultations, range procedures have been developed to accommodate decisions on a wide range of activities. As long as a proposal is within the bounds established by these site procedures in consultation with the various agencies, additional consultation is not required (e.g. section 7 Endangered Species Act or section 106 National Historic Preservation Act). However, the analysis incorporates previously agreed upon actions such as cultural and biological surveys as defined by the former consultation and procedures. Additionally, review of the final EA is solicited from these agencies to ensure resource protection is achieved.

4.1 AIR QUALITY

4.1.1 FLIGHT PREPARATION

Flight preparation activities would include transportation of the missile(s) and propellants to WSMR, storage of the missile(s) and propellants at WSMR, and any launch site operations and maintenance activities. Transportation of the missile(s), propellants, and associated equipment would result in some mobile exhaust emissions, but these emissions would be intermittent and would not measurably impact air quality. The missiles would be stored unfueled and would not cause any air quality impacts. The liquid propellants would be stored in an approved location and would be maintained in accordance with a site safety plan designed to avoid releases and to minimize environmental impacts and health hazards in the unlikely event of an accidental leak or spill. As such, it is not anticipated that propellant storage would result in air quality impacts.

Any construction required at the proposed launch sites would be minimal. It is likely that construction would result in short-term emissions of PM-10 due to dust being entrained into the air. However, the dust would tend to settle quickly, and impacts to air quality would be negligible. If it were determined that any extensive construction were required, additional analysis may be warranted as required by the Clean Air Act and WSMR Environment and Safety Directorate.

4.1.2 PRELAUNCH ACTIVITIES

The prelaunch activity with the greatest potential for air quality impacts is the fueling of the missile(s). The program would obtain the approval of the WSMR Environment and Safety Directorate for all fueling procedures and associated emergency response plans before beginning activities.

The missile(s) would be fueled over a period of several days. Although total oxidizer and fuel vapor emissions can vary depending on the propellant transfer equipment used and how it is assembled, it is anticipated that only very small amounts (approximately 10 grams [0.4 ounce]) of oxidizer vapors would be released to the atmosphere during the oxidizer transfer operation. A negligible amount of fuel vapors would also be released into the atmosphere during fuel transfers. Meteorological conditions at WSMR generally favor a rapid dispersion of airborne pollutants; therefore, it is not anticipated that normal fueling operations would impact air quality.

It is unlikely that a propellant release larger than that described above would occur at WSMR. However, if such an accidental release were to occur, it would be most likely to occur during fueling. A reasonable scenario would involve failure of the transfer equipment or valves. The analysis assumes a leak contained over a 3-minute period that releases up to 17 liters (4.5 gallons) of oxidizer (IRFNA, hydrogen peroxide, or nitrogen tetroxide) or hydrazine fuel. Analysis using the U.S. Air Force Toxic Corridor Model computer model indicated potential exceedances of health standards as shown in table 4-1.

Actual hazard distances would depend on the propellant released, the amount released, meteorological conditions, and emergency response measures taken. SOPs would be developed and would include personal protection equipment procedures and distances at which it would be safe to establish fueling operations area boundaries (based on information similar to that provided in table 4-1). Establishment of and adherence to these SOPs would minimize the potential hazards to personnel in the unlikely event of an unplanned propellant release. The low likelihood of such an occurrence and the implementation of approved emergency response plans would limit the impact of such a release.

Table 4-1: Potential Exceedances Due to Accidental Oxidizer or Fuel Leak During Fueling

Propellant	Health Standard	Standard Limit	Exceedance Distance[e]
IRFNA	OSHA PEL[a]	2 ppm (5 mg/m^3)	34 meters (112 feet)
	NIOSH STEL[b]	4 ppm (10 mg/m^3)	20 meters (66 feet)
	IDLH[c]	25 ppm (65.5 mg/m^3)	Not exceeded
Hydrogen peroxide	OSHA PEL	1 ppm (1.4 mg/m^3)	212 meters (696 feet)
	NIOSH STEL	1 ppm (1.4 mg/m^3)	212 meters (696 feet)
	IDLH	75 ppm (105 mg/m^3)	14 meters (46 feet)
Nitrogen tetroxide	ACGIH TLV[d]	3 ppm (5.4 mg/m^3)	310 meters (1,017 feet)
	ACGIH STEL[b]	5 ppm (9 mg/m^3)	227 meters (746 feet)
	IDLH	75 ppm (135 mg/m^3)	103 meters (336 feet)
Hydrazine	OSHA PEL	1.0 ppm (1.31 mg/m^3)	117 meters (383 feet)
	ACGIH STEL	0.1 ppm (0.131 mg/m^3)	36 meters (118 feet)
	IDLH	50 ppm (65.5 mg/m^3)	Not exceeded

Source: National Institute for Occupational Safety and Health, 2002a, b, c; MG Industries, 2002, Toxnet, 2002.

Notes:

[a] The OSHA Permissible Exposure Limit (PEL) is the level of exposure that must not be exceeded when the exposure is averaged over an 8-hour workday and a 40-hour workweek in the workplace.

[b] The National Institute for Occupational Safety and Health (NIOSH) Short-term Exposure Limit (STEL) (or OSHA STEL or American Conference of Governmental Industrial Hygienists, Inc. [ACGIH] STEL) is the level of exposure that must not be exceeded at any time during a workday when the exposure is averaged over 15 minutes.

[c] The Immediately Dangerous to Life and Health (IDLH) is the level of exposure (not time-weighted) above which it is anticipated a person would suffer life-threatening or irreversible health effects or other injuries that would impair them from escaping the hazardous environment.

[d] The ACGIH Threshold Limit Value (TLV) is an average value of exposure over the course of an 8-hour work shift.

[e] Exceedance Distance—Average of U.S. Air Force Toxic Corridor model results for 15-minute and 30-minute averaging time and multiple stability classes

ppm = parts per million by volume.
mg/m^3 = milligrams per cubic meter

4.1.3 FLIGHT ACTIVITIES

If electricity is not otherwise available at the selected launch site(s), the Proposed Action would require four 100-kilowatt generators to supply appropriate power at the launch site(s). These generators would either be WSMR generators that are already accounted for in the WSMR Title V Air Permit, or new generators, brought in and evaluated for

compliance with the permit. It is anticipated that any change these generators would require to the permit would be minor and could be addressed through an administrative change. In any case the generators would be operated in accordance with the applicable regulations and operating restrictions and as such would not be expected to impact air quality.

The primary exhaust products of LPTs are carbon monoxide, carbon dioxide, hydrogen, nitrogen, and water. Operations personnel would be evacuated to a safe distance before launch according to established launch procedures, and non-operations personnel would be excluded from the launch area during launch operation. Due to the mobile nature of the missile itself, only a small portion of the launch exhaust would be emitted near the ground and these emissions would have minimal impact on air quality.

If flight termination becomes necessary, the potential resulting fire would cause short-term impacts to air quality in the form of combustion by-products and potentially hazardous fumes. Provisions would be made for the availability of fire suppression, hazardous materials emergency response, and emergency medical teams during launch operations. These provisions, in combination with the low probability of a launch mishap would result in only a short-term impact to air quality.

4.1.4 POSTFLIGHT ACTIVITIES

The LPT missile trajectory would cause it to impact in an approved impact area. Air quality impacts would be the same for both existing impact areas and new impact areas. As currently proposed (table 2-5), the missile would impact with approximately 265 liters (70 gallons) of fuel and approximately 473 liters (125 gallons) of oxidizer. Two potential results of the impact include:

- It is possible that the propellants would burn upon impact.
- It is possible one or both propellants could be released and evaporate to the atmosphere without burning.

If the propellants burn upon impact, short-term impacts to air quality would occur. The impact areas are isolated from inhabited areas and would be evacuated before launch, as such any exceedances of the NAAQS or exceedances of health-based criteria would not endanger anyone. The remote location would allow time and distance sufficient to disperse fumes to a non-hazardous level. Thus, it is not anticipated that combustion of the propellant(s) would result in air quality impacts beyond the immediate impact site.

If one or both propellants were released to the atmosphere without combustion, a resulting short-term air hazard would be expected in the immediate vicinity of the impact. The duration of the hazard and extent of the hazard area would be determined by the amount and type of propellant released, the meteorological conditions, and the impact conditions. The remote location of the impact sites and the prevailing weather conditions would provide the time and distance required to disperse the pollutants to non-hazardous levels

before reaching inhabited areas of the range. Table 4-2 indicates the results of analysis using the U.S. Air Force Toxic Corridor Model computer model to determine distances at which the various health standards could be exceeded assuming all 473 liters (125 gallons) of the remaining oxidizer and 265 liters (70 gallons) of the remaining fuel were released to the atmosphere.

SOPs would be developed to establish appropriate response and recovery procedures and would include personal protective equipment and determination of appropriate recovery zone hazard boundaries (based on information similar to that provided in table 4-2).

Table 4-2: Potential Exceedances Due to Accidental Oxidizer or Fuel Leak at Missile Impact Site

Propellant	Health Standard	Standard Limit	Exceedance Distance[e]
IRFNA	OSHA PEL[a]	2 ppm (5 mg/m^3)	213 meters (699 feet)
	NIOSH STEL[b]	4 ppm (10 mg/m^3)	140 meters (458 feet)
	IDLH[c]	25 ppm (65.5 mg/m^3)	50 meters (164 feet)
Hydrogen peroxide	OSHA PEL	1 ppm (1.4 mg/m^3)	195 meters (639 feet)
	NIOSH STEL	1 ppm (1.4 mg/m^3)	195 meters (639 feet)
	IDLH	75 ppm (105 mg/m^3)	11 meters (36 feet)
Nitrogen tetroxide	ACGIH TLV[d]	3 ppm (5.4 mg/m^3)	1074 meters (3525 feet)
	ACGIH STEL[b]	5 ppm (9 mg/m^3)	740 meters (2429 feet)
	IDLH	75 ppm (135 mg/m^3)	274 meters (899 feet)
Hydrazine	OSHA PEL	1.0 ppm (1.31 mg/m^3)	462 meters (1515 feet)
	ACGIH STEL	0.1 ppm (0.131 mg/m^3)	123 meters (404 feet)
	IDLH	50 ppm (65.5 mg/m^3)	13 meters (44 feet)

Source: National Institute for Occupational Safety and Health, 2002a, b, c; MG Industries, 2002; Toxnet, 2002.

Notes:

[a] The OSHA Permissible Exposure Limit (PEL) is the level of exposure that must not be exceeded when the exposure is averaged over an 8-hour workday and a 40-hour workweek in the workplace.

[b] The National Institute for Occupational Safety and Health (NIOSH) Short-term Exposure Limit (STEL) (or OSHA STEL or American Conference of Governmental Industrial Hygienists, Inc. [ACGIH] STEL) is the level of exposure that must not be exceeded at any time during a workday when the exposure is averaged over 15 minutes.

[c] The Immediately Dangerous to Life and Health (IDLH) is the level of exposure (not time-weighted) above which it is anticipated a person would suffer life-threatening or irreversible health effects or other injuries that would impair them from escaping the hazardous environment.

[d] The ACGIH Threshold Limit Value (TLV) is an average value of exposure over the course of an 8-hour work shift.

[e] Exceedance Distance—Average of U.S. Air Force Toxic Corridor model results for 15-minute and 30-minute averaging time and multiple stability classes

ppm = parts per million by volume.
mg/m^3 = milligrams per cubic meter

Note: Spills are not regulated by NAAQS and therefore are not analyzed in that regard. The nature of NAAQS is to protect from long-term health effects. OSHA and NIOSH PELs as well as IDLHs are designed, however, to protect against acute effects of emissions experienced by a spill.

Propellant released after a test or termination would be handled in accordance with the WSMR Installation Spill Contingency Plan (Annex G, Appendix I of the WSMR Disaster Control Plan) (White Sands Missile Range, 1997).

4.1.5 CUMULATIVE IMPACTS

The Proposed Action would increase the overall mobile emissions at WSMR through the addition of up to 40 personnel up to 30 days before each launch, as well as the addition of the exhaust byproducts from launch operations. An accidental liquid propellant release could result in a short-term hazard area. In addition, the combustion or release of unburned propellants at impact sites would create short-term localized hazard areas. When taken in conjunction with other current, planned, and reasonably foreseeable activities at WSMR, these emissions would result in only a short-term, incremental increase in mobile emissions and would not result in exceedance of any permit limitations or in cumulative impacts to air quality on the range or in the region.

4.1.6 MITIGATION MEASURES

Normal construction-related dust suppression methods would be employed for any required construction. The liquid propellants would be stored in an approved location and would be maintained in accordance with a site safety plan designed to avoid releases and to minimize environmental impacts and health hazards in the unlikely event of an accidental leak or spill. The Proposed Action requires that hazardous materials-related response plans and standard safety operating plans be completed and approved by the WSMR Environment and Safety Directorate before beginning the Proposed Action. No other mitigation measures would be required or warranted for air quality.

4.2 AIRSPACE

4.2.1 FLIGHT PREPARATION

LPT missile and propellant transportation and missile component assembly would have no impact on airspace use since they do not physically interfere with navigable airspace or affect airspace scheduling.

4.2.2 PRELAUNCH ACTIVITIES

There would be no impact on airspace from LPT flight testing program evacuations and clearances, or road closures, because they do not physically interfere with navigable airspace or affect airspace scheduling.

4.2.3 FLIGHT ACTIVITIES

4.2.3.1 LPT Missile Flights

Close coordination with the FAA Air Route Traffic Control Center and Holloman AFB by the WSMR National Range Operations Directorate minimizes the potential for any adverse impacts on airspace use. Launches of an LPT missile would require coordination with current aerial activities within the R-5107 complex airspace. Launch from Sulf site would require coordination with activities in the R-5111 complex. Launch, flight, and impact would be in cleared airspace within the restricted area.

The use of WSMR for flight preparation and testing has been analyzed in the Extended Range Interceptor EA, WSMR Range-wide EIS, Flight Test EA, and Patriot Advanced Capability-3 EA (U.S. Army Strategic Defense Command, 1991; White Sands Missile Range, 1998a; U.S. Army Space and Strategic Defense Command, 1995a; and 1997). These documents concluded that there would be no adverse effects to airspace from missile flight tests. LPT missile launches would not affect airborne activities outside the R-5107 complex airspace and would not interfere with any low- or high-altitude en route airways or jet routes used by civilian and commercial airplanes. Similarly, the LPT missile launches would not impact any civilian or private airports around WSMR. The launches, flight trajectory, and ground impacts would occur at sufficient distance and altitude to be virtually unnoticed by local, nonmilitary flying activities. For these reasons, no adverse effects to airspace are expected.

4.2.3.2 Observation Platforms

Launches and flights of LPT missiles could be observed by aircraft flying outside the WSMR restricted airspace. Such flights are routinely conducted, and the aircraft would be coordinated with the FAA through the Albuquerque Air Route Traffic Control Center, thus avoiding potential impacts to airspace.

LPT missiles could also be observed by aircraft flying inside the WSMR restricted airspace. These aircraft would be coordinated by the WSMR National Range Operations Directorate with the FAA and Holloman AFB, thus avoiding potential impacts to airspace.

4.2.4 POSTFLIGHT ACTIVITIES

Helicopter retrieval of debris, if necessary, would be within the boundaries of the WSMR airspace complex and would have no impact on the navigable airspace or airborne activities outside the restricted complex airspace.

4.2.5 CUMULATIVE IMPACTS

The potential for adverse cumulative airspace impacts on WSMR is prevented by the implementation of coordinating and scheduling procedures. The WSMR National Range Operations Directorate would schedule the recall of restricted areas with the Albuquerque Air Route Traffic Control Center, and coordinate with the Holloman AFB radar approach

control facility prior to LPT missile flights. This required coordination would preclude adverse cumulative impacts on airspace use from current, planned, and reasonably foreseeable activities.

4.2.6 MITIGATION MEASURES

Launch of an LPT missile would require coordination with current aerial activities within the WSMR complex of restricted airspace as described under cumulative impacts. Launch, flight, and impact would be in cleared airspace within the restricted area. Launches and flights of LPT missiles could be observed by aircraft flying outside the WSMR restricted airspace, that would also be coordinated with the FAA through the Albuquerque Air Route Traffic Control Center.

4.3 BIOLOGICAL RESOURCES

Based on analysis and discussion in the following sections, it is anticipated that proposed activities may affect, but are unlikely to adversely affect, the Federally endangered Aplomado falcon. In addition, the Proposed Action would not appreciably reduce, directly or indirectly, the likelihood of the survival and recovery of any listed species in the wild.

4.3.1 FLIGHT PREPARATION

The transportation of LPTs, fuel, and oxidizer would not be expected to impact biological resources. As discussed in section 4.7, the transportation of the LPTs would be conducted in accordance with DOT regulations, and the probability of accidents is so low as to be considered not a factor for biological resources. Similarly, the assembly of missile components, accomplished within enclosed buildings, would have no impact on biological resources. Existing spill prevention, containment, and control measures would preclude biological resource impacts at fuel and oxidizer storage locations.

Any modifications of existing launch sites under consideration for the LPT flight tests would be minor and would be planned to occur on previously disturbed areas; consequently, minimal impacts on biological resources would result. New impact areas would be sited to avoid or minimize potential harm to protected species. In accordance with WSMR policy, before any off-road launch sites and/or new impact areas would be used, surveys for threatened and endangered species would be conducted in undocumented or inadequately surveyed areas where suitable habitat exists and where ground disturbing activities would occur. If results of the surveys indicate the presence of or potential for effects to protected species, the area would be avoided or additional environmental documentation would be performed if required.

Personnel would be instructed to avoid all contact with any wildlife that may be encountered during flight preparation activities. Due to the existence of suitable Aplomado falcon habitat, the USFWS has determined that activities similar to the Proposed Action in the northeastern portion of the range may affect but are unlikely to adversely affect the

Federally endangered Aplomado falcon. The last confirmed sighting of an Aplomado Falcon on WSMR was over 8 years ago. If an Aplomado falcon is sighted, coordination with the USFWS would be conducted by the WSMR Environment and Safety Directorate according to ongoing consultation with the USFWS. The program would remain on hold until a determination was made, and would continue only if it were determined that the species would not be affected.

4.3.2 PRELAUNCH ACTIVITIES

The LPT program would follow current WSMR evacuation and road closure procedures. To date no adverse impacts to biological resources from these activities have been identified.

Trained personnel would conduct missile fueling operations, and no more than a few grams of propellant are expected to be released during fueling operations. Appropriate responses to leaks and releases would be included in the project safety plan and would be implemented as soon as a release is identified, to minimize the hazard. All fueling would be conducted using impermeable barriers as shown in figure 2-5. Containers that are brought to the propellant transfer site would be placed on SpillSkid® pallets to provide secondary containment during propellant transfer operations. Spill containment for the propellant transfer operation would be provided by a temporary containment system that is impervious to each particular fuel and oxidizer. One set of temporary containment barriers would be used for fuel, and a second set would be used for oxidizer. The propellant storage locations would be periodically monitored for leaks by visual inspection. Although a leak of any components from the containers would be highly improbable, approved spill containment at each site would ensure any accidental leakage does not enter the soil. Adherence to these procedures would minimize the potential for spills and any adverse effects to biological resources.

4.3.3 FLIGHT ACTIVITIES

Missile launches from WSMR have been discussed and analyzed in several environmental documents, including: the Extended Range Interceptor (ERINT) EA (U.S. Army Strategic Defense Command, 1991), the Extended Test Range EIS (U.S. Army Space and Strategic Defense Command, 1994b), the Flight Test EA and Supplemental EA (U.S. Army Space and Strategic Defense Command, 1995a; b), the EA for the PATRIOT Missile System (White Sands Missile Range, 1995), the WSMR Range-wide EIS (White Sands Missile Range, 1998a), and the PAC-3 Life-cycle EA (U.S. Army Space and Strategic Defense Command, 1997). These documents evaluated activities similar to the LPT flight test program, and applicable results of these analyses are summarized below.

Launch activities would take place in previously disturbed areas and generally are not expected to adversely affect plant species. However, fire from a launch mishap could impact any plant species that may be present near the launch site. The use of existing sites would allow launches in areas where much of the vegetation has previously been removed. Any ground fire would be quickly extinguished, where possible, minimizing impacts to vegetation remaining in the area. Moreover, emergency fire fighting personnel would be on stand-by status for all launch activities as a protective measure.

Flight testing of LPTs on WSMR could have impacts to wildlife resulting from noise and toxic air emissions from the launch, and debris impacts. Test flight trajectories would be planned to avoid impact in the San Andres National Wildlife Refuge and other sensitive habitats such as pupfish habitat and would adhere to requirements of the agreement between the National Park Service and WSMR, which states that no planned debris will impact in the White Sands National Monument. Program personnel would comply with USFWS- and WSMR-adopted procedures developed to protect nesting raptors and other species of special concern, such as avoidance of nests and the use of raptor-safe utilities and routine Aplomado falcon surveys.

The effects of noise on wildlife vary from serious to no effect in different species and situations. Behavioral responses to noise also vary from startling to retreat from favorable habitat. Animals can also be very sensitive to sounds in some situations and very insensitive to the same sounds in other situations. (Larkin, 1996) Noise from LPT launches may startle nearby wildlife and cause flushing behavior in birds, but this startle reaction would be of short duration. Launch sites would not be close enough to the San Andres National Wildlife Refuge to affect the noise-sensitive bighorn sheep. The increased presence of personnel immediately before a launch would tend to cause birds and other mobile species of wildlife to temporarily leave the area that would be subject to the highest level of launch noise. Therefore, no direct physical auditory changes are anticipated. Wildlife is known to exhibit a startle effect when exposed to short-term noise impacts, such as the launch of a target missile.

Recent studies indicate that birds usually show signs of disturbance, such as the fluttering of wings, when the noise occurs, but quickly return to normal behavior after the event. Video camera observations of a wood stork colony located 0.8 kilometer (0.5 mile) south of the Space Shuttle launch pad at Kennedy Space Center showed the birds flew south away from the noise source and started returning within 2 minutes, with a majority of individuals returning in 6 minutes (National Aeronautics and Space Administration, 1997).

A rookery at Kennedy Space Center used by wood storks and other species of wading birds is located approximately 750 meters (2,461 feet) from a Shuttle launch pad. This rookery continues to be used successfully, even though it has received peak noise levels of up to approximately 138 dB. (American Institute of Aeronautics and Astronautics, 1993) As mentioned above, monitoring studies of birds during the breeding season indicate that adults respond to Space Shuttle noise by flying away from the nest, but they return within 2 to 4 minutes. Birds within 250 meters (820 feet) of Titan launch complexes at Cape Canaveral Air Station have shown no mortality or reduction in habitat use. Titan IV vehicles produce noise levels of approximately 170 dB in the immediate vicinity of the launch pad. This noise level attenuates to 125 dB at a distance of 3 kilometers (2 miles) within about 30 seconds following launch. (U.S. Department of the Air Force, 1990) This compares to a noise level of 85 dB at a distance of 1,277 meters (4,190 feet) for the LPT.

Launches would be infrequent, limited to 15 in the first 5 years. Disturbance to wildlife would be brief and is not expected to have a lasting impact nor a measurable negative effect on migratory bird populations. Wildlife would quickly resume feeding and other normal behavior patterns after a launch is completed. Wildlife driven from preferred

feeding areas by aircraft or explosions usually return soon after the disturbance stops, as long as the disturbance is not severe or repeated (Federal Aviation Administration, 1996). Foraging birds would be subjected to increased energy demands if flushed by the noise, but this should be a short-term, minimal effect.

In terms of toxic air emissions, the primary exhaust products of LPTs are carbon monoxide, carbon dioxide, water, and nitrogen. Under normal circumstances, only a small portion of the emissions would be emitted near the ground and would have no impact on air quality. A launch mishap of the liquid propellant could result in the unlikely, but possible, limited emission of oxidizer and coal-tar/kerosene fuel. The severity of and duration of the impact would depend on the type and amount of propellant spilled, meteorological conditions, and proximity to sensitive species. Fuel-contaminated soil would be handled in accordance with the WSMR Installation Spill Contingency Plan (Annex G, Appendix I of the WSMR Disaster Control Plan) (White Sands Missile Range, 1997) in coordination with the WSMR Environment and Safety Directorate.

4.3.3.1 Existing Impact Areas

Each LPT missile would have approximately 265 liters (70 gallons) of fuel and 473 liters (125 gallons) of oxidizer remaining when it impacts the ground at an established impact site during a nominal impact. If the oxidizer and fuel do not explode or burn at impact, then they would most likely be deposited on the ground. The IRFNA or nitrogen tetroxide oxidizer would volatilize into the atmosphere. Any residual nitric acid would react with the alkaline soils, resulting in the deposition of nitrates that would act as a fertilizer and not appreciably affect resources near the impact site. Hydrogen peroxide oxidizer deposited on the ground would decompose into water and oxygen within several hours. The kerosene or JP-8 fuel would be absorbed by the soil. Hydrazine fuel would slowly dissipate from the surface within 24 hours. Hydrazine fuel buried in an impact crater would dissipate over several months. Missile and aerial dispersion experiment debris, and oxidizer or fuel released after a test or termination, would be handled in accordance with the WSMR Installation Spill Contingency Plan (Annex G, Appendix I of the WSMR Disaster Control Plan) (White Sands Missile Range, 1997). In accordance with the Military Munitions Rule, the WSMR Environment and Safety Directorate would determine what range clearance and remediation actions are necessary to support WSMR operations.

Impact of the LPT and metal objects from the aerial dispersion experiment could result in disturbance of the ground surface and the loss of some plants in the debris impact areas. Ground disturbance is further discussed in section 4.5, Geology and Soils. Impact areas would be leveled and restored to the extent necessary to prevent undue erosion where practicable. The proposed impact areas for the LPTs are not located within pupfish habitat. The 649 WIT and AFSWC target impact areas are located within an area identified as Aplomado falcon habitat. These areas would be monitored as part of the ongoing Aplomado Falcon surveys. The chance of an individual falcon being struck by an LPT missile or metal objects from the aerial dispersion experiment is expected to be remote. In addition, the amount of ground disturbed for each missile impact would be less than 0.2 hectare (0.5 acre). For up to 15 missile impacts during the initial 5 years of testing, a total area of 3 hectares (7.5 acres) would be affected. The impact of the aerial

dispersion experiment's metal objects on the ground would result in ground depressions that are similar to, but much smaller than the missile body impact. The depressions from the aerial dispersion experiment's metal objects would also be widely distributed within the impact area. Restoration of the impact site would be conducted on a case-by-case basis in coordination with the WSMR Environment and Safety Directorate. Due to the small affected area, sites would generally not be reseeded. (Anderson, 1998) Since threatened and endangered plant and animal species tend to be widely scattered and occupy small surface areas, the probability of a missile striking an individual is remote.

4.3.3.2 New Impact Areas

New impact areas could potentially be created southeast of Highway 70 in the southeastern portion of the range or north of the Oscura Bombing Range in the northeastern portion of the range, or north of the existing 649 Impact Area in the northwestern portion of the range (figures 2-8 and 2-9). Selection of a new impact area would be coordinated with the WSMR Environment and Safety Directorate in order to avoid or minimize potential harm to protected species. Any required biological surveys would be completed before LPT missile or aerial dispersion experiment impact in the areas. If results of the surveys indicate the presence of or potential for effects to protected species, the area would be avoided or additional environmental documentation would be performed if required. Effects to biological resources from impacts into a new impact area would be similar to those described above in 4.3.3.1. The two new impact areas located north of the 649 Impact Area are located within an area identified as Aplomado falcon habitat. These areas would be monitored as part of the ongoing Aplomado Falcon surveys. The chance of an individual falcon being struck by an LPT missile or aerial dispersion experiment impact is expected to be remote.

4.3.4 POSTFLIGHT ACTIVITIES

Missile and aerial dispersion experiment debris recovery would be in accordance with the WSMR *Standard Operating Procedure for Environmental Protection During Recovery Action*. This SOP focuses on guidelines for avoidance of known sensitive areas on WSMR (e.g., Salt Creek and other White Sands pupfish habitat, San Andres National Wildlife Refuge, and Trinity Site National Historic Landmark) but also provides specific guidance for recovery in areas of unknown natural and cultural resources sensitivity. Sensitive areas are delineated in the text of the SOP and are graphically depicted as areas to be avoided or treated with higher levels of caution and review approval. The majority of recovery operations would utilize existing roads and recovery by foot. Off-road vehicle recovery operations would be undertaken only if necessary and in coordination with the WSMR Environment and Safety Directorate. Recovery by vehicle would be limited to the minimum number of vehicles necessary to complete the operation.

The recovery of debris could involve the use of a light-lift helicopter in rough terrain. Low-altitude helicopter flights, which are known to cause panicky reactions in some wildlife species, would be intermittent, would involve gradual descents when necessary, and would then return to altitudes that would avoid further startling effects. Debris recovery is an ongoing effort at WSMR, and a biologist or other qualified representative would

accompany the debris recovery team, if determined necessary by the WSMR Environment and Safety Directorate, to assist in minimizing the potential for additional impacts.

4.3.5 CUMULATIVE IMPACTS

Cumulative impacts to biological resources would be mainly associated with recovery activities. Once an initial route has been established into a recovery area, the same route would be used for subsequent entries, to the extent possible, to minimize the damage throughout the area and to minimize the need for repeated environmental surveys for entry routes into the same locale.

Although there are no planned direct or indirect impacts on the White Sands pupfish habitat from the proposed action, the Pupfish Monitoring Program that is currently under development would help establish baseline information to aid in identifying potential impacts on the habitat. In addition, flight trajectories that cross the pupfish habitat would receive additional review and coordination by the WSMR Safety and Environment Directorate. The potential for cumulative impacts on biological resources from current, planned, and reasonably foreseeable activities is considered minor.

4.3.6 MITIGATION MEASURES

As discussed above, a biologist or other qualified representative would accompany the debris recovery team if determined necessary by the WSMR Environment and Safety Directorate. The same entry route would be used for subsequent entries during debris recovery, to the extent possible. Off-road vehicle recovery operations would be undertaken only if necessary. Impact areas would be leveled and restored to the extent necessary to prevent undue erosion where practicable.

Personnel would be instructed by the WSMR Environment and Safety Directorate to avoid all contact with any wildlife that may be encountered. Biological surveys, for the presence of the Aplomado falcon and other potential listed species, would be conducted before any ground disturbing activities in undisturbed areas that have had no known prior surveys. Ongoing Aplomado Falcon surveys would continue to be conducted from April to September. If results of the surveys indicate the presence of or potential for effects to protected species, the area would be avoided or additional environmental documentation would be performed if required. Emergency fire fighting personnel would be on stand-by status for all launch activities. Any fuel-contaminated soil would be handled in accordance with the WSMR Installation Spill Contingency Plan (Annex G, Appendix I of the WSMR Disaster Control Plan) (White Sands Missile Range, 1997) in coordination with the WSMR Environment and Safety Directorate.

Selection of new impact areas would be coordinated with the WSMR Environment and Safety Directorate. Required biological surveys would be completed before any ground-disturbing activities. If results of the surveys indicate the presence of or potential for effects to protected species, the area would be avoided or additional environmental documentation would be performed if required.

Program personnel would comply with USFWS, Department of New Mexico Game and Fish, and WSMR-adopted procedures (Pupfish Memorandum of Agreement, WSMR Integrated Natural Resources Management Plan, Aplomado Falcon Survey Protocol, Migratory Bird Treaty Act, Golden Eagle Protection Act) designed to protect raptors and other species of concern.

Although LPT missile impact in pupfish habitat or other sensitive areas is not planned or anticipated, specific operational steps for emergency responses would be determined on a case-by-case basis in accordance with the WSMR Missile Mishap Plan, Annex P to the Disaster Control Plan (White Sands Missile Range, 1998b). The response team's immediate concern would be maintaining the team's safety. In general, a typical response would include the following:

- Render the missile or debris safe
- Stop the flow of oxidizer and/or fuel
- Neutralize the oxidizer in the stream (or body of water) sufficiently far downstream to avoid a continuing hazard to wildlife
- Install surface skimmers and absorptive materials downstream from the lead edge of contamination to collect the fuel
- Monitor the pH along the stream to ascertain that a reasonable pH has been established
- Remove all petroleum products from stream surfaces and return the damaged area to an environmentally sound level

4.4 CULTURAL RESOURCES

There are thousands of known or recorded cultural resources sites distributed throughout WSMR, and large portions of the range are as yet unsurveyed. (U.S. Army Space and Strategic Defense Command, 1997) Based on their ability to meet the National Register criteria for significance, many of the identified sites are believed to be potentially eligible for inclusion in the National Register; however, the total number and distribution of eligible sites have not been determined. As described in section 3.4, resources that meet the National Register criteria, even if they have not been formally evaluated, are considered potentially eligible for inclusion in the National Register and, as such, are afforded the same regulatory consideration as nominated properties.

Because of the large number of sites identified, the immense area that remains unsurveyed, and the prohibitive time and cost involved to systematically survey and evaluate all sites within WSMR, it is assumed that all unsurveyed areas have the potential to contain sites that are eligible for inclusion in the National Register.

Assurance of the avoidance of significant cultural resources sites may not be possible given the nature of flight testing activities. However, through implementation of program actions described herein and those described within the WSMR Range-wide EIS (White

Sands Missile Range, 1998a), the potential for impact is reduced. In addition, there is formal guidance designed to protect and preserve cultural resources on WSMR; the LPT flight test program would adhere to that guidance.

The types of LPT flight testing activities that could result in direct or indirect impacts on prehistoric, historic, traditional, or paleontological resources include: modification of existing facilities, unauthorized artifact collection, missile or aerial dispersion experiment debris, impacts from fire and fire-fighting activities, and disturbance of sites during debris recovery. Analysis of impacts is provided below by specific flight testing activity.

4.4.1 FLIGHT PREPARATION

National Register- and New Mexico state-listed or -eligible properties on WSMR are not located near the Proposed Action and would not be affected by flight preparation activities. Transportation and storage of LPT missiles and propellants would have no effect on cultural resources.

4.4.2 PRELAUNCH ACTIVITIES

All fueling would be conducted using impermeable barriers as shown in figure 2-5. Adherence to these procedures would minimize the potential for spills and any impacts to cultural resources.

The LPT flight testing evacuations and road closures could temporarily restrict access to American Indian sacred or ceremonial sites. These closures would be short-term and would help to ensure safe access to sacred and ceremonial sites.

4.4.3 FLIGHT ACTIVITIES

No impacts to historical structures are expected as a result of noise-induced vibrations. Potential impacts to archaeological resources could occur as a result of flight termination debris striking the ground where surface or subsurface archaeological deposits are located. The probability of this occurring is extremely remote.

4.4.3.1 Existing Impact Areas

The G impact areas, 649 Impact Area, and AFSWC Target area have been surveyed for cultural resources. Within these surveys, several sites have been determined to be National Register eligible. LPT missiles would be targeted away from these sites. The existing impact areas are routinely used to accommodate missile impacts. Due to the small spatial area that would be affected by missile and aerial dispersion experiment debris impact and the wide dispersion of historic resources, the potential for adverse effects in these areas is expected to be minor.

4.4.3.2 New Impact Areas

The new impact area southeast of Highway 70 has been previously surveyed. The results of the survey indicate a low potential for archaeological sites to be located in the area. If required, avoidance, site testing, or data recovery would be undertaken before the area is used for missile or aerial dispersion experiment impacts. The new North of Oscura impact area has not been surveyed for cultural resources. This site would need to be surveyed in coordination with the WSMR Environment and Safety Directorate and consultation with the SHPO completed before the area is used as an impact area. The two new impact areas north of the 649 Impact Area are currently being surveyed. If cultural resources are identified, additional consultation with the SHPO would be carried out to determine appropriate mitigation measures prior to using the areas for missile or aerial dispersion experiment impacts.

4.4.4 POSTFLIGHT ACTIVITIES

Missile and aerial dispersion experiment debris, and oxidizer or fuel released after a test or termination, would be handled in accordance with the WSMR Installation Spill Contingency Plan (Annex G, Appendix I of the WSMR Disaster Control Plan) (White Sands Missile Range, 1997). In accordance with the Military Munitions Rule, the WSMR Environment and Safety Directorate would determine what range clearance and remediation actions are necessary to support WSMR operations.

Missile and aerial dispersion experiment debris recovery would be in accordance with the WSMR Standard Operating Procedure for Environmental Protection During Recovery Action. This SOP focuses on guidelines for avoidance of known sensitive areas on WSMR (e.g., Salt Creek and other White Sands pupfish habitat, San Andres National Wildlife Refuge, and Trinity Site National Historic Landmark) but also provides specific guidance for recovery in areas of unknown natural and cultural resources sensitivity. Sensitive areas are delineated in the text of the SOP and are graphically depicted as areas to be avoided or treated with higher levels of caution and review approval. Restoration of the impact site would be conducted on a case-by-case basis in coordination with the WSMR Environment and Safety Directorate.

To further minimize possible detrimental effects, WSMR recovery procedures in areas with a high probability of cultural resources would include a qualified archaeologist with each recovery team (if determined necessary by the WSMR Environment and Safety Directorate). If, during debris recovery, it is determined that there is a potential to disturb cultural resources then activities would be temporarily halted until appropriate Federal or state agencies could be consulted by the WSMR Environment and Safety Directorate. Range personnel would be instructed concerning the prohibition on collecting cultural resources materials.

In the case of discovery of American Indian burials as a result of ground disturbing activity, the remains would be treated in accordance with the Native American Graves Protection and Repatriation Act.

4.4.5 CUMULATIVE IMPACTS

Cultural resource impacts from the LPT flight testing program, when added to the impacts described and analyzed in the WSMR Range-wide EIS and other WSMR documentation, include debris impacts; repetitive use of entryways into debris-recovery areas; noise or vibration effects from helicopters or fixed-wing aircraft; compaction and surface pressure from the recovery team and equipment affecting fragile resources (e.g., ceramics); and unauthorized artifact collection. Through mitigation measures described in the following section, the potential for cumulative impacts from current, planned, and reasonably foreseeable activities would be reduced.

4.4.6 MITIGATION MEASURES

The potential for impacts would be reduced through implementation of the types of program actions described below. Similar measures have been recommended in the WSMR Range-wide EIS and the WSMR Historic Preservation Plan. These program actions include the following:

- Personnel would be instructed on the prohibition of collecting cultural resources materials. Violations would be reported to the appropriate Federal authorities.
- Adherence to fueling procedures would minimize the potential for propellant spills and impacts to cultural resources.
- Any restricted access to sacred and ceremonial sites would be short-term in nature, and would not impact American Indian tribes.
- LPT missiles would be targeted away from National Register eligible sites.
- In the new impact areas, avoidance, survey, recordation, and data recovery would be conducted as necessary in coordination with the WSMR cultural resources specialist and in consultation with the New Mexico SHPO before mission activities would be performed.
- During debris-recovery operations, off-road travel would be minimized and would be coordinated with the WSMR Environment and Safety Directorate. If determined to be necessary by the WSMR Environment and Safety Directorate, a qualified archaeologist would accompany the recovery team to assist in the selection of an entry/exit path and ensure the protection of resources.
- The unexpected discovery of cultural resources during the course of LPT flight testing activities would be reported to the WSMR Environment and Safety Directorate. Discovery of Indian burials would result in actions that follow guidance provided in the Native American Graves Protection and Repatriation Act.

The WSMR Environment and Safety Directorate would coordinate consultation with the New Mexico SHPO, the Advisory Council on Historic Preservation (as required), and any affected American Indian groups to formally establish and implement measures to minimize impacts to cultural resources as required.

4.5 GEOLOGY AND SOILS

4.5.1 FLIGHT PREPARATION

The transportation of LPT missile components and propellants would have no impact on geology and soils. Similarly, the assembly of missile components in enclosed buildings would have no impact on geology and soils. The potential for soil contamination resulting from accidental spills of toxic material is highly unlikely because propellants would be stored at locations with appropriate spill containment, and handling would be in accordance with approved SOPs.

4.5.2 PRELAUNCH ACTIVITIES

The LPT flight testing evacuations and road closures would have no impact on geology and soils.

Hazardous prelaunch operations including missile fueling would be conducted in accordance with SOPs approved by the WSMR Environment and Safety Directorate and all other applicable regulations. All fueling would be conducted using appropriate impermeable barriers as shown in figure 2-5. Adherence to these procedures would minimize the potential for spills and any impacts to the soils.

4.5.3 FLIGHT ACTIVITIES

Potential geology and soils impacts from launch activities would be minor and would occur on previously disturbed areas at existing launch sites. LPT missile exhaust emissions would not affect soils.

4.5.4 POSTFLIGHT ACTIVITIES

LPT missiles would physically impact the surface and overlying soils, but there would be no impact on geologic resources.

Land surface damage from missile and aerial dispersion experiment debris impact would be variable and determined by impact energy, soil compressibility, presence of water, and missile attitude (White Sands Missile Range, 1998a). The LPT missile impact on the ground may result in ground depressions up to 6 meters (20 feet), depending upon ground conditions and the orientation of the missile upon impact. Clumps of dirt or clouds of dust would be thrown up, and small trees and shrubs might be crushed. The missile would likely deform upon impact but is unlikely to break up. The areal extent of immediate physical disturbance from missile impact is likely to be less than 0.2 hectare (0.5 acre). The impact of the aerial dispersion experiment's metal objects on the ground would result in ground depressions that are similar to, but much smaller than the missile body impact. The depressions from the aerial dispersion experiment's metal objects would also be widely distributed within the impact area. Figures 2-8 and 2-9 show the LPT missile and aerial dispersion experiment impact areas. Table 4-3 identifies the potentially affected soil units

and indicates those with increased potential for erosion. Based on the effects of similar missile impacts, the amount of disturbance is expected to result in minor physical effects on the soil. Impact areas would be leveled and restored to the extent necessary to prevent undue erosion where practicable. (U.S. Army Space and Strategic Defense Command, 1994c)

Table 4-3: Potentially Affected Soils Within the Region of Influence

Descriptor	Name	Erosion Susceptibility	Impact Area
DU	Dune Land-Doña Ana Complex	Blowing	South East of 70
GS	Gypsum Land, Hummocky	Blowing	G-20
MA	Marcial-Ubar Association	–	G-10, -16, -20, -25
MG	Mimbres-Glendale Association	Flooding	G-16, -25
NT	Nickel-Tencee Association	Water erosion	North of Oscura
SR	Sotim-Russler Association	Water erosion	North of Oscura
YH	Yessum-Holloman Association	–	G-10, -16, -20, -25, 649 Impact Area, AFSWC Target, New Impact Areas North of 649

Source: U.S. Department of the Army, 1985a.

Each LPT missile would have approximately 265 liters (70 gallons) of fuel and 473 liters (125 gallons) of oxidizer remaining when it impacts the ground at an established impact site during a nominal impact. If the oxidizer and fuel do not explode or burn at impact, then they would most likely be deposited on the ground. The IRFNA or nitrogen tetroxide oxidizer would volatilize into the atmosphere. Any residual nitric acid would react with the alkaline soils resulting in the deposition of nitrates that would act as a fertilizer and not appreciably affect the soils. Hydrogen peroxide oxidizer deposited on the ground would decompose into water and oxygen within several hours. The kerosene or JP-8 fuel would be absorbed by the soil. Hydrazine fuel would slowly dissipate from surface soils within 24 hours. Hydrazine fuels buried in an impact crater would dissipate over several months. For Lance missiles, the standard procedure is to leave the impact crater open for 6 months to allow the hydrazine fuel (UDMH) to react and dissipate from the soil. After 6 months the crater would be backfilled with soil from the impact (Cortez III Environmental, 1996).

As described in section 2.10, oxidizer or fuel released after a test or termination would be handled in accordance with the WSMR Installation Spill Contingency Plan (Annex G, Appendix I of the WSMR Disaster Control Plan) (White Sands Missile Range, 1997). In accordance with the Military Munitions Rule, the WSMR Environment and Safety Directorate would determine what range clearance and remediation actions are necessary. Missile and aerial dispersion experiment debris would be rendered safe, loaded onto a truck, and transported to the range residue accumulation point at the former liquid propellant storage site. If access to the debris is not possible with a vehicle, then the debris would be carried by helicopter sling to a nearby road for transport. All debris would be characterized to determine if it is hazardous waste. Hazardous waste would be disposed of via permitted procedures through the WSMR Hazardous Waste Storage

Facility. There would be no on-site treatment of hazardous waste except in the event of an emergency response requirement as allowed in the WSMR RCRA permit and U.S. EPA regulations.

The majority of recovery operations would utilize existing roads and recovery by foot. Off-road vehicle recovery operations would be undertaken only if necessary, and would be coordinated with the WSMR Environment and Safety Directorate and other required WSMR organizations. Recovery would be limited to necessary vehicles and off-road access would follow the same entry route, to the extent possible, to complete the operation with minimal disturbance (White Sands Missile Range, 1998a). Off-road travel during debris recovery increases soil density and potential for water runoff erosion. Debris recovery would be in accordance with the WSMR *Standard Operating Procedure for Environmental Protection During Recovery Action*. This SOP focuses on guidelines for avoidance of known sensitive areas on WSMR (e.g., Salt Creek and other White Sands pupfish habitat, San Andres National Wildlife Refuge, and Trinity Site National Historic Landmark) but also provides specific guidance for recovery in areas of unknown natural and cultural resources sensitivity. Sensitive areas are delineated in the text of the SOP and are graphically depicted as areas to be avoided or treated with higher levels of caution and review approval.

If the propellants burn on impact, fire containment activities could also cause minor impacts on the soil. If vegetation is damaged, then wind and water erosion would both increase. Off-road travel would be restricted if the soils were wet or saturated. For each LPT missile impact, an area of approximately 0.2 hectare (0.5 acre) would be disturbed. For up to 15 missile impacts during the initial 5 years of testing, a total area of 3 hectares (7.5 acres) would be affected. This area represents a minor impact to soils. Restoration of the impact site would be conducted on a case-by-case basis in coordination with the WSMR Environment and Safety Directorate. Due to the small affected area, sites would generally not be reseeded. (Anderson, 1998)

4.5.5 CUMULATIVE IMPACTS

Cumulative impacts could result from soil compaction and devegetation caused by accessing missile and aerial dispersion experiment impact sites and repairing the impact disturbance as described and analyzed in several related environmental documents. Missile and aerial dispersion experiment impacts in the G Impact areas would add to existing impacts analyzed in the Tactical High Energy Laser EA (U.S. Army Space and Missile Defense Command). However, the addition of several LPT impacts per year, when added to the several hundred missile impacts per year analyzed in the Tactical High Energy Laser EA, would result in a minor cumulative impact to soils. The amount of soil disturbed by LPT missile and aerial dispersion experiment impacts would be relatively small, and since there is little chance of the same spot being affected twice, the potential cumulative impacts on soil is considered minor.

4.5.6 MITIGATION MEASURES

Hazardous prelaunch operations including missile fueling would be conducted in accordance with SOPs approved by the WSMR Environment and Safety Directorate and in accordance with all other applicable regulations. All fueling would be conducted using appropriate impermeable barriers as shown in figure 2-5. Adherence to these procedures would minimize the potential for spills and any impacts to soils. Off-road vehicle recovery operations would be undertaken only if necessary and in coordination with the WSMR Environment and Safety Directorate. After recovering the target missile, the affected area would be restored to original grade where practicable to minimize any potential for water or wind erosion.

4.6 HAZARDOUS MATERIALS AND HAZARDOUS WASTE MANAGEMENT

Health and safety impacts of hazardous materials would be minimized by adherence to applicable U.S. Army regulations and SOPs regarding the handling and use of hazardous materials and waste. The IRFNA, hydrogen peroxide, and nitrogen tetroxide oxidizers are very hazardous and would have similar hazardous materials handling requirements. Waste disposal requirements are also similar for these three oxidizers. Hydrazine fuels and the initiator fuel are also very hazardous and would have more stringent handling requirements than the kerosene/coal tar distillate and JP-8 fuels. Waste disposal requirements are similar for all of the fuels. Any item containing asbestos would be disposed of as hazardous waste.

4.6.1 FLIGHT PREPARATION

Transportation of hazardous materials to and from both WSMR and WSTF would be accomplished using the existing transportation infrastructure, without the need for revised procedures due to the similarity of proposed materials to those currently in use. Transportation of the missiles and propellants to the launch sites would be conducted in accordance with DOT regulations and would not be a hazardous materials or hazardous waste impact.

4.6.2 PRELAUNCH ACTIVITIES

Fueling operations, whether conducted at a fixed, permanent facility or at the launch site, would be conducted according to SOP, which would be designed to minimize hazardous materials impacts to personnel and the environment. Total vapor emissions due to fueling operations (of both fuel and oxidizer) would vary depending on the propellant used, specific transfer equipment used, its assembly, and ambient weather conditions. It is anticipated that less than approximately 10 grams (0.4 ounce) of oxidizer vapor would be released to the atmosphere. The kerosene-based and JP-8 fuels are less volatile than the oxidizer, and there would be negligible amounts of fuel vapors released to the atmosphere. Hydrazine fuels would be similar to the oxidizers in volatility and vapors released. These releases would have no health and safety impacts beyond the immediate transfer area. Personnel

directly involved in transfer operations would be equipped with appropriate personal protection equipment as per the operating procedures developed.

Containers that are brought to the propellant transfer site would be placed on SpillSkid® pallets to provide secondary containment during propellant transfer operations. Spill containment for the propellant transfer operation would be provided by a temporary containment system that is impervious to each particular fuel and oxidizer. One set of temporary containment barriers would be used for fuel, and a second set would be used for oxidizer. No permanent containment would be constructed.

After completion of the transfer operations, the transfer equipment would be flushed to decontaminate it. Flushing the fuel transfer system would generate approximately 208 liters (55 gallons) of ethyl alcohol with approximately 40 grams (1.4 ounces) of fuel in solution. Flushing the oxidizer transfer system with deionized water would generate approximately 4164 liters (1,100 gallons) of neutralized deionized water and oxidizer rinsate (less then 1 percent) and would result in the release of approximately 5 grams (0.2 ounce) of nitric oxide to the atmosphere (with no safety or health impacts). The material generated from flushing the fuel and oxidizer systems would be handled as hazardous waste and would be disposed of via permitted procedures through the WSMR Hazardous Waste Storage Facility. Although propellant quantities and fueling systems have not been defined for the Future LPT, it is anticipated that similar materials would be generated when flushing the hydrogen peroxide oxidizer and the JP-8 fuel. Nitrogen tetroxide oxidizer would also involve similar flushing methods and materials generated as the IRFNA.

Should it become necessary to defuel the LPT, the propellant would be transferred into empty bulk liquid propellant containers. The propellant containers would then be transported back to the respective propellant storage areas for reuse in the next LPT. The defueled LPT oxidizer tank would be flushed with deionized water and the LPT fuel tank would be flushed with ethyl alcohol in a manner similar to that described above. The LPT would be transported back to the missile assembly building for reuse or returned to a MDA facility.

Emergency response planning would be incorporated into the LPT operations requirement in order to minimize any impacts due to an unplanned release of hazardous materials. The proposed fuel transfer actions are similar in nature to other project actions at WSMR and would not result in an increased hazard in their implementation.

4.6.3 FLIGHT ACTIVITIES

Non-essential personnel would be evacuated before actual launch, and essential personnel would be removed to protected areas. During a normal launch there would be no hazardous materials or hazardous waste impacts.

It is possible that the missile's flight could be terminated early and the missile would impact inside the evacuation zone. In the event of such an impact, the missile would contain a varying level of propellant that would depend on the flight time before activation

of the FTS. The missile would fall within the evacuation zone and there would be no impact to personnel or the public from such an accidental release. Emergency response actions would be in accordance with the WSMR Missile Mishap Plan, Annex P to the Disaster Control Plan and would include restricting access to the impact site at a distance sufficient to ensure personal safety (White Sands Missile Range, 1998b).

Although it is extremely unlikely, in the event of a missile failure coupled with an FTS failure, there is the possibility that an errant missile could impact off range. Off range impact would be handled in accordance with RCRA emergency response requirements in accordance with the Military Munitions Rule. The LPT project office emergency response SOP would activate the WSMR EOC. The EOC would activate the in-place notification rosters for the appropriate WSMR Disaster Plan Annex, depending on the nature of the off range impact area. The EOC activation is the process for involving the functional area specialists who are charged with assuring that environmental and health & safety requirements are met. The MDA Targets Office, as the proponent of the Proposed Action, would be responsible for clean-up operations and would coordinate recovery actions with the appropriate agencies through the WSMR Environment and Safety Directorate. The toxic hazard resulting from an off-range impact would not be anticipated to exceed those that would result from a planned impact as shown in table 4-2.

4.6.4 POSTFLIGHT ACTIVITIES

For a nominal flight, the missile would contain unburned propellant when it impacts the range within the planned impact area. The amount of propellant remaining in the missile will vary depending on the particular mission objectives (i.e., distance flown and fuel burned). The approximate quantity of unburned propellants remaining at impact is listed in table 2-4. Missile and aerial dispersion experiment debris, and oxidizer or fuel released after a test or termination, would be handled in accordance with the WSMR Installation Spill Contingency Plan (Annex G, Appendix I of the WSMR Disaster Control Plan) (White Sands Missile Range, 1997). This plan establishes responsibility, outlines personnel duties, and provides resources and guidelines for use in the control, clean up, and response for spills. Release of materials above threshold levels would be reported to the U.S. EPA and to state and local level agencies with emergency planning authority as mandated by the Emergency Planning and Community Right to Know Act of 1986. In accordance with the Military Munitions Rule, the WSMR Environment and Safety Directorate would determine what range clearance and remediation actions are necessary to support WSMR operations. In the event that any of the 500 grams (1.1 pounds) of explosive material used to trigger some aerial dispersion experiments remains after impact, a certified explosive ordnance disposal technician would inspect the mounting structure and render safe any explosive material.

Entry to the impact site would be restricted to approved hazardous materials response personnel until the area is determined to be safe. Missile and aerial dispersion experiment debris would be rendered safe, loaded onto a truck, and transported to the range residue accumulation point at the former liquid propellant storage site. If access to the debris is not possible with a vehicle, then the debris would be carried by helicopter sling to a nearby road for transport. All debris would be characterized to determine if it is hazardous waste.

Hazardous waste would be disposed of via permitted procedures through the WSMR Hazardous Waste Storage Facility. There would be no on-site treatment of hazardous waste except in the event of an emergency response requirement as allowed in the WSMR RCRA permit and U.S. EPA regulations.

The Proposed Action would potentially increase the hazardous waste generated on WSMR. However, this increase in hazardous waste would not overburden the WSMR Hazardous Waste Management Program, and only minimal impact would be anticipated.

4.6.5 CUMULATIVE IMPACTS

Flight preparation and pre-launch operations would require the transport, storage, and handling of additional amounts of fuel and oxidizer. These hazardous materials are similar to others in use at WSMR and the NASA WSTF. It is not anticipated that the proposed quantities would cause a cumulative impact to the hazardous materials and waste management at either facility. The proposed flight operations would not result in a cumulative hazardous materials or hazardous waste impact when considered in conjunction with current, planned, and reasonably foreseeable activities at WSMR.

The post-flight operations would probably result in the release of both oxidizer and fuel. These operational releases would be evaluated on a case-by-case basis and would not be expected to result in cumulative impacts on hazardous waste management.

4.6.6 MITIGATION MEASURES

Each LPT missile would contain unburned propellant when it impacts the range. It is likely that at least a portion of the fuel and/or oxidizer would leak from the missile casing and evaporate into the atmosphere and leak into the soil. Once the LPT missile's impact location is determined, a properly trained and equipped hazardous response team would take steps to ensure the area was safe to enter (e.g., determine air quality, enclose free-standing propellant). Missile and aerial dispersion experiment debris, and oxidizer or fuel released after a test or termination, would be handled in accordance with the WSMR Installation Spill Contingency Plan (Annex G, Appendix I of the WSMR Disaster Control Plan) (White Sands Missile Range, 1997). In accordance with the Military Munitions Rule, the WSMR Environment and Safety Directorate would determine what range clearance and remediation actions are necessary to support WSMR operations. These mitigations would minimize the impact of hazardous waste generated during flight operations.

The Proposed Action requires that hazardous materials-related response plans and SOPs be prepared and approved by the WSMR Environment and Safety Directorate before initiating LPT actions. These plans would provide details as to specific recovery and contamination minimization measures to be taken to maintain operational safety during recovery operations, minimize environmental damage, and prevent unnecessary environmental contamination during recovery actions.

4.7 HEALTH AND SAFETY

4.7.1 FLIGHT PREPARATION

The proposed launch sites would require little or no modification before use. Any modifications required would be minor, accomplished using SOPs, and in accordance with U.S. Army occupational safety and health regulations. Launch site maintenance operations are considered routine activities on WSMR, and activities at the proposed launch sites would not impact health and safety at WSMR.

The transportation of LPT missiles and propellants to WSMR would be conducted in accordance with DOT regulations. Transportation may occur by rail or truck in specialized shipping containers designed to protect them from damage in the event of an accident. However, because the fuel and explosives are sensitive to heat, there is the potential of ignition of propellant in an accident.

The DoD has considerable experience with shipment of missiles and other sensitive components. Analysis of past experience using the primary modes of transportation (air, rail, and road) for shipment of missile systems has shown the following:

1. Rail Transport—Data provided concerning the Navy Fleet Ballistic Missile program indicates that since 1963 a total of four accidents (none involving motor ignition, fire, or explosion) have occurred during rail shipment over a total of 7,823,612 kilometers (4,861,500 miles). This yields an accident rate of 8×10^{-3} per rail mile, which translates into an accident probability of 0.008 for a 1,609 kilometers (1,000-mile) trip (one accident every 1,200-plus trips).

2. Road Transport—Specific DoD data concerning road transport of missile systems are lacking; however, representative data from the National Highway Transportation Safety Administration show a major accident rate of 6×10^{-8} per truck mile, or a probability of 1 accident in 16,000 trips of 1,609 kilometers (1,000 miles) each.

In each of the described cases, the accident probability presented reflects only the potential for an accident involving the transport vehicle. Only a small fraction of such accidents would affect a missile system being transported due to the use of specialized shipping containers that protect the shipment; consequently, minimal health and safety impacts would be expected from transporting the LPT missile and propellants.

The assembly of missile components, accomplished within enclosed buildings, has the potential to affect worker health and safety but not that of the public. The kinds of material likely to be handled are discussed in section 3.7. These activities are considered routine at WSMR, and the potential for impacts on worker health and safety is considered minor.

4.7.2 PRELAUNCH ACTIVITIES

LPT flight testing evacuations, clearances, and road closures are expressly intended to ensure both worker and public health and safety. Evacuation includes preparation for establishing appropriate roadblocks before launch activities, coordinating with evacuation activities, and conducting appropriate ground and air surveillance sweeps to ensure that all areas are evacuated in accordance with agreements between the U.S. Army and state and Federal agencies. Roadblocks would be limited to a maximum of 1 hour 10 minutes (U.S. Army Space and Strategic Defense Command, 1995a).

Hazardous prelaunch operations including missile fueling would be conducted in accordance with SOPs approved by the WSMR Environment and Safety Directorate and all other applicable regulations. Adherence to these procedures would minimize the potential for health and safety impacts. It is anticipated that releases under normal conditions would be limited to less than 15 grams (0.6 ounce) of gaseous oxidizer and negligible amounts of fuel vapors. Personnel directly involved in fueling would wear appropriate personal protection equipment, and anyone not directly involved would be evacuated to a safe distance.

The potential exists for larger accidental releases of either propellant component. The likelihood of such an occurrence would be remote due to the implementation of the SOP. Table 4-1 indicates the potential distances at which the various health standards could be exceeded in the event of a larger leak during fueling operations. The duration and size of the actual hazard area would vary depending on the amount and type of propellant released and meteorological conditions at the time. SOPs would be developed that include personal protective equipment and safety zones based on the spill modeling discussed in 4.1.2. The WSMR Installation Spill Contingency Plan (Annex G, Appendix I of the WSMR Disaster Control Plan) (White Sands Missile Range, 1997) would be incorporated into the SOP to enable rapid response to any leak and minimize the threat such a leak would pose to personnel and to the environment.

4.7.3 FLIGHT ACTIVITIES

The principal health and safety concerns would be missile malfunctions on or near the launch pad, potential hazards presented by the missile following a flight termination action, and missile and aerial dispersion experiment impact areas. The WSMR Missile Flight Safety Office must approve all flight plans and trajectories and all planned impact areas. Evacuation areas would be established that would encompass the launch area, flight path, and impact area. These evacuation areas would generally be completely contained within on-range lands. In some scenarios for launches from the Sulf or Lite sites, a portion of the Western Call-up area could also be evacuated. Thus, proposed flight activities would pose no threat to the general public.

Personnel inside the evacuation area would be limited to mission essential personnel. Mission essential personnel (specifically those required to be within the evacuation area to conduct the launch) would remain within facilities rated to provide adequate blast and debris protection and to which positive communications would be maintained at all times.

The implementation of such safety practices would limit the number of personnel exposed to increased hazards and, as a result, minimal health and safety impacts are expected.

4.7.4 POSTFLIGHT ACTIVITIES

Debris-recovery activities would be conducted in accordance with WSMR SOP. Missile and aerial dispersion experiment debris, and oxidizer or fuel released after a test or termination, would be handled in accordance with the WSMR Installation Spill Contingency Plan (Annex G, Appendix I of the WSMR Disaster Control Plan) (White Sands Missile Range, 1997). In accordance with the Military Munitions Rule, the WSMR Environment and Safety Directorate would determine what range clearance and remediation actions are necessary to support WSMR operations. These procedures are designed to prevent risks to WSMR and program personnel and the general public.

Table 4-2 indicates the potential distances at which the various health standards could be exceeded assuming all 473 liters (125 gallons) of the remaining oxidizer and 265 liters (70 gallons) of the remaining fuel were released to the atmosphere. The duration and size of the actual hazard area would vary depending on the amount and type of propellant released and meteorological conditions at the time. SOPs would be developed that include personal protective equipment and safety zones based on the spill modeling discussed in 4.1.2. The WSMR Installation Spill Contingency Plan (Annex G, Appendix I of the WSMR Disaster Control Plan) (White Sands Missile Range, 1997) would be incorporated into the SOP to enable rapid response to any leak and minimize the threat such a leak would pose to personnel and to the environment.

4.7.5 CUMULATIVE IMPACTS

Minor impacts from the Proposed Action, when added to other activities in the area, would not result in cumulative impacts to health and safety. WSMR health and safety requirements are implemented during all phases of operation, from initial planning through life of the project to final disposition. In addition, emergency response planning and implementation also are given the highest priority at WSMR. Through this approach, the vast majority of potential health and safety hazards are avoided entirely or reduced to extremely low probabilities, minimizing the potential for cumulative impacts from current, planned, and reasonably foreseeable activities at WSMR.

4.7.6 MITIGATION MEASURES

The transportation of LPT missiles and propellants to WSMR would be conducted in accordance with DOT regulations. Transportation may occur by rail or truck in specialized shipping containers designed to protect them from damage in the event of an accident. The Proposed Action requires that hazardous materials-related response plans and standard safety operating plans be completed and approved by the WSMR Environment and Safety Directorate before beginning the Proposed Action. Adherence to these two plans would minimize any health and safety risks associated with the Proposed Action. Mission essential personnel would remain within facilities rated to provide adequate blast and debris protection and to which positive communications would be maintained at all times.

4.8 LAND USE

4.8.1 FLIGHT PREPARATION

The transportation of LPT missiles and the assembly of missile components, accomplished in existing buildings dedicated to that purpose, would have no impact on land use or represent any land use conflicts.

Storage of LPT missiles would occur in an approved missile assembly building. Storage of propellants at the NASA WSTF would occur at existing fuel and oxidizer storage areas designed for such use. The U.S. Army currently has a Memorandum of Agreement with NASA through 2002, which allows for storage of liquid propellants at WSTF. The Memorandum of Agreement could be extended if necessary to accommodate the LPT program.

Storage of propellants at LC-36 would occur in a facility designed for such use. This facility would need to be leased from the Navy, owner of the facilities at LC-36.

Potential LPT Launch Sites

Launch sites LC-32, LC-50, Brent, and LER-4, are located in the southern portion of the range near the WSMR Main Post area. Mine, Sulf, GranJean, Lite, and Fair are located in the northernmost portion of the range in the Jornada del Muerto Basin.

Maximum use would be made of existing infrastructure and facilities at the launch sites. Existing facilities would be modified, if necessary, to support LPT missile system operations. These operations would be considered routine activities for WSMR.

4.8.2 PRELAUNCH ACTIVITIES

LPT flight testing evacuations and clearances would be considered normal operations and would have no land use impacts on WSMR.

When launches are scheduled at Sulf and Lite sites, if necessary, evacuation procedures would take place in a portion of the Western Call-up area. Residents would leave their homes for a specified time, generally a maximum of 12 hours. Upon completion of the launches, "ALL CLEAR" notices are broadcast from area radio stations. This is a normal, if infrequent, practice, and the evacuation agreements are already negotiated and in place. Evacuation procedures are discussed in section 3.8.

Impacts on land use within the Western Call-up area, predominantly livestock grazing, are considered minor, since use of the land itself would not be affected and compensation agreements have already been negotiated with landowners, permit holders, the Bureau of Land Management, and the state including loss and damage liability and compensation procedures.

Impacts on public use of the public lands in the Western Call-up area would result from its evacuation and road closures to prevent access. Consequently, impacts on land use on the public lands within the Western Call-up area are also considered minor given the present Memorandum of Understanding limitation of 20 evacuations per year.

4.8.3 FLIGHT ACTIVITIES

Any evacuations that occur due to the LPT testing would remain active throughout the duration of the flight activities. Evacuations would follow normal evacuation procedures, therefore, no impacts on land use would occur during LPT missile flight activity.

LPTs launched from the northern launch sites would follow a ballistic trajectory and impact on one of the existing southern impact areas, G-10, G-16, G-20, or G-25, or a new impact area located southeast of Highway 70 (figure 2-8). LPTs launched from the southern launch sites would follow a ballistic trajectory and impact on one of the existing northern impact areas (649 Impact Area or AFSWC Target), one of the two new impact areas north of the 649 Impact Area, or a new impact area located north of the Oscura bombing range (figure 2-9).

The existing impact areas, G-10, G-16, G-20, G-25, 649 Impact Area, and AFSWC Target would not be utilized in any manner not already identified; therefore, no impact on land use would occur at these designated impact areas.

Land use would change from open area to impact area at the new impact areas. This would affect a very small percentage of the existing open area on WSMR and would be a minor impact, since WSMR in its entirety is a military missile test range. Additional internal WSMR coordination would be required to effect the change in land use.

4.8.4 POSTFLIGHT ACTIVITIES

Postflight debris recovery activities would be coordinated with the WSMR Environment and Safety Directorate in accordance with WSMR SOP and would have no impact on land use.

4.8.5 CUMULATIVE IMPACTS

No other current, planned, or reasonably foreseeable activities have been identified that, when added to the minor land use impacts from LPT missile testing, would result in cumulative impacts to land use.

4.8.6 MITIGATION MEASURES

Negotiated evacuation procedures would be followed in the Western Call-up area, if necessary, when launches are scheduled at the Sulf and Lite sites. Any evacuations that occur would remain active throughout the duration of the flight activities. Postflight debris recovery activities would be coordinated with the WSMR Environment and Safety Directorate in accordance with WSMR SOPs.

4.9 NOISE

4.9.1 FLIGHT PREPARATION

Any modification of the existing launch sites under consideration would be minor, and with no known sensitive receptors in the vicinity, no noise impacts are expected.

The transportation of LPT missiles would not affect existing noise levels. The transportation of the LPT missiles would be conducted according to DOT regulations. The assembly of missile components within enclosed buildings would have no impact on the noise environment outside the missile assembly building, and would be at noise levels that are typical for an industrial environment.

4.9.2 PRELAUNCH ACTIVITIES

LPT missile prelaunch evacuation and road closure activities would have no impacts on the noise environment. Storing LPT missile and propellants would have no impact on noise.

4.9.3 FLIGHT ACTIVITIES

During flight testing activities, three possible issues must be addressed to determine potential noise impacts: personnel safety, public safety, and public annoyance.

Personnel safety is addressed through OSHA regulation 1910.95. LPT missile launches would not add new types or levels of noise to the current noise environment at WSMR. Noise levels would be similar to past and current program noise levels at WSMR and in the call-up areas. Missile launches would be of short duration in which all personnel would take cover in control blockhouses, or other protective shelter protected from noise by the sound attenuation provided by the building's construction. The potential for extended exposure to high noise levels from the generators that may be used during flight test activities may lead to possible noise impacts on operations personnel. Zones in the operations area with high noise levels would be designated off-limits. Entry into these zones would be prohibited except to mission personnel who must enter them in support of the mission, and they would be required to wear hearing protection, which would reduce the noise levels to prescribed health and safety levels.

Public safety would not be affected due to the lack of public access to the launch or impact areas.

The nearest residential areas are the communities of Las Cruces, Socorro, San Antonio, Alamogordo, Tularosa, Orogrande, Carrizozo, and Bingham. The nearest sensitive receptors would be those located on the Main Post area and could include hospitals, schools, and daycare facilities. However there are no sensitive receptors located within the L_{max} = 85-dB contour that would extend approximately 1,277 meters (4,190 feet) from the proposed launch sites. While the missile launches would produce high noise levels for a short period of time, the proposed flight activities would be similar to past and

present activities carried out at or near the same sites. In addition, the proposed schedule of launches (15 launches over a 5-year period) would not appreciably affect background noise levels. Therefore, no noise impacts are expected to occur.

4.9.4 POSTFLIGHT ACTIVITIES

Noise from vehicles employed in recovery operations (trucks and helicopters) is also a potential impact. The UH-1H helicopter has an anticipated noise level in the range of 80 dBA; moreover, each recovery operation should last less than 1 day. Helicopter flight helmets would provide the required noise attenuation for the crew. Noise impacts from recovery operations are expected to be minor.

4.9.5 CUMULATIVE IMPACTS

No cumulative noise impacts from current, planned, and reasonably foreseeable activities are anticipated because of the standard practices employed at WSMR and the limitations of range scheduling that prevent major increases in the number of noise sources at WSMR. Operations personnel who are potentially subjected to action sound levels equal or exceeding an 8-hour time-weighted average of 85 dBA would be subject to a continuous effective hearing conservation program pursuant to OSHA regulations. (U.S. Army Space and Strategic Defense Command, 1994c)

4.9.6 MITIGATION MEASURES

Operations personnel who are potentially subjected to maximum sound levels in excess of 85 dBA would be subject to a hearing-loss-prevention monitoring program as per OSHA regulations. During launch operations personnel within the 90 dBA maximum sound level contour would be provided with appropriate protective measures to ensure sound levels are reduced to within safe levels. Protective measures could include either or both personal sound reduction equipment such as earplugs or covering or protective shelters designed to protect personnel from launch effects including sound impacts.

4.10 TRANSPORTATION AND INFRASTRUCTURE

4.10.1 FLIGHT PREPARATION

The LPT missiles would be transported to WSMR without fuel. All transportation within the Continental United States would be performed in accordance with appropriate DOT-approved procedures and routing, as well as OSHA requirements and U.S. Army safety regulations. Liquid propellants would be transported in DOT-approved containers. Appropriate safety measures would be followed during transportation of the propellants as required by DOT and as described in the BOE Tariff No. BOE 6000-I, *Hazardous Materials Regulations of the Department of Transportation* (Association of American Railroads, 2000). Therefore, the transportation of LPT missiles to WSMR would have no impacts on transportation.

No modification to existing facilities would be required for LPT testing other than routine maintenance and possible retrofitting of existing utilities at launch sites. No unusual utility requirements or additional personnel would be required to support this level of activity.

LPT missiles and propellants would be stored in WSMR-approved locations and would not affect transportation or infrastructure.

4.10.2 PRELAUNCH ACTIVITIES

Propellants would be transported from the storage facility to the fueling location in accordance with appropriate regulations as discussed above.

U.S. Highways 70 and 380 are regularly closed during missile tests. A resolution adopted in 1972 (New Mexico Highway Department, 1972) identifies procedures to be followed in establishing roadblocks on designated roads surrounding WSMR, including these highways. The procedures for road closures would be followed during each LPT flight test. LPT missile activity would have similar impact on rail or air traffic in the immediate ROI as existing missile flight tests.

LPT missile fueling, road closure, and evacuations would not affect infrastructure.

4.10.3 FLIGHT ACTIVITIES

Maximum use would be made of existing infrastructure and facilities at each launch site. Existing facilities would be retrofitted, if necessary, to support LPT missile system operations. Additional temporary infrastructure requirements may include floodlighting sufficient to support possible nighttime launches, temporary equipment and camera towers, minor road maintenance, fencing, potable water storage, and telephone and data transmission lines. The use of portable ground support equipment may reduce or eliminate some of the fixed facility and infrastructure requirements. Portable equipment, which might be used to support LPT missile testing, would also include launch control stations, telemetry vans, personnel trailers, and power generators. Additionally, shallow (less than 0.3-meter [1-foot] depth) in-ground placement of thermal and acoustic instrumentation would be required for some test operations. These operations would be considered routine activities for WSMR.

LPT missile and debris dispersion experiment impact areas are located away from existing infrastructure and would not affect that infrastructure. Although a flight termination could result in the LPT missile impacting existing infrastructure, the probability is extremely remote and the potential for effect is considered minor.

4.10.4 POSTFLIGHT ACTIVITIES

Debris-recovery efforts would have no impact on transportation or infrastructure.

4.10.5 CUMULATIVE IMPACTS

No other current, planned, and reasonably foreseeable activities have been identified that, when added to the minor affects on transportation and infrastructure from the LPT program, would result in cumulative impacts. Road closures for 15 launches over 5 years are an insignificant impact when considered with the existing closures.

4.10.6 MITIGATION MEASURES

All transportation within the Continental United States would be performed in accordance with appropriate DOT-approved procedures and routing, as well as OSHA and U.S. Army safety requirements. If roadblocks are required, established procedures for road closures, including U.S. Highway 70, would be followed during each LPT flight test.

4.11 WATER RESOURCES

All LPT activities would comply with the WSMR Storm Water Pollution Prevention Plan and best management practices.

4.11.1 FLIGHT PREPARATION

The transportation of LPT missile components and propellants would have no impact on water resources. Similarly, the assembly of missile components in enclosed buildings would have no impact on water resources. The potential for surface water or groundwater contamination resulting from accidental spills of toxic material is highly unlikely because propellants would be stored at locations with appropriate spill containment, and handling would be in accordance with approved SOPs.

4.11.2 PRELAUNCH ACTIVITIES

The LPT flight testing evacuations and road closures would have no impact on water resources.

Hazardous prelaunch operations including missile fueling would be conducted in accordance with SOPs approved by the WSMR Environment and Safety Directorate and all other applicable regulations. All fueling would be conducted using appropriate impermeable barriers as shown in figure 2-5. Adherence to these procedures would minimize the potential for spills and any impacts to water resources. The Proposed Action would not result in construction disturbance of more than an acre of land. Therefore, a National Pollutant Discharge Elimination System Construction Storm Water General Permit is not required.

4.11.3 FLIGHT ACTIVITIES

LPT missile exhaust emissions would not appreciably affect surface water or groundwater.

4.11.4 POSTFLIGHT ACTIVITIES

The LPT missile impact on the ground may result in ground depressions up to 6 meters (20 feet) deep, depending upon ground conditions and the orientation of the missile upon impact. The aerial dispersion experiment impact on the ground would be similar but much smaller, with less disturbance. Based on a review of maps (White Sands Missile Range, 2001), there is no surface water within the proposed LPT impact areas. As shown in table 4-4, the depth to groundwater at each impact area is greater than the maximum anticipated liquid propellant deposition depth of 6 meters (20 feet) below ground level.

Table 4-4: Depth to Groundwater at Each Impact Area

Impact Area	Estimated Depth to Water
G-10	70 feet
G-16	85 feet
G-20	85 feet
G-25	100 feet
Southeast of Highway 70	185 feet
649 Impact Area	100 to 200 feet
Area 1 North of 649 Impact Area	100 to 200 feet
Area 2 North of 649 Impact Area	100 to 200 feet
AFSWC Target	100 to 200 feet
North of Oscura Range	200 feet

Source: WSMR Environment and Safety Directorate, 2000a, 2000b, U.S. Army Space and Missile Defense Command, 1998

There is a remote possibility that an early flight termination could result in liquid propellant and missile and aerial dispersion experiment debris deposition in water bodies. The missile body and debris from aerial dispersion experiments would consist primarily of inert metal objects. Some perennial surface waters, such as Mound Springs, Lake Lucero, Malpais Springs, and Salt Creek, could be impacted by an LPT missile following a flight termination. However, the probability of any individual water body, spring, or creek being directly impacted is extremely low. An early flight termination could also possibly impact in an area of shallower groundwater or an aquifer recharge zone. In any of these unlikely events, the LPT project office emergency response SOP would activate the WSMR EOC. The EOC would activate the in-place notification rosters for the appropriate WSMR Disaster Plan Annex, depending on the nature of the emergency. The EOC activation is the process for involving the functional area specialists who are charged with assuring that environmental and health and safety requirements are met.

Each LPT missile would have approximately 265 liters (70 gallons) of fuel and 473 liters (125 gallons) of oxidizer remaining when it impacts the ground. If the oxidizer and fuel do not explode or burn at impact, then they would most likely be deposited on the ground. The MSDS information in appendix D provides some information regarding environmental fate of the propellants. The IRFNA or nitrogen tetroxide oxidizer would volatilize into the

atmosphere. Any residual nitric acid would react with the alkaline soils resulting in the deposition of nitrates that would act as a fertilizer and not appreciably affect the soils or groundwater. Hydrogen peroxide oxidizer deposited on the ground would decompose into water and oxygen within several hours. The kerosene or JP-8 fuel would be absorbed by the soil. Hydrazine fuel would slowly dissipate from surface soils within 24 hours. Hydrazine fuels buried in an impact crater would dissipate over several months. In the highly unlikely event that the propellants are deposited in surface water, residual nitric acid would cause a substantial, short-term pH change. The acid would mix with the water and eventually be neutralized and diluted. Hydrogen peroxide in surface water would decompose into water and oxygen within 8 hours to 20 days. Kerosene or JP-8 fuel would not mix with the water, but would form a slick on the surface that would stick to surfaces it contacts. Hydrazine fuels would degrade primarily into nitrogen gas and water over a period of hours to weeks, with degradation proceeding more rapidly in alkaline waters.

Missile and aerial dispersion experiment debris and oxidizer or fuel released after a test or termination would be handled in accordance with the WSMR Installation Spill Contingency Plan (Annex G, Appendix I of the WSMR Disaster Control Plan) (White Sands Missile Range, 1997). In accordance with the Military Munitions Rule, the WSMR Environment and Safety Directorate would determine what range clearance and remediation actions are necessary to support WSMR operations. Missile and aerial dispersion experiment debris would be rendered safe, loaded onto a truck, and transported to the range residue accumulation point at the former liquid propellant storage site. If access to the debris is not possible with a vehicle, then the debris would be carried by helicopter sling to a nearby road for transport. All debris would be characterized to determine if it is hazardous waste. Hazardous waste would be disposed of via permitted procedures through the WSMR Hazardous Waste Storage Facility. There would be no on-site treatment of hazardous waste except in the event of an emergency response requirement as allowed in the WSMR RCRA permit and U.S. EPA regulations.

Off-road travel during debris recovery and fire containment activities increases soil density and potential for water runoff erosion. Recovery operations would be carried out in accordance with the WSMR *Standard Operating Procedure for Environmental Protection During Recovery Action*. This SOP focuses on guidelines for avoidance of known sensitive areas on WSMR (e.g., Salt Creek and other White Sands pupfish habitat, San Andres National Wildlife Refuge, and Trinity Site National Historic Landmark) but also provides specific guidance for recovery in areas of unknown natural and cultural resources sensitivity. Sensitive areas are delineated in the text of the SOP and are graphically depicted as areas to be avoided or treated with higher levels of caution and review approval. The majority of recovery operations would utilize existing roads and recovery by foot. Off-road vehicle recovery operations would be undertaken only if necessary, and would be coordinated with the WSMR Environment and Safety Directorate and other required WSMR organizations. Recovery would be limited to necessary vehicles and off-road access would follow the same entry route, to the extent possible, to complete the operation with minimal disturbance (White Sands Missile Range, 1998a). Restoration of the impact site would be conducted on a case-by-case basis in coordination with the WSMR Environment and Safety Directorate. Any increase in erosion would be minor and

would not appreciably impact surface or ground water quality. Therefore, impacts on water resources from debris-recovery operations are expected to be minimal.

In the highly unlikely event of an LPT missile or aerial dispersion experiment impact in surface water, specific operational steps for emergency responses would be determined on a case-by-case basis in accordance with the WSMR Missile Mishap Plan, Annex P to the Disaster Control Plan (White Sands Missile Range, 1998b). Metal objects from the missile body and aerial dispersion experiment would be inert and have little potential to contaminate water bodies. The response team's immediate concern would be maintaining the team's safety. In general a typical response would include the following:

- Render the missile or debris safe
- Stop the flow of oxidizer or fuel
- Neutralize the oxidizer in the stream (or body of water) sufficiently far downstream so as to avoid a continuing hazard to water quality
- Install surface skimmers and absorptive materials downstream from the lead edge of contamination to collect the fuel
- Monitor the pH along the stream to ascertain that a background pH level has been established
- Remove all petroleum products from stream surfaces and return the damaged area to an environmentally sound level

Although it is extremely unlikely, in the event of an FTS failure, there is the possibility that an errant missile could impact off range. Off range impact would be handled in accordance with RCRA emergency response requirements in accordance with the Military Munitions Rule. The LPT project office emergency response SOP would activate the WSMR EOC. The EOC would activate the in-place notification rosters for the appropriate WSMR Disaster Plan Annex, depending on the nature of the off range impact area. The EOC activation is the process for involving the functional area specialists who are charged with assuring that environmental and health & safety requirements are met.

4.11.5 CUMULATIVE IMPACTS

Cumulative impacts could result from increased erosion due to soil compaction and devegetation caused by accessing missile and aerial dispersion experiment impact sites and repairing the impact disturbance. Missile and aerial dispersion experiment impacts in the G Impact areas would add to existing missile impacts analyzed in the Tactical High Energy Laser EA (U.S. Army Space and Missile Defense Command, 1998). The impact of several hundred missiles per year, as analyzed in the Tactical High Energy Laser EA, did not result in significant impacts. The amount of soil disturbed by several LPT missile impacts per year would be relatively small, and with no direct impacts to surface or ground water, the potential for cumulative impacts on the quality of surface water or groundwater is considered minor.

4.11.6 MITIGATION MEASURES

Hazardous pre-launch operations, including missile fueling, would be conducted in accordance with applicable regulations and SOPs approved by the WSMR Environment and Safety Directorate. All fueling would be conducted using appropriate impermeable barriers as shown in figure 2-5. Adherence to these procedures would minimize the potential for spills and any impacts to water resources. Off-road vehicle recovery operations would be undertaken only if necessary and in coordination with the WSMR Environment and Safety Directorate and other WSMR organizations.

4.12 ENVIRONMENTAL EFFECTS OF THE NO-ACTION ALTERNATIVE

If the No-action Alternative is selected, no environmental consequences associated with the LPT flight testing would occur. Present WSMR activities would continue with no change in current operations. The capability for WSMR to provide launches of LPTs would not be further developed or tested.

Existing liquid propellant missiles, such as the Lance missile, would continue to be utilized on WSMR. Impacts associated with Lance missile testing were addressed in the Lance Missile EA (Cortez III Environmental, 1996).

The WSMR EIS describes the types of activities and environmental effects from ongoing activities.

4.13 ADVERSE ENVIRONMENTAL EFFECTS THAT CANNOT BE AVOIDED

Minor noise impacts on wildlife from LPT launches and debris recovery cannot be avoided. Debris impacts, particularly to unlisted vegetation, and debris-recovery impacts, such as noise and habitat disturbance, cannot be totally avoided. However, known populations of threatened and endangered species would be avoided. Oxidizer or fuel released into the soil would be handled in accordance with the WSMR Installation Spill Contingency Plan. The WSMR Environment and Safety Directorate would determine what range clearance and remediation activities are necessary to support WSMR operations.

4.14 CONFLICTS WITH FEDERAL, STATE, AND LOCAL LAND USE PLANS, POLICIES, AND CONTROLS FOR THE AREA CONCERNED

All of the proposed program activities would take place in existing facilities or locations on a DoD installation dedicated to missile testing activities. These activities would not alter the uses of the sites, which were in the past or currently are used to support missile and

rocket testing. However, potential new impact areas within the range boundaries could be developed. No conflicts with land use plans, policies, and controls are anticipated.

4.15 ENERGY REQUIREMENTS AND CONSERVATION POTENTIAL

Anticipated energy requirements of the LPT program would be well within the energy supply capacity of all facilities. Energy requirements would be subject to any established energy conservation practices at each facility.

4.16 IRREVERSIBLE OR IRRETRIEVABLE COMMITMENT OF RESOURCES

The Proposed Action would result in no loss of threatened or endangered species, and no loss of cultural resources, such as archaeological or historic sites. Moreover, there would be no changes in land use nor preclusion of development of underground mineral resources that were not already precluded.

The amount of materials required for any program-related activities and energy used during the project would be small. Although the proposed activities would result in some irreversible or irretrievable commitment of resources such as various metallic materials, minerals, and labor, this commitment of resources is not significantly different from that necessary for many other defense research and development programs carried out over the past several years. Proposed activities would not commit natural resources in significant quantities.

4.17 RELATIONSHIP BETWEEN SHORT-TERM USE OF THE HUMAN ENVIRONMENT AND THE MAINTENANCE AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY

Proposed LPT program activities would take advantage of existing facilities and infrastructure. The upgrades to some of these facilities or locations would not alter the uses of the sites, which were or are to support missile and rocket launches. Therefore, the Proposed Action does not eliminate any options for future use of the environment for the locations under consideration.

4.18 NATURAL OR DEPLETABLE RESOURCE REQUIREMENTS AND CONSERVATION POTENTIAL

Other than various structural materials and fuels, no significant natural or depletable resources would be required by the program.

4.19 FEDERAL ACTIONS TO ADDRESS ENVIRONMENTAL JUSTICE IN MINORITY POPULATIONS AND LOW-INCOME POPULATIONS (EXECUTIVE ORDER 12898)

LPT program activities would be conducted in a manner that would not substantially affect human health and the environment. The environmental assessment has identified no effects that would result in disproportionately high or adverse effect on minority or low-income populations in the area. The activities would also be conducted in a manner that would not exclude persons from participating in, deny persons the benefits of, or subject persons to discrimination under the LPT program because of their race, color, national origin, or socioeconomic status.

THIS PAGE INTENTIONALLY LEFT BLANK

5.0
REFERENCES

5.0 REFERENCES

American Institute of Aeronautics and Astronautics, 1993. *Environmental Monitoring of Space Shuttle Launches at Kennedy Space Center: The First Ten Years*.

American National Standards Institute, 1983. *Specification for Sound Level Meters*, ANSI S1.4-1983.

Anderson, D.L., 1998. Personal Communication between David Lee Anderson, Land Manager, White Sands Missile Range, and EDAW, Inc., concerning soil restoration procedures at impact areas, 30 January.

Association of American Railroads, 2000. Bureau of Explosives (BOE) Tariff No. BOE 6000-I, *Hazardous Materials Regulations of the Department of Transportation.*

Bismack, K., 2001. Personal Communication between Kevin Bismack, Engineer, Teledyne Solutions, and EDAW, Inc, concerning LPT explosives, 15 January.

Chemical Propulsion Information Agency, 1984. *Hazards of Chemical Rockets and Propellants, Volume II, Solid Propellants and Ingredients*, September.

Cortez III Environmental, 1996. *Lance Missile Target Environmental Assessment*.

Federal Aviation Administration, 1996. *Environmental Assessment of the Kodiak Launch Complex*, June.

Larkin, R., 1996. *Effects of Military Noise on Wildlife: A Literature Review,* January.

Leyva, L., 2000. Personal Communication between Lori Leyva, Flight Safety, White Sands Missile Range, and EDAW, Inc., concerning missile flight safety procedures, 30 August.

MG Industries, 2002. 'Material Safety Data Sheet #16635" [Online]. Available: http://www.mgindustries.com/msds/SubLookup.asp?SubName=16635, [March 12]

National Aeronautics and Space Administration, 1997. *Environmental Resources Document*, KSC-DF-3080/Revision C, dated February 1997, [Online]. Available: http://www-de.ksc.nasa.gov/jj-d/programs/erd/erd.html, [24 January].

National Institute for Occupational Safety and Health, 2002a. "Immediately Dangerous to Life or Health Concentrations: Hydrazine" [Online]. Available: http://www.cdc.gov/niosh/idlh/302012.html, [March 12]

National Institute for Occupational Safety and Health, 2002b. "Immediately Dangerous to Life or Health Concentrations: Hydrogen Peroxide" [Online]. Available: http://www.cdc.gov/niosh/idlh/772841.html, [March 12]

National Institute for Occupational Safety and Health, 2002c. "Immediately Dangerous to Life or Health Concentrations: Nitric Acid' [Online]. Available: http://www.cdc.gov/niosh/idlh/7697372.html, [March 12]

New Mexico Department of Game and Fish, 2000. "Seeking a Balance: Both Sheep and Cougars Have a Place in New Mexico's Biotic Community," [Online]. Available at http://www.gmfsh.state.nm.us/PageMill_Text/Publication/cougarinfo2.html [7 September].

New Mexico Department of Game and Fish, 2001. "Biota Information System of New Mexico BISON, Species Account 042070, Interior Least Tern" [Online]. Available: http://www.fw.vt.edu/fishex/nmex_main/species/042070.htm, [7 March].

New Mexico Highway Department, 1972. Written resolution between the New Mexico State Highway Department and the White Sands Missile Range Real Estate Division, 21 March.

Ruck, John, ed., 1983. *The Illustrated Encyclopedia of Science and the Future*, Volume II.

Toxnet, 2002. "Hydrogen Peroxide" [Online]. Available: http://toxnet.nlm.nih.gov/cgi-bin/sis/htmlgen?HSDB, [March 12].

U.S. Army Corps of Engineers, 1988. *Historic Preservation Plan, White Sands Missile Range, New Mexico*.

U.S. Army Materiel Readiness and Development Command, 1983. *A Cultural Resources Overview and Management Plan for the White Sands Missile Range*.

U.S. Army Space and Missile Defense Command, 1998. *Tactical High Energy Laser Advanced Concept Technology Demonstration Environmental Assessment*, 27 April.

U.S. Army Space and Strategic Defense Command, 1994a. *Theater Missile Defense Hera Target Systems Environmental Assessment,* January.

U.S. Army Space and Strategic Defense Command, 1994b. *Draft Theater Missile Defense Extended Test Range Environmental Impact Statement*, January.

U.S. Army Space and Strategic Defense Command, 1994c. *Theater Missile Defense Extended Test Range Environmental Impact Statement*, November.

U.S. Army Space and Strategic Defense Command, 1995a. *Theater Missile Defense Flight Test Environmental Assessment*, April.

U.S. Army Space and Strategic Defense Command, 1995b. *Theater Missile Defense Flight Test Supplemental Environmental Assessment*, November.

U.S. Army Space and Strategic Defense Command, 1997. *PATRIOT Advanced Capability-3 (PAC-3) Life Cycle Environmental Assessment*, May.

U.S. Army Strategic Defense Command, 1990. *HEDI Kite I Noise Monitoring Technical Report, White Sands Missile Range, Las Cruces, New Mexico.*

U.S. Army Strategic Defense Command, 1991. *Extended Range Intercept Technology (ERINT) Environmental Assessment*, September.

U.S. Army White Sands Missile Range, 1996. *Letter from the U.S. Fish and Wildlife Service addressing changes on the Aplomado Falcon Survey Program*, April.

U.S. Army White Sands Missile Range, et al., 1994. *Cooperative Agreement for the Protection and Maintenance of White Sands Pupfish between U.S. Army–White Sands Missile Range, U.S. Air Force–Holloman Air Force Base, National Park Service–White Sands National Monument, U.S. Fish and Wildlife Service, and New Mexico Department of Game and Fish*, 21 July.

U.S. Department of the Air Force, 1990. *Environmental Assessment, Titan IV Solid Rocket Motor Upgrade Program*, Cape Canaveral Air Force Station, Florida and Vandenberg Air Force Base, California.

U.S. Department of the Army, 1985. *Installation Environmental Assessment, White Sands Missile Range, New Mexico*, March.

U.S. Department of the Army, 1985a. *Safety Manual*, Army Materiel Command Regulation No. 385-100, August.

U.S. Department of the Interior, 1994. Comments received from the U.S. Department of the Interior, U.S. Fish and Wildlife Service, New Mexico Ecological Services Field Office regarding the Theater Missile Defense Flight Test Environmental Assessment.

U.S. Department of the Interior, 1996. Comments received from the U.S. Department of the Interior, U.S. Fish and Wildlife Service, New Mexico Ecological Services Field Office on the Preliminary Final PAC-3 EA, 31 October.

U.S. Fish and Wildlife Service, 1999. *Interim Survey Methodology for the Northern Aplomado Falcon (Falco femoralis septentrionalis) in Desert Grasslands*, April.

U.S. Fish and Wildlife Service, 2001a. *Species List*, "Species Profile as of 3/7/2001, Mountain Plover," [Online]. Available: http://ecos.fws.gov/species_profile/species_profile.html, [7 March].

U.S. Fish and Wildlife Service, 2001b. "Mexican Wolf Frequently Asked Questions," [Online]. Available: http://mexicanwolf.fws.gov/faq.cfm, [7 March].

U.S. Fish and Wildlife Service, 2001c. "Threatened and Endangered Species System (TESS), Listing by State and Territory," [Online]. Available: http://ecos.fws.gov/webpage/webpage_usa_lists.html, [March].

University of New Mexico, 2001. "Rare Plant Report," [Online]. Available: http://nmrareplants.unm.edu/reports/hedtod.htm, [7 March].

White Sands Missile Range, 1990. *Range User's Handbook*.

White Sands Missile Range, 1995. *Environmental Assessment for the PATRIOT Missile System*, White Sands Missile Range, New Mexico, June.

White Sands Missile Range, 1997. *White Sands Missile Range Disaster Control Plan, Annex G (Environmental Spill Plan) Appendix I, "Installation Spill Contingency Plan,"* 29 September.

White Sands Missile Range, 1998a. *White Sands Missile Range, Range-wide Environmental Impact Statement,* January.

White Sands Missile Range, 1998b. *White Sands Missile Range Disaster Control Plan, Annex P, "Missile Mishap Plan*," 19 February.

White Sands Missile Range, 2000. *White Sands Missile Range Bighorn Sheep Location Map.*

White Sands Missile Range Environment and Safety Directorate, 2000a. *White Sands Missile Range, Water-Level Studies, March to April 1999*, March.

White Sands Missile Range Environment and Safety Directorate, 2000b. *WAO 400-GG White Sands Missile Range, Water Monitoring, August 1999*, March.

White Sands Missile Range Environment and Safety Directorate, 2001. White Sands Missile Range Digital Map Layers, Surface Water, Draft Waters of the U.S., Wetlands.

6.0
LIST OF PREPARERS

6.0 LIST OF PREPARERS

Government Preparers

Julia Hudson Elliott, Environmental Protection Specialist
U.S. Army Space and Missile Defense Command
M.A., 1976, Mathematics/Science Education, Michigan State University
B.A., 1971, Secondary Education, Michigan State University
Years of Experience: 24

Dennis R. Gallien, Environmental Engineer
U.S. Army Space and Missile Defense Command
B.S., 1979, Industrial Chemistry, University of North Alabama
Years of Experience: 23

Contractor Preparers

Rusty Anchors, Environmental Planner, EDAW, Inc.
B.A., 1993, Anthropology, University of New Mexico
Years of Experience: 8

Mike Carstensen, Environmental Specialist, EDAW, Inc.
B.S., in progress, Information Systems, Athens State University
Years of Experience: 4

Matthew Estes, Environmental Specialist, EDAW, Inc.
M.S., 2000, Environmental Management, Samford University
B.S., 1991, Environmental Science, University of California at Riverside
Years of Experience: 11

Seon Farris, Environmental Engineer, Teledyne Solutions, Inc.
M.S.E., in progress, Environmental Engineering, University of Alabama in Huntsville
B.S., 1993, Chemical Engineering, Auburn University
Years of Experience: 7

Amy Fenton-McEniry, Technical Editor, EDAW, Inc.
B.S., 1988, Biology, University of Alabama in Huntsville
Years of Experience: 13

Rebecca J. Fitzsimmons, Environmental Specialist, EDAW, Inc.
B.S., 2000, Civil/Environmental Engineer, University of Alabama in Huntsville
Years of Experience: 1

Jonathan Henson, Environmental Specialist, EDAW, Inc.
B.S., 2000, Environmental Science, Auburn University
Years of Experience: 1

Rachel Y. Jordan, Environmental Scientist, EDAW, Inc.
B.S., 1972, Biology, Christopher Newport College, Virginia
Years of Experience: 13

Brandon Krause, Technical Illustrator, EDAW, Inc.
B.S., Computer Engineering, in progress, University of Alabama in Huntsville
Years of Experience: 2

Wesley S. Norris, Senior Environmental Planner, EDAW, Inc.
B.S., 1976, Geology, Northern Arizona University
Years of Experience: 24

William Sims, Geographic Information Services Specialist, EDAW, Inc.
B.S., 1993, Geography, University of North Alabama
Years of Experience: 8

7.0
AGENCIES CONTACTED

7.0 AGENCIES CONTACTED

FEDERAL AGENCIES

Federal Aviation Administration

NASA White Sands Test Facility

Naval Air Warfare Center Weapons Division

U.S. Air Force

U.S. Army Space and Missile Defense Command

U.S. Department of the Interior
- U.S. Fish and Wildlife Service
  - Ecological Services Field Office
  - San Andres National Wildlife Refuge
- White Sands National Monument

White Sands Missile Range

STATE AGENCIES

State of New Mexico

- Department of Energy, Minerals, and Natural Resources
- Department of Game and Fish
- Environment Department
- State Historic Preservation Office

THIS PAGE INTENTIONALLY LEFT BLANK

APPENDIX A
DISTRIBUTION LIST

APPENDIX A
DISTRIBUTION LIST

Defense Technical Information Center
Fort Belvoir, Virginia

Deputy for Air Force
U.S. Army White Sands Missile Range
White Sands Missile Range, New Mexico
ATTN: Major Tom Smith

Deputy for Navy
U.S. Army White Sands Missile Range
Naval Air Warfare Center Weapons Division
White Sands Missile Range, New Mexico
ATTN: Environmental Manager/NAVOSH (Tom Coleman)

Federal Aviation Administration
Southwest Region Headquarters
Airspace Branch ASW-520
Fort Worth, Texas
ATTN: Don Day

Fort Sill Apache
Oklahoma

Holloman Air Force Base
New Mexico

Mescalero Apache
New Mexico

NASA White Sands Test Facility
New Mexico
ATTN: David Harris

New Mexico Department of Energy, Minerals, and Natural Resources
Forestry Division
Santa Fe, New Mexico
ATTN: Bob Sivinski

New Mexico Department of Game and Fish
Conservation Services Division
Santa Fe, New Mexico
ATTN: Mr. Tod Stevenson

New Mexico Environment Department
Secretary of Environment
Santa Fe, New Mexico
ATTN: Peter Maggiore

State Historic Preservation Office
New Mexico Historic Preservation Division
Santa Fe, New Mexico
ATTN: Mr. Elmo Baca

U.S. Army Space and Missile Defense Command
DCSEN-EN-V, BMTJPO, LC-H
Huntsville, Alabama

U.S. Army White Sands Missile Range
Commander
CSTE-DTC-WS-PA , -ES, -MT, -NRO, -IS, -IO, -TC, -SJA, -TT
White Sands Missile Range, New Mexico

U.S. Department of the Interior
National Park Service
White Sands National Monument
Alamogordo, New Mexico
ATTN: Mr. Bill Conrod

U.S. Department of the Interior
U.S. Fish and Wildlife Service
Ecological Services Field Office
Albuquerque, New Mexico
ATTN: Joy E. Nicholopoulos

U.S. Department of the Interior
U.S. Fish and Wildlife Service
San Andres National Wildlife Refuge
ATTN: Mr. Kevin Cobble
Las Cruces, New Mexico

USAADACENTFB
Fort Bliss Directorate of Environment
ATZC-DOE-C
Fort Bliss, Texas
ATTN: John Barrera

Libraries

Alamogordo Public Library
Alamogordo, New Mexico

Las Cruces Public Library
Las Cruces, New Mexico

Main Library Albuquerque Bernalillo County
Albuquerque, New Mexico

Socorro Public Library
Socorro, New Mexico

White Sands Post Library
White Sands, New Mexico

APPENDIX B
CORRESPONDENCE

DEPARTMENT OF THE ARMY
U.S. ARMY SPACE AND MISSILE DEFENSE COMMAND
POST OFFICE BOX 1500
HUNTSVILLE, ALABAMA 35807-3801

REPLY TO
ATTENTION OF

SMDC-EN

MEMORANDUM FOR

New Mexico Environment Department, Secretary of Environment, ATTN: Mr. Peter Maggiore, Harold S. Runnels Building, 1190 St. Francis Drive, Santa Fe, NM 87502-0110
U.S. Department of the Interior, U.S. Fish and Wildlife Service, San Andres National Wildlife Refuge, ATTN: Mr. Kevin Cobble, 5686 Santa Gertrudes, Las Cruces, NM 88012
U.S. Department of the Interior, National Park Service, White Sands National Monument, ATTN: Mr. Bill Conrod, 19955 U.S. Highway 70 West, Mile 200, Alamogordo, NM 88330
Federal Aviation Administration, Southwest Region Headquarters, Airspace Branch ASW-520, ATTN: Mr. Don Day, 2601 Meacham Boulevard, Fort Worth, TX 76137-4298
U.S. Army Air Defense Center/Ft. Bliss, Directorate of Environment, ATTN: ATZC-DOE-C (Mr. John Barrera), B624, Pleasonton Road, Fort Bliss, TX 79916-6812

SUBJECT: Liquid Propellant Target Environmental Assessment (EA) - Coordinating Draft

1. The U.S. Army Space and Missile Defense Command is preparing an Environmental Assessment (EA) in compliance with the National Environmental Policy Act (NEPA) and the Council on Environmental Quality regulations implementing NEPA. This EA is in support of the Liquid Propellant Target (LPT) program at White Sands Missile Range, New Mexico.

2. The EA describes and addresses the potential impacts of expanding the capabilities of White Sands Missile Range to provide launches of Scud and Scud-type LPT missiles for flight analyses in support of missile defense technology testing. This Coordinating Draft EA is being provided to the state and federal agencies that were identified by White Sands Missile Range.

3. Please review the enclosed Coordinating Draft Liquid Propellant Target EA and provide comments by 13 April 2001 to Deputy Commanding General, U.S. Army Space and Missile Defense

SMDC-EN-V
SUBJECT: Liquid Propellant Target Environmental Assessment (EA) - Coordinating Draft

Command, ATTN: SMDC-EN-V (Ms. Julia Hudson-Elliott), P.O. Box 1500, Huntsville, AL 35807-3801 or by data facsimile (256) 955-5074. If you have any questions or comments, please contact Julia Hudson-Elliott (256) 955-4822.

4. *Please note that this document is a draft and is not intended for dissemination to the public.*

Encl

EDWIN P. JANASKY
COL, EN
Deputy Chief of Staff,
Engineer

State of New Mexico
ENVIRONMENT DEPARTMENT
Office of the Secretary
Harold Runnels Building
1190 St. Francis Drive, P.O. Box 26110
Santa Fe, New Mexico 87502-6110
Telephone (505) 827-2855
Fax (505) 827-2836

GARY E. JOHNSON
GOVERNOR

PETER MAGGIORE
SECRETARY

PAUL R. RITZMA
DEPUTY SECRETARY

April 6, 2001

Deputy Commanding General
U.S. Army Space and Missile Defense Command
ATTN: SMDC-EN-V (Ms. Julia Hudson-Elliott)
P.O. Box 1500
Huntsville, AL 35807-3801

Dear Ms. Hudson-Elliott:

RE: WHITE SANDS MISSILE RANGE, NEW MEXICO, LIQUID PROPELLANT TARGET: COORDINATING DRAFT ENVIRONMENTAL ASSESSMENT (PREPARED BY EDAW, MARCH 14, 2001)

This transmits New Mexico Environment Department (NMED) staff comments concerning the above-referenced Coordinating Draft Environmental Assessment (DEA).

HAZARDOUS WASTE

General Concerns

Multiple references in the DEA refer to the White Sands Test Facility (WSTF)-NASA RCRA Permit. A RCRA permit is not required for NASA to store the liquid propellant as a product for use by NASA or White Sands Missile Range (WSMR). The NASA RCRA permit prohibits WSTF-NASA from receiving waste from off-site (e.g., WSMR) for treatment, storage or disposal. This includes liquid propellants and initiator fuels. Any references to the WSTF-NASA Hazardous Waste Permit must be omitted from this document because it has no bearing on this operation.

The DEA fails to discuss the applicability of White Sands Missile Range's Hazardous Waste Permits or the Corrective action requirements under the Hazardous and Solid Waste Amendments to the Resource Conservation and Recovery Act (RCRA) of 1984 for the proposed actions. Several times throughout the DEA, reference is made to "appropriate officials" and "applicable regulations"; however, WSMR fails to specify these entities and regulations. NMED regulations that WSMR is subject to include but are not limited to: the Hazardous Waste Act (NMSA 1978, § 74-4-4), the Hazardous Waste Regulations (20.4.1 NMAC, 6-14-2000), Solid

Waste Management Regulations (20.9.1 NMAC), and Water Quality Control Commission Regulations (20.6.2 NMAC).

If the LPT crashes on-site, then WSMR may be exempt from RCRA as an active range except for release notification and cleanup requirements under the WSMR Hazardous Waste Permit.

However, if WSMR manages the crash debris and contaminated soil, as required by their Stewardship program, then WSMR's remediation and recovery efforts become subject to RCRA Subtitle C and/or D. Management of debris and contaminated media constitutes a newly generated waste. The act of management associated with crash debris and contaminated soil is subject to RCRA and must be fully characterized to determine which Subtitle of RCRA is applicable.

If the LPT crashes off-site, then WSMR is definitely subject to the Military Munitions Rule (see 40 CFR 266 Subpart M). This scenario is not addressed in the DEA.

The DEA does not address WSMR's reporting requirements under Module 1 Condition I.E.14 of the WSMR Hazardous Waste Permit.

If the LPT crashes on-site in the aquifer recharge zone, then WSMR may be subject to not only RCRA but also WQCC and Drinking Water Regulations.

It is unclear throughout the DEA if the "Contingency Plan" referred to is the WSMR approved Contingency Plan in the WSMR Hazardous Waste Permit.

The DEA does not provide sufficient information on the liquid propellants. One of the initiator fuels is a U 404 listed waste. Several of the other constituents may be characteristic hazardous waste upon impact.

Debris recovery activities would be conducted in accordance with WSMR standard operating procedures. Again, the debris must be characterized if managed as a waste to determine if it is subject to Subpart C or Subpart D of RCRA.

The DEA does not address contingency for addressing releases to surface water or ground water should there be an in flight malfunction.

Liquid propellant released to the soil on impact and contaminated soil removed by WSMR constitutes management as a waste under RCRA and the soil must be fully characterized to determine if it is subject to Subpart C or Subpart D of RCRA.

Specific Comments

Page 2-1 & 2-3:

Kerosene-based main fuel composed of 60% coal tar distillate and 40% kerosene
825 kilos = 1,815 pounds or 1,022 liters = 270 gallons
Inhibited red fuming nitric acid oxidizer 100% IRFNA
2,920 kilos = 6,425 pounds or 1,836 liters = 485 gallons
Initiator fuel composed of triethylamine and dimethylamines. 50% to 50% mixture
30 kilos = 66 pounds or 34 liters = 9 gallons

Clean up standards for dimethylamines are governed by RCRA and the daughter products of natural degradation have a clean up level of 1 ppt in surface or ground water.

Page 2-4, Lines 1-7:

Spent solvents used in the maintenance of the missile and launch equipment may be a hazardous waste and must be handled in accordance with RCRA Subtitle C.

Page 2-4, Lines 10 through 20:

Transportation of the liquid propellant is not a RCRA concern unless there is a spill. Any spill during transportation would come under the jurisdiction of NMED if within the borders of New Mexico.

Page 2-5, Line 30:

The DEA needs to more fully describe the type of the impermeable flat surface. New description must specify its compatibility with the types of propellants stored.

Should it become necessary to defuel the missile will the propellants be stored in the same structure? Will the fuel be reused or declared off spec and handled as a hazardous waste?

Page 2-17, Table 2-5 Propellant Remaining at Missile Impact:

This table addresses the quantities of fuel left for release at impact. It does not address the quantities of initiator fuel remaining at impact. Is all 9 gallons consumed during launch? If not, how long into flight before the initiator fuel is consumed?

By applying basic chemistry to the information in this table the release at impact will include coking products that may be regulated under RCRA.

Page 2-20, Lines 24-26:

In the event of an early flight termination after the missile has left the launch pad, how much initiator fuel, main fuel, and oxidizer remains? How far is "left the launch pad"?

Page 2-21, Lines 8-10:

In this section of the DEA WSMR states: " Soil that is removed would be land-farmed at an approved pre-existing site on WSMR or would be shipped off-range for treatment in accordance with applicable regulations." If WSMR is now treating or has treated crash debris and/or contaminated soil in a land-farm, then they may have created an unpermitted hazardous waste management unit and need to contact their facility project leader.

Page 3-14, Lines 5-9:

In this section of text the DEA states: "No hazardous wastes are treated or recycled on WSMR and there are no hazardous waste treatment facilities on WSMR." This section appears to contradict the section referred to above on Page 2-21 and does not take into consideration existing hazardous waste permits issued to WSMR.

AIR QUALITY

Dona Ana County is currently considered to be in attainment with the National Ambient Air Quality Standards; however, the Air Quality Bureau (AQB) has recorded exceedances of the standard for PM_{10} in the county. In response to the recorded exceedances of the standard for PM_{10}, a Natural Events Action Plan (NEAP) for Dona Ana County has been prepared and submitted to the U.S. Environmental Protection Agency (USEPA) for approval. As part of the NEAP, WSMR has signed a memorandum of Agreement (MOA) with NMED in support of the NEAP. This MOA needs to be referenced in the final environmental assessment for this project. In accordance with the MOA, appropriate dust control techniques may also need to be addressed.

The WSMR has applied for and received a Title V Operating Permit (No. P085). Information should also be included as to whether any of the proposed liquid propellant constituents are listed under the New Source Performance Standards and/or the National Emissions Standards for Hazardous Air Pollutants.

SURFACE WATER QUALITY

The USEPA requires National Pollutant Discharge Elimination System (NPDES) Construction Storm Water General Permit coverage prior to beginning construction for storm water discharges from construction projects (common plans of development) that will result in the disturbance of five or more acres (one or more acres after March 10, 2003), including expansions, of total land area. It is unclear whether activities associated with this project will involve construction but, if so, appropriate NPDES permit coverage prior to beginning construction will be required.

Among other things, this permit requires that a Storm Water Pollution Prevention Plan (SWPPP) be prepared for the site and that appropriate Best Management Practices (BMPs) be installed and maintained both during and after construction to prevent, to the extent practicable, pollutants (primarily sediment, oil & grease and construction materials from construction sites) in storm water runoff from entering waters of the U.S. This permit also requires that permanent stabilization measures (revegetation, paving, etc.), and permanent storm water management measures (storm water detention/retention structures, velocity dissipation devices, etc.) be implemented post construction to minimize, in the long term, pollutants in storm water runoff from entering these waters.

You should also be aware that USEPA requires that all "operators" (see Federal Register/Vol. 63, No. 128/Monday, July 6, 1998 pg 36509) obtain NPDES permit coverage for construction projects. Generally, this means that at least two parties will require permit coverage. The owner/developer of this construction project who has operational control over project specifications (probably WSMR in this case), the general contractor who has day-to-day operational control of those activities at the site, which are necessary to ensure compliance with the storm water pollution plan and other permit conditions, and possibly other "operators" will require appropriate NPDES permit coverage for this project.

In addition, operation of these types of facilities requires Storm Water Multi-sector General Permit (see Federal Register/Vol. 65, No. 210/Monday, October 30, 2000) coverage. Launch sites, impact areas, fueling, soil remediation activities, etc. likely qualify as potential sources of

pollution which may reasonably be expected to affect the quality of storm water discharges, from activities that meet the USEPA definition of "industrial activities" under Sector K and/or L, and possibly other sectors. This permit also requires preparation of a SWPPP, and installation of appropriate storm water runoff control practices (per the SWPPP).

We appreciate the opportunity to comment on this document. Please let us know if you have any questions on the above.

Sincerely,

Gedi Cibas, Ph. D.
Environmental Impact Review Coordinator

NMED File No. 1435ER

GOVERNOR
Gary E. Johnson

DIRECTOR AND SECRETARY
TO THE COMMISSION
Gerald A. Maracchini

STATE OF NEW MEXICO
DEPARTMENT OF GAME & FISH

Villagra Building
P.O. Box 25112
Santa Fe, NM 87504

Visit our Web Site home page at http://www.gmfsh.state.nm.us
For basic information or to order free publications: 1-800-862-9310

STATE GAME COMMISSION
Steven C. Emery, Chairman
Albuquerque, NM
Stephen E. Doerr
Portales, NM
Bud Hettinga
Las Cruces, NM
George Ortega
Santa Fe, NM
Steve Padilla
Albuquerque, NM
J. Karen Stevens
Farmington, NM
Ray Westall
Loco Hills, NM

April 26, 2001

Commander (Attn: Mr. Patrick Morrow)
U.S. Army White Sands Missile Range
CSTE-DTC-WS-ES-ES
White Sands Missile Range, NM 88002-5048

Re: Liquid Propellant Target Program Draft Environmental Assessment
NMGF Doc. No. 7412

Dear Mr. Morrow:

The Department of Game and Fish (Department) has reviewed the Draft Environmental Assessment (EA) for the proposed Liquid Propellant Target Program (LPT) at White Sands Missile Range (WSMR). Program activities include transportation, fuel storage, fueling, launch, flight, ground impact, and debris recovery for approximately 15 separate missile launches over five years. This project does not include target intercept using another missile or weapon system.

The Department believes that liquid propellant missile impacts from the LPT program represent a significantly higher risk for contamination of state-Threatened White Sands pupfish (*Cyprinodon tularosa*) habitat than previous solid fuel missile projects. Page 4-3 states that the missiles would impact with approximately 70 gallons of kerosene-based fuels, and approximately 125 gallons of nitric acid. Although the proposed impact areas are not located near pupfish habitat, the Department has voiced concerns in the past regarding approximately 10 missile payload impacts that have occurred since 1987 in the immediate vicinity of pupfish habitat (4 August 1992 comments on the Sounding Rocket Program).

The Department also commented recently (11 April 2001) on biological and chemical warfare agent plume studies planned for the Permanent High Explosives Test Site (PHETS). This project proposes to test 30+ biological and chemical warfare agent simulants within 15 miles of known occupied pupfish habitat. Plumes from previous tests have been known to travel up to 30 miles. One of the chemical agent simulants proposed for plume research is Triethyl Phosphate (TEP). In our 3 February 1998 comments on the Final Draft Environmental Assessment for TEP testing, the Department recommended that a rigorous TEP monitoring program be implemented for soils, surface water, plants and fauna. We are not aware that this monitoring program has been implemented.

Based on the potential for contamination of the limited habitat of White Sands pupfish from these proposed projects, and the Department's ongoing concerns with a lack of an adequate cumulative effects assessment of WSMR projects on pupfish habitat, the Department again

requests that a surface water-quality monitoring program be implemented to measure the potential for impacts to White Sands pupfish habitat from LPT, PHETS, or other projects. We believe this monitoring program would be consistent with WSMR responsibilities under the interagency White Sands Pupfish Cooperative Agreement (III.B.1.b) to assist in monitoring of habitats and populations of White Sands pupfish to further protection of habitats and populations.

We appreciate the opportunity to comment on the LPT project. Should you have any questions regarding our comments, please contact Mark Watson, Habitat Specialist of my staff at 827-1210, or mwatson@state.nm.us.

Sincerely,

Tod W. Stevenson

Tod W. Stevenson
Chief, Conservation Services Division

Cc: Scott Brown (Assistant Director, NMGF)
Bill Hays (Conservation Services Assistant Chief, NMGF)
Pat Mathis (Southwest Area Habitat Specialist, NMGF)
Nic Medley (Conservation Services Aquatic Habitat Specialist, NMGF)

United States Department of the Interior

FISH AND WILDLIFE SERVICE
New Mexico Ecological Services Field Office
2105 Osuna NE
Albuquerque, New Mexico 87113
Phone: (505) 346-2525 Fax: (505) 346-2542

April 30, 2001

Cons. # 2-22-01-I-359

Thomas A. Ladd, Director Environment and Safety
Department of the Army
U.S. Army White Sands Missile Range
100 Headquarters Avenue
White Sands Missile Range, New Mexico 88002-5000

Dear Mr. Ladd:

This responds to your request for informal consultation regarding the Draft Environmental Assessment for the Liquid Propellant Target Program at White Sands Missile Range. We have reviewed the draft environmental assessment with regard to federally protected fish, wildlife, and plant species, as well as other natural resources that may be found within the proposed project area. We provide the following comments to assist you in your assessment of project impacts.

The proposed project area falls within the historic habitat of the endangered northern aplomado falcon (*Falco femoralis septentrionalis*) (falcon). The presence of a nesting pair of falcons near Deming, New Mexico, in conjunction with sightings of falcons on or near White Sands Missile Range in 1991, 1992, and 1994 support the potential presence of the species on or near the proposed project area.

The assessment states that surveys for falcons are conducted every two weeks during the months of April through September. However, the assessment does not specify whether the survey routes are in the proposed project area. Specifically, the assessment should clarify whether surveys will be conducted in both the launch and impact sites. If these survey routes do not encompass both the launch and impact sites, and these sites are located within potential habitat for the falcon, provisions should be made within the project plan to survey in these areas within two weeks of the proposed liquid propellant target testing. Those launch and impact sites in the northern part of White Sands Missile Range, which is largely comprised of Chihuahuan desert grassland and could potentially support falcons, should be considered for surveys prior to the proposed action.

The black-tailed prairie dog (*Cynomys ludovicianus*) is a candidate for listing under the Endangered Species Act, as amended (Act). Candidates receive no protection under the Act. We are required to monitor the status of these species. If significant declines are detected, these species could potentially be listed as endangered or threatened. Therefore, actions that may contribute to their decline should be avoided. Black-tailed prairie dogs residing on launch or impact sites may be impacted by the proposed missile testing. Therefore, we recommend that this species be included in your surveys and in your assessment of the proposed project impacts.

Thank you for considering our comments. Should you have questions or concerns, please contact Carrie Hernandez at (505) 346-2525 extension 143.

Sincerely,

Joy E. Nicholopoulos

Joy E. Nicholopoulos
Field Supervisor

cc:
Director, New Mexico Department of Game and Fish, Santa Fe, New Mexico
Director, New Mexico Energy, Minerals, and Natural Resources Department, Forestry Division, Santa Fe, New Mexico

CSTE-DTC-WS-ES-ES 9 May 01

MEMORANDUM FOR Acting Chief, Patrick Morrow

SUBJECT: Liquid Propellant Target (LPT) EA/U.S. Fish and Wildlife Service (Service) Consultation # 2-22-01-I-359

1. This memorandum documents an 8 May 01 (1450-1500 hours) phonecon between myself and Ms. Carrie Hernandez, Service, New Mexico Ecological Services Field Office, Albuquerque, NM, concerning potential endangered species issues which were raised by the Service in their review of the LPT EA (Cons. # 2-22-01-I-359).

2. Aplomado Falcon. During the subject phonecon, the Service and White Sands Missile Range (Range) agreed that the Range's established Northern Aplomado Falcon (Falco femoralis septentrionalis) programmatic survey does cover LPT launch and impact sites as they are described in the LPT EA. LPT launch and impact sites are either located within the area of current survey coverage or they are located in areas that do not constitute potentially suitable falcon habitat.

3. Black-tailed Prairie Dog. It was further agreed between the Service and the Range that protection of the black-tailed prairie dog (Cynomys ludovicianus) was not an issue in relation to LPT, since it is believed, with a reasonable amount of certainty, that no active colonies of this species, or other species of prairie dogs, currently exist on the Range. The nearest known dog town is located on BLM lands in Taylor Draw along the Range's NE boundary.

4. The WS-ES-ES POC for this memorandum is the undersigned at (505) 678-2641.

DAVE HOLDERMANN
Wildlife Biologist

DEPARTMENT OF THE ARMY
U.S. ARMY SPACE AND MISSILE DEFENSE COMMAND
MISSILE DEFENSE AND SPACE TECHNOLOGY CENTER
POST OFFICE BOX 1500
HUNTSVILLE, ALABAMA 35807-3801

REPLY TO ATTENTION OF

13 FEB 2002

SMDC-EN-V

MEMORANDUM FOR New Mexico Environment Department, Office of the Secretary, Gedi Cibas, Ph.D., 1190 Saint Francis Drive, Santa Fe, NM 87502

SUBJECT: Liquid Propellant Target Environmental Assessment (EA) - Coordinating Draft

1. The U.S. Army Space and Missile Defense Command is preparing an Environmental Assessment (EA) in compliance with the National Environmental Policy Act (NEPA) and the Council on Environmental Quality regulations implementing NEPA. This EA is in support of the Liquid Propellant Target (LPT) program at White Sands Missile Range, New Mexico (WSMR).

2. The EA describes and addresses the potential impacts of expanding the capabilities of WSMR to provide launches of Scud and Scud-type LPT missiles for flight analyses in support of missile defense technology testing. This Coordinating Draft EA is being provided to the state and federal agencies that were identified by WSMR.

3. Your office reviewed the document and provided comments in Apr 01. Please review the enclosed redlined document and the Comment Response Table. A teleconference is scheduled on 25 Feb 02, 10:00 a.m., CST, to discuss your comments. The number to call is 256-955-8627. The Code is 2576. If you have any questions, please contact Julia Hudson-Elliott, 256-955-4822.

4. Please note that this document is a draft and is not intended for dissemination to the public.

Encl

EDWIN P. JANASKY
COL, U.S. Army
Deputy Chief of Staff,
Engineer

DEPARTMENT OF THE ARMY
U.S. ARMY SPACE AND MISSILE DEFENSE COMMAND
MISSILE DEFENSE AND SPACE TECHNOLOGY CENTER
POST OFFICE BOX 1500
HUNTSVILLE, ALABAMA 35807-3801

REPLY TO ATTENTION OF

SMDC-EN-V

13 FEB 2002

MEMORANDUM FOR

State of New Mexico Department of Game and Fish, Mr. Tod Stevenson, 1 Wildlife Way, off of Caja Del Rio Road, Santa Fe, NM 87507

U.S. Fish and Wildlife Service, Ecological Services Field Office, Joy E. Nicholopoulos, Field Supervisor, 2105 Osuna NE, Albuquerque, NM 87113

SUBJECT: Liquid Propellant Target Environmental Assessment (EA) - Coordinating Draft

1. The U.S. Army Space and Missile Defense Command (SMDC) is preparing an Environmental Assessment (EA) in compliance with the National Environmental Policy Act (NEPA) and the Council on Environmental Quality regulations implementing NEPA. This EA is in support of the Liquid Propellant Target (LPT) program at White Sands Missile Range, New Mexico.

2. The EA describes and addresses the potential impacts of expanding the capabilities of White Sands Missile Range (WSMR) to provide launches of Scud and Scud-type LPT missiles for flight analyses in support of missile defense technology testing. This Coordinating Draft EA is being provided to the state and federal agencies that were identified by White Sands Missile Range.

3. Your office reviewed the document and provided comments in Apr 01. Please review the enclosed redlined document and the Comment Response Table. Representatives from the SMDC and WSMR look forward to meeting with you Thursday, 21 Feb 02, in Albuquerque, to discuss your comments. If you have any questions, please contact Julia Hudson-Elliott, 256-955-4822.

4. Please note that this document is a draft and is not intended for dissemination to the public.

Encl

EDWIN P. JANASKY
COL, U.S. Army
Deputy Chief of Staff,
Engineer

APPENDIX C
BIOLOGICAL RESOURCES

APPENDIX C
BIOLOGICAL RESOURCES

Table C-1: WSMR Threatened and Endangered[1] Plant and Wildlife Species

		WSMR Occurrence Status[2]		Regulatory Listing Status[3]	
Common Name	**Scientific Name**	**Known**	**Potential**	**USFWS[4]**	**NM[5]**
Plants					
Hedgehog cactus, Kuenzler's	*Echinocereus fendleri* var. *kuenzleri*		X	E	E
Pennyroyal, Todsen's	*Hedeoma todsenii*	X		E	E1
Pincushion cactus, Sneed's	*Coryphantha sneedii* var. *sneedii*		X	E	E
Prickle-poppy, Sacramento	*Argemone pleiacantha* ssp. *pinnatisecta*		X	E	E
Thistle, Sacramento Mountain (= Mescalero)	*Cirsium vinaceum*		X	T	T
Wildlife					
Crane, whooping[6]	*Grus americana*		X	–	E2
Eagle, bald	*Haliaeetus leucocephalus*	X		T	E2
Falcon, Northern Aplomado	*Falco femoralis septentrionalis*	X		E	E1
Flycatcher, southwestern willow	*Empidonax traillii extimus*		X	E	E2
Owl, Mexican spotted	*Strix occidentalis lucida*	X		T	S
Plover, mountain	*Charadrius montanus*		X	PT	S
Plover, piping	*Charadrius melodus circumcinctus*		X	T	E1
Plover, western snowy	*Charadrius alexandrinus nivosus*	X		PT	S
Pupfish, White Sands[7]	*Cyprinodon tularosa*	X		None	E2
Sheep, desert bighorn[7]	*Ovis canadensis mexicana*	X		None	E1
Tern, interior least	*Sterna antillarum athalassos*		X	E	E1
Wolf, Mexican gray	*Canis lupus baileyi*		X	E	E2

Source: White Sands Missile Range, 1998; U.S. Fish and Wildlife Service, 2001c.

Notes:

[1] Endangered Species include:
- – all species listed as threatened or endangered by the USFWS
- – all species proposed for listing as threatened or endangered by the USFWS
- – all species which are candidates for listing as threatened or endangered by the USFWS

[2] Species are either known to exist on WSMR (Known) or have the potential to occur on WSMR (Potential).

[3] The Regulatory Listing Status of a species dictates the level of substantive protection it is afforded and the type of procedural compliance required. The status of a species is current for only 90 days past the date of

the list; both the species list and species status must be confirmed through contact with the appropriate regulatory agencies before use.

[4] Applies to Federally listed, proposed, and candidate species as follows:

- E Federally listed endangered species; any species which the secretaries of the Interior or Commerce determine to be in danger of extinction throughout all or a significant portion of its range.
- T Federally listed threatened species; any species the secretaries of the Interior or Commerce determine is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.
- P Species legally proposed for Federal listing; any species proposed for listing as threatened or endangered by either the Secretary of the Interior or the Secretary of Commerce.
- C A candidate (Notice of Review) species for Federal listing as threatened or endangered for which substantial information currently exists to support a listing proposal; proposed status is anticipated but backlogged.

[5] Applies to state-listed and candidate animals as follows:

- E1 Endangered (group 1); species whose prospects of survival or recruitment within the state are in jeopardy.
- E2 Endangered (group 2); species whose prospects of survival or recruitment within the state are likely to become jeopardized.
- S Sensitive species; New Mexico species which have been singled out for special consideration, typically as being formally listed as threatened, endangered, or in the pipeline for becoming so. (This designation should be considered the state's equivalent of Candidate.)

[6] Designated as a non-essential experimental population in New Mexico

[7] Included at the request of the New Mexico Department of Fish and Game

Table C-2: State Threatened and Endangered Plant[1] Species Known to Occur on WSMR

Common Name	Scientific Name
Alamo penstemon	*Penstemon alamosensis*
Button cactus	*Epithelantha micromeris var. micromeris*
Castetter's milkvetch	*Astragalus castetteri*
Cliff brittlebush	*Apacheria chiricahuensis*
Desert parsley	*Pseudocymopterus longiradiatus*
Duncan's pincushion cactus	*Coryphantha duncanii*
Grama grass cactus	*Pediocactus papyracantha*
Long-stemmed flame flower	*Talinum longipes*
Mescalero milkwort	*Polygala rimulicola var. mescalerorum*
Mescalero pennyroyal	*Hedeoma pulcherrimum*
Mosquito plant	*Agastache cana*
Night blooming cereus	*Cereus greggii*
Organ Mountain evening primrose	*Oenothera organensis*
Organ Mountain pincushion cactus	*Coryphantha organensis*
Payson's hiddenflower	*Cryptantha paysonii*
Pineapple cactus	*Neolloydia intertexta var. dasyacantha*
Plank's catchfly	*Silene plankii*

Table C-2: State Threatened and Endangered Plant[1] Species Known to Occur on WSMR (Continued)

Common Name	Scientific Name
San Andres rock daisy	*Perityle staurophylla var. homoflora*
Sand prickly pear	*Opuntia arenaria*
Sandberg's pincushion cactus	*Escobaria sandbergii*
Scheer's pincushion cactus	*Coryphantha scheeri var. valida*
Supreme sage	*Salvia summa*
Tall prairie gentian	*Eustoma exaltum*
Vassey's bitterweed	*Hymenoxys vaseyi*
Wright's fishhook cactus	*Mammillaria wrightii var. wrightii*

Source: White Sands Missile Range, 1998

[1] Species are listed as L1 or L2 by the New Mexico Forestry Resource Conservation Division as endangered (List 1) or rare/sensitive (List 2).

Table C-3: State Threatened and Endangered Wildlife[1] Species that Occur or Potentially Occur on WSMR

Common Name	Scientific Name
New Mexico jumping mouse	*Zapus hudsonius luteus*
Baird's sparrow	*Ammodramus bairdii*
Organ Mountain Colorado chipmunk	*Tamius quadrivittatus australis*
Spotted bat	*Euderma maculatum*
Arizona grasshopper sparrow	*Ammodramus savannarum ammolegus*
Common black-hawk	*Buteogallus anthracinus*
Varied bunting	*Passerina versicolor*
Bell's vireo	*Vireo bellii*
Neotropic cormorant	*Phalacrocorax brasiliensis*
Gray vireo	*Vireo vicinior*

Source: White Sands Missile Range, 1998

[1] Listed by the New Mexico Department of Game and Fish as threatened or endangered.

THIS PAGE INTENTIONALLY LEFT BLANK

APPENDIX D
CHARACTERISTICS OF LIQUID PROPELLANTS

APPENDIX D
CHARACTERISTICS OF LIQUID PROPELLANTS

Table D-1 lists the liquid propellant missiles and liquid propellants currently in use or proposed for use at WSMR. The Lance missile is fully fueled and ready for use when it arrives at WSMR. There is no separate propellant storage for Lance missiles.

Table D-1: Liquid Propellant Fuels

	Main Fuel					Initiator Fuel	
Missile	UDMH	MMH	Hydrazine	Kerosene/ Coal Tar	JP-8	Triethylamine/ Dimethylanaline	Solid Propellant
Lance	X						X
Existing LPT				X		X	
Future LPT					X	TBD	
Other LPT		X	X				

Table D-2: Liquid Propellant Oxidizers

	Oxidizers		
Missile	IRFNA	Hydrogen Peroxide	Nitrogen Tetroxide
Lance	X		
Existing LPT	X		
Future LPT		X	
Other LPT			X

A summary of the characteristics of the liquid propellants used in the above missile is presented in tables D-3 and D-4.

Table D-3: Liquid Propellant Fuel Characteristics

Physical/Chemical Characteristics	UDMH	MMH	Hydrazine	Kerosene/Coal Tar Distillate				JP-8	Initiator Fuel	
				Kerosene	Coal Tar Distillate (Kerosene, Benzene, Toluene, Xylene)				Triethylamine (50%)	Dimethylaniline (50%)
					Benzene	Toluene	Xylene			
- Boiling Point	62 - 64°C	87°C (188.6°F)	113.5°C (236.3°F)	106 - 167°C	80.1°C	110.6°C	137-144°C	160 - 300°C (320-572°F)	89°C	194°C
- Freezing/Melting Point	-58°C	-52.4°C (-62.3°F)	1.5°C (34.7°F)	-20°C	5.5°C	-95°C	-25°C	-52°C	-115°C	2.5°C
- Specific Gravity	.7800 g/cm^3	.8660g/cm^3	1.0036 @ 25C/4C	.90 @ 20°C	.8765 @ 20°C	0.8669 @ 20°C	0.86 @ 20°C	0.775 to 0.840	0.726	0.96
- Solubility	Miscible	Miscible	Miscible in water	Insoluble	1-5 mg/mL @ 17.78°C	Insoluble <1 mg/mL @ 22°C	Insoluble <1 mg/mL @ 22°C	Negligible; less than 0.1%	Slightly	1.6/100g H_2O
- % volatiles					100	100		100%		
- Lower explosive limit	2.9%	2.50%	2.9%	0.6%	1.4%	1.27%	1.0%	0.7%	1.2%	1.0%
- Upper explosive limit	95%	97.00%	98%	4.9%	8%	7.1%	7.0%	5.0%	8%	
Fire / Explosion										
-Fire Hazard								Moderate		
	Highly flammable	Flammable	Flammable	Highly flammable	Highly flammable	Flammable	Flammable	Combustible	Flammable liquid	Combustible
	Corrosive		Corrosive	Combustible liquid				Highly flammable	Corrosive	
Health Hazards										
-Carcinogen	Yes		Yes, based on animal tests	Probable, but not tested	Yes	No	Not tested	Yes	No	No
- IARC								No		
- OSHA PEL	0.5 ppm (1.23 mg/m^3)	0.2 ppm (0.38 mg/m^3)	1.0 ppm (1.31 mg/m^3)	Not established	1 ppm (3.2 mg/m^3)	200 ppm (748 mg/m^3)	100 ppm (134 mg/m^3)	0.7 ppm (5 mg/m^3) (kerosene)	25 ppm (103.5 mg/m^3)	5 ppm (24.8 mg/m^3)
- ACGIH STEL	0.1 ppm (0.246 mg/m^3)	.04 ppm (0.076 mg/m^3)	0.1 ppm (0.131 mg/m^3)	Not established	5 ppm (16 mg/m^3)	300 ppm (1122 mg/m^3)	150 ppm (201 mg/m^3)	14.01 ppm (100 mg/m^3) (kerosene)	3 ppm (12.42 mg/m^3)	10 ppm (49.6 mg/m^3)
- IDLH level	15 ppm (36.9 mg/m^3)		50 ppm (65.5 mg/m^3)		500 ppm (1600 mg/m^3)	500 ppm (1870 mg/m^3)	900 ppm (1206 mg/m^3)		200 ppm (828 mg/m^3)	100 ppm (496 mg/m^3)

Table D-4: Liquid Propellant Oxidizer Characteristics

Physical/Chemical Characteristics	IRFNA	Hydrogen Peroxide	Nitrogen Tetroxide
- Boiling Point	64.2°C	141°C (90%) 125°C (70%)	21°C (70° F)
- Freezing/Melting Point	-52.0°C	-11°C (90%) -39°C (70%)	-11°C (12°F)
- Specific Gravity	1.25	1.288 @ 20°C	1.5
- Solubility	Miscible	Miscible	Miscible
- % Volatiles		99.8	
- Lower explosive limit	N/A	N/A	
- Upper explosive limit	N/A	N/A	
Fire / Explosion			
- Fire Hazard	Non Flammable	Non-Flammable	Negligible
		Not combustible, but enhances combustion of other substances	Oxidizer. May ignite or explode on contact with combustible materials
Health Hazard			
- Carcinogen			
- IARC			
- OSHA PEL	2 ppm (5 mg/m^3)	1 ppm (1.4 mg/m^3)	5 ppm (9 mg/m^3)
- ACGIH STEL	2 ppm (5 mg/m^3)	1 ppm (1.4 mg/m^3)	3 ppm (5.4 mg/m^3)
- IDLH Level	25 ppm (62.5 mg/m^3)	75 ppm (105 mg/m^3)	75 ppm (135 mg/m^3)

The OSHA Permissible Exposure Limit (PEL) is the level of exposure that must not be exceeded when the exposure is averaged over an 8-hour workday and a 40-hour workweek in the workplace.
The American Conference of Governmental Industrial Hygienists, Inc. (ACGIH) is the level of exposure that must not be exceeded at any time during a workday when the exposure is averaged over 15 minutes.
The Immediately Dangerous to Life and Health (IDLH) is the level of exposure (not time-weighted) above which it is anticipated a person would suffer life-threatening or irreversible health effects or other injuries that would impair them from escaping the hazardous environment.
ppm = parts per million by volume.
mg/m^3 = milligrams per cubic meter

IRFNA

DOWELL SCHLUMBERGER -- INHIBITED RED FUMING NITRIC ACID L61DOWELL SCHLUMBERGER -- INHIBITED RED FUMING NITRIC ACID L61
MATERIAL SAFETY DATA SHEET
NSN: 681000N075082
Manufacturer's CAGE: DXWEL
Part No. Indicator: A
Part Number/Trade Name: INHIBITED RED FUMING NITRIC ACID L61

General Information
==========
Company's Name: DOWELL SCHLUMBERGER
Company's P. O. Box: 2710
Company's City: TULSA
Company's State: OK
Company's Country: US
Company's Zip Code: 74101
Company's Emerg Ph #: 918-582-0104
Company's Info Ph #: 918-582-0104
Record No. For Safety Entry: 001
Tot Safety Entries This Stk#: 001
Status: SMJ
Date MSDS Prepared: 25SEP91
Safety Data Review Date: 03DEC96
MSDS Preparer's Name: W.W. SHEPHERD
Preparer's Company: SAME
MSDS Serial Number: CCSPP

Ingredients/Identity Information
==========
Proprietary: NO
Ingredient: NITRIC ACID; (HNO3) (SARA 302/313) (CERCLA)
Ingredient Sequence Number: 01
NIOSH (RTECS) Number: QU5775000
CAS Number: 7697-37-2
OSHA PEL: 2 PPM
ACGIH TLV: 2 PPM; 4 STEL

Proprietary: NO
Ingredient: NITROGEN TETROXIDE; (NITROGEN DIOXIDE) (NO2) (CERCLA)
Ingredient Sequence Number: 02
NIOSH (RTECS) Number: QX1575000
CAS Number: 10544-72-6
OSHA PEL: N/K (FP N)
ACGIH TLV: N/K (FP N)

Proprietary: NO
Ingredient: HYDROFLUORIC ACID; (HYDROGEN FLUORIDE) (HF) (SARA 302/313) (CERCLA)
Ingredient Sequence Number: 03
Percent: <1
NIOSH (RTECS) Number: MW7875000

CAS Number: 7664-39-3
OSHA PEL: 3 PPM (F)
ACGIH TLV: 3 PPM (F) C

Proprietary: NO
Ingredient: WATER; (H*2O)
Ingredient Sequence Number: 04
NIOSH (RTECS) Number: ZC0110000
CAS Number: 7732-18-5
OSHA PEL: N/K (FP N)
ACGIH TLV: N/K (FP N)

Physical/Chemical Characteristics

Appearance And Odor: YELLOW LIQUID; PUNGENT ODOR.
Boiling Point: 140F, 60C
Melting Point: -61F, -52C
Vapor Pressure (MM Hg/70 F): SUPDAT
Vapor Density (Air=1): >1
Specific Gravity: 1.57
Solubility In Water: COMPLETE
Percent Volatiles By Volume: 100
pH: <2

Fire and Explosion Hazard Data

Flash Point: >200F,>93C
Lower Explosive Limit: N/A
Extinguishing Media: USE WATER PRIOR TO OTHER MEDIA.
Special Fire Fighting Proc: USE NIOSH APPROVED SCBA AND FULL PROTECTIVE EQUIPMENT (FP N).
Unusual Fire And Expl Hazrds: NONE SPECIFIED BY MANUFACTURER.

Reactivity Data

Stability: YES
Cond To Avoid (Stability): TOXIC CORROSIVE FUMES OF NITROGEN DIOXIDE ARE
SLOWLY RELEASED AT ROOM TEMPERATURE.
Materials To Avoid: REACTS EXPLOSIVELY W/REDUCING AGENTS & MANY ORGANIC CHEMICALS INCLUDING CYCLOHEXANE, FORMALDEHYDE & ALCOHOLS. (SUPDAT)
Hazardous Decomp Products: TOXIC CORROSIVE FUMES OF NITROGEN OXIDES AND HYDROGEN FLUORIDE.
Hazardous Poly Occur: NO
Conditions To Avoid (Poly): NOT RELEVANT

Health Hazard Data

LD50-LC50 Mixture: NONE SPECIFIED BY MANUFACTURER.
Route Of Entry - Inhalation: YES
Route Of Entry - Skin: YES
Route Of Entry - Ingestion: YES
Health Haz Acute And Chronic: EYES: CORROSIVE. RAPIDLY CAUSES PAIN, BURNS, CORNEAL INJURY. MAY CAUSE PERMANENT DAMAGE & BLINDNESS. SKIN: TOXIC. CORROSIVE. CAN CAUSE ILLNESS OR DEATH. RAPIDLY CAUSES BURNS, TISSUE DAMAGE & PAIN. INGEST: TOXIC. CORROSIVE. CAUSES PAIN & SEVERE

BURNS TO MOUTH, THROAT & STOMACH. CAN CAUSE ILLNESS/DEATH. (EFTS OF OVEREXP)
Carcinogenicity - NTP: NO
Carcinogenicity - IARC: NO
Carcinogenicity - OSHA: NO
Explanation Carcinogenicity: NOT RELEVANT
Signs/Symptoms Of Overexp: HLTH HAZ: INHAL: TOXIC. CORROSIVE. VERY DANGEROUS. POOR WARNING PROPERTIES. MAY CAUSE COUGHING, DIFFICULT BREATHING, PULMONARY EDEMA & DEATH. EFFECTS MAY NOT APPEAR FOR SEVERAL HOURS OR A FEW DAYS AFTER EXPOSURE. OTHER: 50 PPM AS VAPOR IS IRRITATING TO EYES & NOSE. ODOR IS PERCEPTIBLE FOR MOST PERSONS AT 0.22 PPM.
Med Cond Aggravated By Exp: NONE SPECIFIED BY MANUFACTURER.
Emergency/First Aid Proc: EYES: IMMED FLUSH EYES W/WATER FOR 30 MIN WHILE HOLDING EYELIDS OPEN. SEE MD AT ONCE. SKIN: IMMED WASH W/SOAP & WATER FOR 30 MIN. SEE MD AT ONCE. DESTROY CONTAMD SHOES & CLTHG. INGEST: DO NOT INDUCE VOMIT. DRINK LG QTYS OF MILK (PREFERRED) OR WATER & GIVE MILK OF MAGNESIA. TAKE TO HOSPITAL AT ONCE. INHAL: REMOVE TO FRESH AIR. SEE MD AT ONCE. IF BRTHG HAS STOPPED, BEGIN ARTF RESP.
NOTES: (SUPDAT)

Precautions for Safe Handling and Use

Steps If Matl Released/Spill: CONTAIN W/DIKES. DILUTE WITH WATER. NEUTRALIZE WITH SODA ASH OR LIME. PUT IN STEEL DRUM (PLASTIC DRUM IF ACIDIC). NOT BIODEGRADABLE. TOXIC TO FISH. DO NOT ALLOW TO ENTER WATERWAY.
Neutralizing Agent: NEUTRALIZE WITH SODA ASH OR LIME.
Waste Disposal Method: NEUTRALIZED MATERIAL IS GENERALLY ACCEPTABLE IN SANITARY SEWERS; CHECK FEDERAL, STATE AND LOCAL REGULATIONS. CONSULT MANUFACTURER FOR CONTAINER DISPOSAL. RCRA HAZARDOUS WASTE NUMBER: D001, D002.
Precautions-Handling/Storing: AVOID CONTACT WITH CLOTHING, ORGANICS OR OTHER COMBUSTIBLE MATERIALS. DO NOT STORE OR TRANSPORT WITH CORROSIVE MATERIALS OR COMBUSTIBLE MATERIALS.
Other Precautions: OXIDIZER. PACKAGING REQUIREMENT: USE SPECIALLY CONSTRUCTED CONTAINERS ONLY. THIS MATERIAL MUST BE HANDLED ONLY BY PERSONS WHO HAVE BEEN SPECIALLY TRAINED IN ITS HAZARDS AND HANDLING PROCEDURES.

Control Measures

Respiratory Protection: USE NIOSH APPROVED SCBA OR EXTERNAL SUPPLIED AIR.
Ventilation: GENERAL AND LOCAL VENTILATION IS REQUIRED.
Protective Gloves: IMPERVIOUS GLOVES (FP N).
Eye Protection: ANSI APPRVD CHEM WORKERS GOGGS (SUPDAT)
Other Protective Equipment: ANSI APPROVED EYE WASH & DELUGE SHOWER (FP N).
WEAR SPECIAL RESISTANT FULL BODY COVERING SUIT W/HOOD, GLOVES, BOOTS.
Work Hygienic Practices: NONE SPECIFIED BY MANUFACTURER.
Suppl. Safety & Health Data: VP: 5 PSI @ 100F. MATL TO AVOID: REACTS W/ BASES & MANY METALS. FIRST AID PROC: EFTS OF BRTHG VAP MAY BE DELAYED FOR HRS/DAYS. KEEP PATIENT AT REST & UNDER SURVEILLANCE A MINIMUM OF 72 HRS. ADMIN OXYGEN IF BRTHG IS DFCLT. DO NOT USE CARBONATED ALKALIES AS ANTIDOTE FOR SWALLOWING. EYE PROT: & FULL LENGTH FSHLD (FP N).

Transportation Data

Disposal Data

Label Data

Label Required: YES
Technical Review Date: 03NOV96
Label Date: 25NOV96
Label Status: G
Common Name: INHIBITED RED FUMING NITRIC ACID L61
Chronic Hazard: NO
Signal Word: DANGER!
Acute Health Hazard-Severe: X
Contact Hazard-Severe: X
Fire Hazard-Slight: X
Reactivity Hazard-Slight: X
Special Hazard Precautions: CORROSIVE. ACUTE: EYES: CORROSIVE. RAPIDLY CAUSES PAIN, BURNS, CORNEAL INJURY. MAY CAUSE PERMANENT DAMAGE AND BLINDNESS. SKIN: TOXIC. CORROSIVE. CAN CAUSE ILLNESS OR DEATH. RAPIDLY CAUSES BURNS, TISSUE DAMAGE AND PAIN. INGESTION: TOXIC. CORROSIVE. CAUSES PAIN AND SEVERE BURNS TO MOUTH, THROAT AND STOMACH. CAN CAUSE ILLNESS OR DEATH. INHALATION: TOXIC. CORROSIVE. VERY DANGEROUS. MAY CAUSE COUGHING, DIFFICULT BREATHING, PULMONARY EDEMA AND DEATH. EFFECTS MAY BE DELAYED HOURS OR DAYS. CHRONIC: NONE LISTED BY MANUFACTURER.
Protect Eye: Y
Protect Skin: Y
Protect Respiratory: Y
Label Name: DOWELL SCHLUMBERGER
Label P.O. Box: 2710
Label City: TULSA
Label State: OK
Label Zip Code: 74101
Label Country: US
Label Emergency Number: 918-582-0104

HYDROGEN PEROXIDE SOLUTIONS GREATER THAN 90%

General Information

Item Name: HYDRAZINE
Company's Name: FMC Corporation
Company's Street: 1735 Market Street
Company's City: Philadelphia
Company's State: PA
Company's Zip Code: 19103
Company's Emerg Ph #: Chemtrec - (800) 424-9300
Company's Info Ph #: (215) 299-6000
Safety Data Review Date: 15NOV2000
MSDS Serial Number: 7722-84-1-9

Ingredients/Identity Information

Proprietary: NO
Ingredient: Hydrogen Peroxide
Ingredient Sequence Number: 01
Percent: >90%
CAS Number: 7722-84-1

Proprietary: NO
Ingredient: WATER, H2O
Ingredient Sequence Number: 02
Percent: <10%
CAS Number: 7732-18-5

Hazards Identification

EMERGENCY OVERVIEW
IMMEDIATE CONCERNS: Oxidizer. Contact with combustibles will cause fire. Decomposes yielding oxygen that supports combustion of organic matters and can cause overpressure if confined. If product is heated to high temperatures, the vapor phase in a confined area could undergo a rapid decomposition, (explosion) when subjected to a flame or fire conditions.
POTENTIAL HEALTH EFFECTS: Corrosive to eyes, skin, nose, throat and lungs. May cause irreversible tissue damage to the eyes including blindness.

First Aid Measures

EYES: Immediately flush with water for at least 15 minutes, lifting the upper and lower eyelids intermittently. See a medical doctor or ophthalmologist immediately.
SKIN: Immediately flush with plenty of water while removing contaminated clothing and/or shoes, and thoroughly wash with soap and water. See a medical doctor immediately.
INGESTION: Rinse mouth with water. Dilute by giving 1 or 2 glasses of water. Do not induce vomiting. Never give anything by mouth to an unconscious person. See a medical doctor immediately.
INHALATION: Remove to fresh air. If breathing difficulty or discomfort occurs and persists, see a medical doctor. If breathing has stopped, give artificial respiration and see a medical doctor immediately.
NOTES TO MEDICAL DOCTOR: Hydrogen peroxide at these concentrations is a strong oxidant. Direct contact with the eye is likely to cause corneal damage especially if not washed immediately. Careful ophthalmologic evaluation is recommended and the possibility of local corticosteroid therapy should be considered. Because of the likelihood of corrosive effects on the gastrointestinal tract after ingestion, and the unlikelihood of systemic effects, attempts at evacuating the stomach via emesis induction or gastric lavage should be avoided. There is a remote possibility, however, that a nasogastric or orogastric tube may be required for the reduction of severe distension due to gas formation.

Fire Fighting Measures

EXTINGUISHING MEDIA: Flood with water.

FIRE / EXPLOSION HAZARDS: A severe detonation hazard when mixed with organics. Contact with combustibles will cause fire. While not flammable by OSHA and DOT definitions, contamination, contact with incompatible materials, or high temperature could cause a rapid decomposition that yields heat and oxygen, which support combustion and will cause a rapid overpressure if confined.
FIRE FIGHTING PROCEDURES: Any tank or container surrounded by fire should be flooded with water for cooling. Wear full protective clothing and self-contained breathing apparatus.
AUTOIGNITION TEMPERATURE: ASTM E 659-78; 90% - 210ºC (in air), 169ºC (in oxygen); 99% - 122ºC (in air or oxygen). Reaction was attributed to rapid decomposition of vapors at both concentrations.
PROPERTIES CONTRIBUTING TO FLAMMABILITY: Non-flammable but vapor phase decomposition occurs at 7.6 vol. % for 90%, and 4.8 vol. % for 99% based on flash points.
FLASH POINT: Setaflash - closed cup: 90% - 82-85ºC; 99% - 73.9ºC. No visible flame observed - reaction attributed to a rapid decomposition.
SENSITIVITY TO STATIC DISCHARGE: Static discharge can potentially initiate decomposition in vapor mixtures.
SENSITIVITY TO IMPACT: Not sensitive to impact under typical conditions of storage, transportation and use.
HAZARDOUS DECOMPOSITION PRODUCTS: Oxygen which supports combustion.

Accidental Release Measures

RELEASE NOTES: Dilute with a large volume of water and hold in a pond or diked area until hydrogen peroxide decomposes. Dispose according to methods outlined for waste disposal. Immediately notify the appropriate authorities in case of reportable spill.
Combustible materials exposed to hydrogen peroxide should be immediately submerged in or rinsed with large amounts of water to ensure that all hydrogen peroxide is removed. Residual hydrogen peroxide that is allowed to dry (upon evaporation hydrogen peroxide can concentrate) on organic materials such as paper, fabrics, cotton, leather, wood or other combustibles can cause the material to ignite and result in a fire.

Handling and Storage

HANDLING: CONSULT FMC FOR APPROVED PERSONAL PROTECTIVE EQUIPMENT AND HANDLING AND STORAGE PROCEDURES. Wear cup type safety goggles and full face shield, Gortex, polyester or acrylic full cover clothing and approved rubber or nitrile gloves and shoes. Do not use cotton, wool or leather for these materials react rapidly with hydrogen peroxide concentrations greater than 90%. Avoid contamination and heat as these will cause decomposition and generation of oxygen gas which will result in high pressures and possible container rupture. Hydrogen peroxide should be stored only in vented containers and transferred only in a prescribed manner (contact FMC for procedures). Never return unused hydrogen peroxide to original container. Empty aluminum drums should be returned to FMC. Utensils used for handling hydrogen peroxide should be made only of clean glass, pre-approved passivated aluminum or stainless steel, or approved plastics such as polytetrafluoroethylene. Do not discard 90% or higher concentrations without first diluting to less than 5%.

STORAGE: Store drums in cool areas out of direct sunlight and away from combustibles. For bulk storage, contact FMC's Hydrogen Peroxide Division.
COMMENTS: VENTILATION:
Provide mechanical general and/or local exhaust ventilation to prevent release of vapor or mist into the work environment.

Exposure Controls, Personal Protection

EXPOSURE LIMITS

Chemical Name	TWA (ACGIH)	STEL/Ceiling (ACGIH)	PEL (OSHA)	STEL/Ceiling (OSHA)
Hydrogen Peroxide	1 ppm		1 ppm	

ENGINEERING CONTROLS: Ventilation should be provided to minimize the release of hydrogen peroxide vapors and mists into the work environment. Ensure that exhaust vapors do not mix with organics or other reactive materials. Spills should be minimized or confined immediately to prevent release into the work area. Remove contaminated clothing immediately and wash before reuse.
PERSONAL PROTECTIVE EQUIPMENT
EYES AND FACE: Use cup type chemical goggles, full face shield.
RESPIRATORY: If concentrations in excess of 10 ppm are expected use approved self-contained breathing apparatus. Do not use oxidizable sorbants such as activated carbon.
PROTECTIVE CLOTHING: Wear cup type safety goggles and full-face shield, Gortex, polyester or acrylic full cover clothing and approved rubber or nitrile gloves and shoes. Do not use cotton, wool or leather for these materials react rapidly with 90% or higher concentrations of hydrogen peroxide. Completely submerge hydrogen peroxide contaminated clothing or other materials in water prior to drying. Residual hydrogen peroxide, if allowed to dry on materials such as paper, fabrics, cotton, leather, wood or other combustibles can cause the material to ignite and result in a fire.

Physical and Chemical Properties

ODOR: Odorless
APPEARANCE: Clear, colorless liquid
pH: (as is) < 1.0
PERCENT VOLATILE: 100
VAPOR PRESSURE: @ 30°C (86°F): 90%: 5 mmHg; 98%: 3 mmHg; 99%: 2.8 mmHg
VAPOR DENSITY: (Air = 1): Not available
BOILING POINT: 90%: 141°C (286°F); 98-99%: 149°C (300°F)
MELTING POINT: 90%: -11.5°C (11.3°F); 98%: -2.5° (27.5°F); 99%: -1.5°C (29.3°F)
SOLUBILITY IN WATER: (in H2O % by wt) 100%
EVAPORATION RATE: (butyl acetate = 1) Less than water
DENSITY: @ 25°C: 90%: 1.387; 98%: 1.431; 99%: 1.437
SPECIFIC GRAVITY: (H2O=1): @ 25°C: 90%: 1.387 (11.6 lb/gal); 98%: 1.431 (11.9 lb/gal); 99%: 1.437 (12 lb/gal)
COEFF. OIL/WATER: Not available
ODOR THRESHOLD: Not available
OXIDIZING PROPERTIES: Very strong oxidizer
COMMENTS: pH (1% solution): 5.0 - 6.0

Stability and Reactivity

CONDITIONS TO AVOID: Excessive heat, contamination, or contact with incompatible materials could cause product to decompose rapidly.
STABILITY: Stable (heat and contamination will accelerate decomposition).
POLYMERIZATION: Will not occur
HAZARDOUS DECOMPOSITION PRODUCTS: Oxygen which supports combustion.
INCOMPATIBLE MATERIALS: Reducing agents, wood, paper and other combustibles, iron and other heavy metals, copper containing alloys, caustic, organic chemicals, etc.
COMMENTS: Materials to Avoid: Dirt, catalytic metals such as iron, copper, manganese, etc., organics, cyanides and combustibles such as wood, paper, oils, etc. Concentrated hydrogen peroxide will react violently with leather, wood, cotton and other combustible materials.

Toxicological Information

EYE EFFECTS: No data available for the formulation.
Corrosive (rabbit), (70% hydrogen peroxide) [FMC Study Number: ICG/T-79.027]
SKIN EFFECTS: No data available for the formulation.
Corrosive (rabbit), (70% hydrogen peroxide) [FMC Study Number: I87-0972]
DERMAL LD50: No data available for the formulation.
>6.5 g/kg (rabbit), (70% hydrogen peroxide) [FMC Study Number: ICG/T-79.027]
ORAL LD50: No data available for the formulation.
805 mg/kg (rat), (70% hydrogen peroxide) [FMC Study Number: I96-2068]
INHALATION LC50: No data available for the formulation.
>0.17 mg/L (rat), (50% hydrogen peroxide) [FMC Study Number: I89-1080]
TARGET ORGANS: Eye, skin, nose, throat, lungs
ACUTE EFFECTS FROM OVEREXPOSURE: Corrosive to eyes, skin, nose, throat, lungs and gastrointestinal tract. May cause irreversible tissue damage to the eyes including blindness.
CHRONIC EFFECTS FROM OVEREXPOSURE: There are reports of limited evidence of carcinogenicity of hydrogen peroxide to mice administered high concentrations in their drinking water (IARC Monograph 36, 1985). However, the International Agency For Research on Cancer concluded that hydrogen peroxide could not be classified as to its carcinogenicity to humans (Group III carcinogen).
CARCINOGENICITY

Chemical Name	NTP Status	IARC Status	OSHA Status	Other
Hydrogen Peroxide	Not listed	Not listed	Not listed	(ACGIH) Listed (A3, Animal Carcinogen)

Ecological Information

ECOTOXICOLOGICAL INFORMATION: Channel catfish 96 hour LC50 = 37.4 mg/L
Fathead minnow 96 hour LC50 = 16.4 mg/L
Daphnia magna 24 hour EC50 = 7.7 mg/L
Daphnia pulex 48 hour LC50 = 2.4 mg/L
Freshwater snail 96 hour LC50 = 17.7 mg/L

For more information refer to ECETOC "Joint Assessment of Commodity Chemicals No. 22, Hydrogen Peroxide." ISSN-0773-6339, January 1993
CHEMICAL FATE INFORMATION: Hydrogen peroxide in the aquatic environment is subject to various reduction or oxidation processes and decomposes into water and oxygen. Hydrogen peroxide half-life in freshwater ranged from 8 hours to 20 days, in air from 10-20 hrs. and in soils from minutes to hours depending upon microbiological activity and metal contaminants.

Disposal Considerations

DISPOSAL METHOD: An acceptable method of disposal is to dilute with a large amount of water and allow the hydrogen peroxide to decompose followed by discharge into a suitable treatment system in accordance with all regulatory agencies. The appropriate regulatory agencies should be contacted prior to disposal.

Transport Information

U.S. DOT (DEPARTMENT OF TRANSPORTATION)
PROPER SHIPPING NAME: Hydrogen Peroxide, aqueous solutions, stabilized with more than 60% hydrogen peroxide.
PRIMARY HAZARD CLASS/DIVISION: 5.1 (Oxidizer)
UN/NA NUMBER: UN 2015
PACKING GROUP: I
PLACARDS: 5.1 Oxidizer
LABEL: Oxidizer, Corrosive
OTHER SHIPPING INFORMATION:
DOT Marking: Hydrogen Peroxide, aqueous solutions, stabilized with more than 60 percent Hydrogen Peroxide, UN 2015
Hazardous Substance/RQ: Not applicable
49 STCC Number: 4918335
High purity aluminum cargo tanks and drums. Contact FMC for specific details.
SPECIAL SHIPPING NOTES: IMDG: Hydrogen Peroxide, aqueous solutions stabilized with more than 60% hydrogen peroxide.
IATA: Hydrogen Peroxide >60% is forbidden on Passenger and Cargo Aircraft, as well as Cargo Only Aircraft.
Protect from physical damage. Avoid excessive heat. Avoid contamination. Keep drums in upright position. Drums should not be stacked in transit. Do not store drum on wooden pallets. Store only in vented containers.
Ship full and residue containing aluminum drums in dedicated metal floor trailer only (unless properly overpacked).

Regulatory Information

UNITED STATES
SARA TITLE III (SUPERFUND AMENDMENTS AND REAUTHORIZATION ACT)
SARA TITLE III SECTION 302 EXTREMELY HAZARDOUS SUBSTANCES (40 CFR 355):
Hydrogen Peroxide > 52%
RQ: 1000 lbs.
Planning Threshold: 1000 lbs.
SECTION 311 HAZARD CATEGORY (40 CFR 370):
Fire Hazard
Immediate (Acute) Health Hazard

SECTION 312 THRESHOLD PLANNING QUANTITY (40 CFR 370): 1000 lbs. (conc. >52%)
SECTION 313 REPORTABLE INGREDIENTS (40 CFR 372): Not listed
CERCLA (COMPREHENSIVE ENVIRONMENTAL RESPONSE COMPENSATION AND LIABILITY ACT)
CERCLA REGULATORY (40 CFR 302.4): Unlisted (Hydrogen Peroxide); RQ = 100 lbs; Ignitability, Corrosivity
CERCLA RQ: Not listed
RCRA STATUS: Waste No. D001 Waste No. D002
CANADA
WHMIS (WORKPLACE HAZARDOUS MATERIALS INFORMATION SYSTEM):
Hazard Classification: Class C (Oxidizer), Class D, Div. 2 Subdiv. B, Class E (Corrosive)
Product Identification No. : 2015
Ingredient Disclosure List: Listed

Other Information

REVISION SUMMARY Revision #: 4
This MSDS replaces the September 29, 2000 MSDS. Any changes in information are as follows:
In Section 5
Autoignition Temperature (text) Properties Contributing to Flammability (text) Flash Point (text) Sensitivity to Impact (text) Sensitive Static Discharge (text)
In Section 6
Release Notes (text)
In Section 7
Handling (text)
In Section 8
Clothing Protection (text)
In Section 9
(Group Field) for Vapor Pressure (Group Field) for Boiling Point (Group Field) for Melting Point (Group Field) for Density (Group Field) for Specific Gravity
In Section 10
Incompatible Materials (text)
In Section 14
Other Shipping Information (text)
HMIS RATING

HEALTH:	2
FLAMMABILITY	0
REACTIVITY:	3
PROTECTION:	H

HMIS RATING

HEALTH:	2
FLAMMABILITY	0
REACTIVITY:	3
PROTECTION:	H

Key
4 = Severe
3 = Serious
2 = Moderate
1 = Slight
0 = Minimal

HMIS RATINGS NOTES: Protection = H (Safety goggles, gloves, apron and a vapor respirator)
The contents and format of this MSDS are in accordance with OSHA Hazard Communication Standard and Canada's Workplace Hazardous Information System (WHMIS).
National Fire Protection Association (NFPA)
SPECIAL = OX (Oxidizer)
Hazardous Materials Identification System (HMIS)

NITROGEN TETROXIDE

==========
General Information
==========
Item Name: NITROGEN TETROXIDE, LIQUID
Company's Name: MG INDUSTRIES
Company's Street: 3 GREAT VALLEY PARKWAY
Company's City: MALVERN
Company's State: PA
Company's Zip Code: 19355
Company's Emerg Ph #: Chemtrec: 1-800-424-9300
Company's Info Ph #: 610-695-7400
Date MSDS Prepared: 07MAY1990
Date MSDS Revised: 21MAR2000
==========
Ingredients/Identity Information
==========
Proprietary: NO
Ingredient: NITROGEN TETROXIDE, LIQUID
Ingredient Sequence Number: 01
Percent: 100%
CAS Number: 10544-72-6
==========
Health Hazards Data
==========
NFPA RATINGS (SCALE 0-4): HEALTH=3 FIRE=0 REACTIVITY=0EC
CLASSIFICATION (ASSIGNED): T+ Very Toxic C Corrosive R 26-34 EC
Classification may be inconsistent with independently-researched data.
EMERGENCY OVERVIEW: PHYSICAL DESCRIPTION: Reddish-brown liquified gas with a pungent odor. MAJOR HEALTH HAZARDS: harmful if inhaled, respiratory tract burns, skin irritation (possibly severe), eye irritation (possibly severe) PHYSICAL HAZARDS: Containers may rupture or explode if exposed to heat. Strong oxidizer. Contact with combustible material may cause fire.POTENTIAL HEALTH EFFECTS:INHALATION:
MGI16635 SHORT TERM EXPOSURE: burns, nausea, stomach pain, difficulty breathing, irregular heartbeat, headache, dizziness, bluish skin color, lung damage LONG TERM EXPOSURE: tooth decay, digestive disorders, lung damageSKIN CONTACT: SHORT TERM EXPOSURE: irritation (possibly severe), frostbite LONG TERM EXPOSURE: same as effects reported in short term exposureEYE CONTACT: SHORT TERM EXPOSURE: irritation (possibly severe), frostbite, eye damage LONG TERM EXPOSURE: same as effects reported in short term exposureINGESTION: SHORT TERM EXPOSURE: frostbite, nausea, vomiting, stomach pain LONG TERM EXPOSURE: no information is availableCARCINOGEN STATUS:OSHA: NNTP:

NIARC: N

First Aid Measures

INHALATION: When safe to enter area, remove from exposure. Use a bag valve mask or similar device to perform artificial respiration (rescue breathing) if needed. Keep warm and at rest. Get medical attention immediately.SKIN CONTACT: Remove contaminated clothing, jewelry, and shoes immediately. Wash with soap or mild detergent and large amounts of water until no evidence of chemical remains (at least 15-20 minutes). For burns, cover affected area securely with sterile, dry, loose-fitting dressing. Get medical attention immediately. EYE CONTACT: Wash eyes immediately with large amounts of water, occasionally lifting upper and lower lids, until no evidence of chemical remains. Continue irrigating with normal saline until ready to transport to hospital. Cover with sterile bandages. Get medical attention immediately. INGESTION: If vomiting occurs, keep head lower than hips to help prevent aspiration. Get medical attention, if needed. NOTE TO PHYSICIAN: For inhalation, consider oxygen.

Fire Fighting Measures

FIRE AND EXPLOSION HAZARDS: Negligible fire hazard. Oxidizer. May ignite or explode on contact with combustible materials. EXTINGUISHING MEDIA: water. Do not use dry chemicals, carbon dioxide or halogenated extinguishing agents. Large fires: Flood with fine water spray. FIRE FIGHTING: Move container from fire area if it can be done without risk. Cool containers with water spray until well after the fire is out. Stay away from the ends of tanks. For fires in cargo or storage area: If this is impossible then take the following precautions: Keep unnecessary people away, isolate hazard area and deny entry. Let the fire burn. For small fires, contain and let burn. FLASH POINT: not flammable.

Accidental Release Measures

AIR RELEASE: Reduce vapors with water spray. Collect runoff for disposal as potential hazardous waste. OCCUPATIONAL RELEASE: Stop leak if possible without personal risk. Avoid contact with combustible materials. Keep unnecessary people away, isolate hazard area and deny entry. Ventilate closed spaces before entering. Notify Local Emergency Planning Committee and State Emergency Response Commission for release greater than or equal to RQ (U.S. SARA Section 304). If release occurs in the U.S. and is reportable under CERCLA Section 103, notify the National Response Center at(800)424-8802 (USA) or (202)426-2675 (USA).

Handling and Storage

Store and handle in accordance with all current regulations and standards. Protect from physical damage. Keep separated from incompatible substances. Store and handle in a detached building. Store in compatible containers. Keep separated from incompatible substances.

Exposure Controls, Personal Protection

EXPOSURE LIMITS: NITROGEN TETROXIDE, LIQUID: NITROGEN DIOXIDE: 5 ppm (9 mg/m3) OSHA ceiling 1 ppm (1.8 mg/m3) OSHA STEL (vacated by 58 FR 35338, June 30, 1993) 3 ppm ACGIH TWA 5 ppm ACGIH STEL 1 ppm (1.8 mg/m3) NIOSH recommended STEL 9.5 mg/m3 (5 ml/m3) DFG MAK (peak limitation category-I) 3 ppm (5.7 mg/m3) UK OES TWA 5 ppm (9.6 mg/m3) UK OES STEL MEASUREMENT METHOD: Palmes tube; Reagent; Visible spectrophotometry; NIOSH III # 6700VENTILATION: Provide local exhaust or process enclosure ventilation system. Ensure compliance with applicable exposure limits.
PROTECTION: Wear splash resistant safety goggles with a faceshield. Provide an emergency eye wash fountain and quick drench shower in the immediate work area. CLOTHING: Wear appropriate chemical resistant clothing. GLOVES: Wear appropriate chemical resistant gloves.
RESPIRATOR: The following respirators and maximum use concentrations are drawn from NIOSH and/or OSHA.20 ppm any supplied-air respirator. Any self-contained breathing apparatus with a full facepiece. Any supplied-air respirator with a full facepiece. Escape - Any air-purifying respirator with a full facepiece and a canister providing protection against this substance. Only non-oxidizable sorbents are allowed (not charcoal). Any appropriate escape-type, self-contained breathing apparatus. For Unknown Concentrations or Immediately Dangerous to Life or Health - Any supplied-air respirator with full facepiece and operated in a pressure-demand or other positive-pressure mode in combination with a separate escape supply. Any self-contained breathing apparatus with a full facepiece.

==========

Physical/Chemical Properties

==========

PHYSICAL DESCRIPTION: Reddish-brown liquified gas with a pungent odor.
MOLECULAR WEIGHT: 92.02
MOLECULAR FORMULA: N2-O4
BOILING POINT: 70 F (21 C)
FREEZING POINT: 12 F (-11 C)
VAPOR PRESSURE: Not available
VAPOR DENSITY (air=1): 3.2
SPECIFIC GRAVITY (water=1): 1.5
WATER SOLUBILITY: decomposes
PH: Not applicable
VOLATILITY: Not applicable
ODOR THRESHOLD: 5 ppm
EVAPORATION RATE: Not applicable
COEFFICIENT OF WATER/OIL DISTRIBUTION: Not applicable
SOLVENT SOLUBILITY: Soluble: concentrated sulfuric acid, nitric acid

==========

Stability and Reactivity

==========

REACTIVITY: Stable at normal temperatures and pressure.CONDITIONS TO AVOID: Avoid contact with combustible materials. Minimize contact with material. Avoid inhalation of material or combustion by-products. Keep out of water supplies and sewers. INCOMPATIBILITIES: combustible materials, metals, bases, metal oxides, reducing agents, metal carbide, halo carbons, halogens, oxidizing materials, metal salts, amines, acidsNITROGEN DIOXIDE (NITROGEN TETROXIDE): ACETIC ANHYDRIDE: Violent explosion. ACETONITRILE: Possible explosion. ALCOHOLS: Possible explosion. ALUMINUM POWDER: Possible ignition. AMMONIA: Explosive reaction. BARIUM OXIDE: Intense reaction at 200 C. BORON TRICHLORIDE: Interaction is energetic. CALCIUM: Explosive interaction.

CARBON DICHLORIDE: Formation of explosive mixture. CARBON DISULFIDE: Fire and explosion hazard. CARBONYL METALS: Combination is hypergolic. CESIUM ACETYLENE CARBIDE: Ignition at 100 C. CHLOROFORM: Explosion on impact. CELLULOSE PERCHLORATE: Possible explosion. COATINGS: Attacks. COMBUSTIBLE MATERIALS: Fire and explosion hazard. CYCLOALKENES: Formation of explosive compound. CYCLOHEXANE: Violent reaction. 1,2-DICHLOROETHANE: Formation of explosive mixture. DICHLOROETHYLENE: Formation of explosive compound. DIFLUOROTRIFLUOROMETHYLPHOSPHINE: Possible ignition. DIMETHYL SULFOXIDE: Explosive reaction. ETHYLENE: Formation of unstable compound. FLUORINE: Possible ignition. FORMALDEHYDE: Possible explosion. FUELS: Possible ignition. HALOCARBONS: Formation of explosive compound. HETEROCYCLIC BASES: Violent reaction. HYDRAZINE DERIVATIVES: Formation of explosive mixture. HYDROCARBONS: Formation of explosive product. HYDROGEN: Formation of explosive mixture. INDIUM: Possible explosion. IRON (REDUCED): Decomposes with incandescence. IRON OXIDE: Incandescent reaction by heating. ISOPROPYL NITRITE: Possible explosion. MAGNESIUM: Burns vigorously. MAGNESIUM PERCHLORATE: Possible explosion. MANGANESE: Possible ignition. METALS: Possible ignition. METAL ACETYLIDES: Possible ignition. METAL CARBONYLS: Violent reaction. METHYLENE CHLORIDE: Formation of explosive mixture. NITROANILINE: Possible ignition. NITROAROMATICS: Possible explosion. NITROBENZENE: Formation of explosive mixture. NITROGEN TRICHLORIDES: Possible explosion. OLEFINS: Formation of explosive product. OXIDIZERS (STRONG): Reacts. OXYGEN: Formation of explosive compound. OZONE: Explosive reaction. PETROLEUM: Violent reaction. PHOSPHAM: Possible ignition. PHOSPHINE: Possible ignition. PHOSPHORUS: Violent combustion. PHOSPHORUS TRICHLORIDE: Possible explosion. PHTHALIC ANHYDRIDE: Explosive decomposition. PLASTICS: Attacks. POTASSIUM: Possible ignition. PROPYL NITRITE: Possible explosion. PROPYLENE: Possible explosion. REDUCING AGENTS: Reacts violently. RUBBER: Attacks. SODIUM (GASEOUS): Reacts with marked luminescence at 260 C. SODIUM AMIDE: Violent reaction. STEEL: Corrosive when wet. SULFUR: Violent combustion. SULFURIC ACID: Explosive decomposition. SULFURYL CHLORIDE: Explosive reaction. TETRACARBONYLNICKEL: Violent reaction. TETRACHLOROETHANE: Formation of explosive compound. TETRACHLOROETHYLENE: Formation of explosive compound. TETRAMETHYLTIN: Interaction is explosively violent even at -80 C. TOLUENE: Violent reaction. TRICHLOROETHANE: Formation of explosive compound. TRICHLOROETHYLENE: Formation of explosive compound. TRIETHYLAMINE: Formation of explosive compound. TRIETHYLAMMONIUM NITRATE: Formation of heat-sensitive explosive compound. TUNGSTEN CARBIDE: Burns with incandescence. VINYL CHLORIDE: Possible explosion.HAZARDOUS DECOMPOSITION: Thermal decomposition products: oxides of nitrogenPOLYMERIZATION: Will not polymerize.

==========

Toxicological Information

==========

NITROGEN TETROXIDE, LIQUID: LOCAL EFFECTS: Corrosive: inhalation, skin, eye ADDITIONAL DATA: Contact with the liquid or vapor may cause frostbite due to rapid evaporation. HEALTH EFFECTS:INHALATION: ACUTE EXPOSURE: NITROGEN TETROXIDE: Usually no symptoms occur at the time of exposure, with the exception of a slight cough and perhaps fatigue and nausea. Exposure to low concentrations, below 50 ppm, may result in impaired pulmonary defense mechanisms. Only very concentrated fumes, above 100 ppm, may produce prompt coughing, choking, headache, dizziness, nausea, abdominal pain, and dyspnea. A symptom-free latent

period may follow exposure lasting 5-72 hours. Fatigue, uneasiness, restlessness, cough, hypernea, and dyspnea may appear gradually. Increasingly rapid and shallow respirations, mild or violent coughing with frothy expectorations, cyanosis, possible formation of methemoglobin, and physical signs of pulmonary edema may occur. Anxiety, mental confusion, lethargy, and finally loss of consciousness may result. The circulatory system may be affected as noted by a weak, rapid pulse, dilated heart, venous congestion, intense cyanosis, and severe hemoconcentration. Circulatory collapse may occur but is secondary to anoxia and hemoconcentration. Death commonly occurs within a few hours after the first evidence of pulmonary edema and is due to asphyxiation. A second acute phase sometimes follows the initial pulmonary reaction after a latent period of several weeks. Signs may include fever, chills, cough, dyspnea, tachypnea, tachycardia, and cyanosis. The relapse may be abrupt and fulminating, leading either to death or a slow convalescence, which may be complicated by infectious bronchitis, bronchiolitis obliterans, pneumonia, and general asthenia. One study with rats indicated that exertion may potentiate the toxic effects of nitrogen dioxide. CHRONIC EXPOSURE: NITROGEN TETROXIDE: Prolonged exposure to low concentrations, insufficient to cause pulmonary edema, may result in chronic irritation of the respiratory tract, with headache, dizziness, ulcers of the nose and mouth, moist rales and wheezes, sporadic cough with mucopurulent expectoration, anorexia, dyspepsia, dental erosion, insomnia, gradual loss of strength, dyspnea upon exertion, chronic bronchitis, and emphysematous lesions. Effects on fertility, embryo, and newborns have been reported when female rats were chronically exposed prior to mating. Effects on the newborns have also been reported from chronic exposure during pregnancy in rats. SKIN CONTACT: ACUTE EXPOSURE: NITROGEN TETROXIDE: Direct contact with the liquid may cause severe irritation, pain, yellow-brown discoloration, necrosis, frostbite, and possible burns either by the vapors or rapid evaporation of the liquid. CHRONIC EXPOSURE: NITROGEN TETROXIDE: Effects depend on concentration and duration of exposure. Repeated or prolonged contact with corrosive substances may result in dermatitis or effects similar to acute exposure.EYE CONTACT: ACUTE EXPOSURE: NITROGEN TETROXIDE: Direct contact with the liquid may cause severe irritation with redness, pain, blurred vision, edema of the eyelids, corneal ulceration, possible burns, and frostbite either by the vapors of rapid evaporation of the liquid. CHRONIC EXPOSURE: NITROGEN TETROXIDE: Effects depend on concentration and duration of exposure. Repeated or prolonged contact with corrosive substances may result in conjunctivitis or effects as in acute exposure.INGESTION: ACUTE EXPOSURE: NITROGEN TETROXIDE: Ingestion of the liquid may cause an acid taste, nausea, vomiting, abdominal pain, and frostbite damage of the lips, mouth, and mucous membranes. CHRONIC EXPOSURE: NITROGEN TETROXIDE: No data available.

==========

Ecological Information

==========

==========

Disposal Considerations

==========

Dispose in accordance with all applicable regulations.

==========

Transport Information

==========

U.S. DOT 49 CFR 172.101 SHIPPING NAME-UN NUMBER: Dinitrogen tetroxide. -UN1067U.S. DOT 49 CFR 172.101 HAZARD CLASS OR DIVISION: 2.3U.S. DOT 49 CFR 172.101 AND SUBPART E LABELING REQUIREMENTS: Poison gas; Oxidizer; Corrosive U.S. DOT 49 CFR 172.101 PACKAGING AUTHORIZATIONS: EXCEPTIONS: None NON-BULK PACKAGING: 49 CFR 173.336BULK PACKAGING: 49 CFR 173.314U.S. DOT 49 CFR 172.101 QUANTITY LIMITATIONS: PASSENGER AIRCRAFT OR RAILCAR: Forbidden CARGO AIRCRAFT ONLY: Forbidden LAND TRANSPORT ADR/RID: SUBSTANCE NAME: Nitrogen dioxide (NO2)/Dinitrogen tetroxide (nitrogen dioxide) UN NUMBER: UN1067 ADR/RID CLASS: 2 ITEM NUMBER: 3(at)/2TOC WARNING SIGN/LABEL: 6.1; 05/6.1; 05; 8; 13 HAZARD ID NUMBER: 265AIR TRANSPORT IATA/ICAO: No classification assigned. MARITIME TRANSPORT IMDG: No classification assigned.

==========

Regulatory Information

==========

U.S. REGULATIONS: TSCA INVENTORY STATUS: Y TSCA 12(b) EXPORT NOTIFICATION: Not listed. CERCLA SECTION 103 (40CFR302.4): Y NITROGEN DIOXIDE: 10 LBS RQ SARA SECTION 302 (40CFR355.30): Y NITROGEN DIOXIDE: 100 LBS TPQ SARA SECTION 304 (40CFR355.40): Y NITROGEN DIOXIDE: 10 LBS RQ SARA SECTION 313 (40CFR372.65): N SARA HAZARD CATEGORIES, SARA SECTIONS 311/312 (40CFR370.21): ACUTE: Y CHRONIC: N FIRE: Y REACTIVE: N SUDDEN RELEASE: Y OSHA PROCESS SAFETY (29CFR1910.119): Y NITROGEN DIOXIDE: 250 LBS TQSTATE REGULATIONS: California Proposition 65: NEUROPEAN REGULATIONS: EC NUMBER (EINECS): 234-126-4 EC RISK AND SAFETY PHRASES: R 26 Very toxic by inhalation. R 34 Causes burns. S 1/2 Keep locked-up and out of reach of children. S 9 Keep container in a well-ventilated place. S 26 In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. S 28b after contact with skin wash immediately with plenty of soap and water. S 36/37/39 Wear suitable protective clothing, gloves and eye/face protection. S 45 In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible). CONCENTRATION LIMITS: C>=10% T+ R 26-34 5%<=C<=C<=C<=C

==========

UDMH

OLIN -- CPE134072 UNSYMMETRICAL DIMETHYLHYDRAZINE - HYDRAZINE
MATERIAL SAFETY DATA SHEET
NSN: 9135006874293
Manufacturer's CAGE: 53084
Part No. Indicator: A
Part Number/Trade Name: CPE134072 UNSYMMETRICAL DIMETHYLHYDRAZINE
==========
General Information
==========
Item Name: HYDRAZINE
Company's Name: OLIN CORPORATION
Company's Street: 120 LONG RIDGE ROAD
Company's City: STAMFORD
Company's State: CT
Company's Zip Code: 06904
Company's Emerg Ph #: (203) 356-3449
Company's Info Ph #: (203) 356-3449
Record No. For Safety Entry: 001
Tot Safety Entries This Stk#: 002
Date MSDS Prepared: 01JAN91
Safety Data Review Date: 19MAR92
Preparer's Company: OLIN CORPORATION
Preparer's St Or P. O. Box: 120 LONG RIDGE ROAD
Preparer's City: STAMFORD
Preparer's State: CT
Preparer's Zip Code: 06904
MSDS Serial Number: BFLSF
Specification Number: MIL-P-25604
Hazard Characteristic Code: F6
Unit Of Issue: LB
Type Of Container: METAL
==========
Ingredients/Identity Information
==========
Proprietary: NO
Ingredient: 1,1-DIMETHYLHYDRAZINE, UDMH INTENDED CHANGE (IC)
Ingredient Sequence Number: 01
Percent: 95-99%
NIOSH (RTECS) Number: MV2450000
CAS Number: 57-14-7
OSHA PEL: 1 MG/CUM
ACGIH TLV: 0.025 MG/CUM IC (A2)
Other Recommended Limit: 0.5 PPM

Proprietary: NO
Ingredient: DIMETHYLAMINE (SARA III)
Ingredient Sequence Number: 02
Percent: 1-5%
NIOSH (RTECS) Number: IP8750000
CAS Number: 124-40-3
OSHA PEL: 5 PPM/STEL15PPM;9293

ACGIH TLV: 10 PPM
Other Recommended Limit: 10 PPM

Proprietary: NO
Ingredient: WATER, H2O
Ingredient Sequence Number: 03
Percent: 0.1-1%
NIOSH (RTECS) Number: ZC0110000
CAS Number: 7732-18-5

Physical/Chemical Characteristics

Appearance And Odor: CLEAR, COLORLESS LIQUID W/AMMONIA ODOR
Boiling Point: 146F
Melting Point: -71F
Vapor Pressure (MM Hg/70 F): 157 MM HG
Vapor Density (Air=1): 2.1
Specific Gravity: 0.78
Decomposition Temperature: 700F
Solubility In Water: COMPLETE
Percent Volatiles By Volume: 100%
pH: 10

Fire and Explosion Hazard Data

Flash Point: 5F
Flash Point Method: COC
Lower Explosive Limit: 2%
Upper Explosive Limit: 95%
Extinguishing Media: CO2, DRY CHEMICAL, OR WATER SPRAY
Special Fire Fighting Proc: USE WATER TO COOL CONTAINERS EXPOSED TO FIRE.
WEAR SELF-CONTAINED BREATHING APPARATUS POSITIVE PRESSURE UNIT.

Reactivity Data

Stability: YES
Cond To Avoid (Stability): HEAT, SPARKS, & OPEN FLAME
Materials To Avoid: STRONG OXIDIZERS SUCH AS HYDROGEN PEROXIDE/NITROGEN TETROXIDE/FLUORINE/HALOGNE FLUORIDES/FUMING NITRIC ACID. SEE SUPP.
Hazardous Decomp Products: CO, & NITROGEN OXIDES
Hazardous Poly Occur: NO

Health Hazard Data

LD50-LC50 Mixture: ORAL LD50 (RAT): 122 MG/KG
Route Of Entry - Inhalation: YES
Route Of Entry - Skin: YES
Route Of Entry - Ingestion: YES
Health Haz Acute And Chronic: INHALATION: NOSE/THROAT/UPPER RESPIRATORY TRACT/LUNG IRRITATION/BRONCHITIS/PULMONARY EDEMA/LIVER/KIDNEY/BLOOD/LUNG DAMAGE/FATAL. SKIN: IRRITATION/BURN. EYE: INFLAMMATION/SWELL/REDNESS/DISCHARGE. INGESTION: GASTROINTESTINAL TRACT/STOMACH/INTESTINE IRRITATION/NAUSEA/VOMITING/DIARRHEA/ABDOMINAL PAIN/BLEEDING/ABSORPTION.
Carcinogenicity - NTP: NO
Carcinogenicity - IARC: NO

Carcinogenicity - OSHA: NO
Explanation Carcinogenicity: NONE
Signs/Symptoms Of Overexp: INHALATION: HEMOLYSIS/VOMITING/DIARRHEA/ NAUSEA/DIZZINESS/CYANOSIS/CONVULSIONS/CANCER. SINGLE EXPOSURE WOULD NOT LIKELY PRODUCE FETAL TOXICITY/MALFORMATIONS, BUT SEVERAL EXPOSURES MAY TEMPORARY BLINDNESS/BURN/CORNEAL DAMAGE/VISION IMPAIRMENT.
Med Cond Aggravated By Exp: LIVER, KIDNEY, BLOOD DISEASES AS WELL AS ASTHMA & CARDIOVASCULAR DISEASE.
Emergency/First Aid Proc: EYES/SKIN: FLUSH W/PLENTY OF WATER FOR AT LEAST 15 MINS. INGESTION: DRINK PLENTY OF WATER. INDUCE VOMITING. DON'T GIVE ANYTHING BY MOUTH IF UNCONSCIOUS OR HAVING CONVULSIONS. INHALATION: REMOVE TO FRESH AIR. IF BREATHING STOPS, GIVE ARTIFICIAL RESPIRATION. IF BREATHING DIFFICULT, GIVE OXYGEN. ENSURE ADEQUATE VENTILATION. OBTAIN MEDICAL ATTENTION IN ALL CASES.

==========

Precautions for Safe Handling and Use

==========

Steps If Matl Released/Spill: REMOVE ALL IGNITION SOURCES. STOP SPILL AT SOURCE AS SOON AS POSSIBLE. CONTAIN LIQUID FOR TREATMENT/NEUTRALIZATION. REMOVE W/VACUUM SYSTEM/PUMPING DEVICE. LAND SPILL: DIKE/DILUTE TO BRING CONCENTRATION OF UDMH <30% & REMOVE AS LIQUID/CONTAINERIZE.
Neutralizing Agent: ADD WATER TO 5% OR 124F.
Other Precautions: DON'T EXPOSE TO DIRECT LIGHT. STABLE FOR AT LEAST ONE YEAR IF STORED UNDER NITROGEN & TIGHTLY SEALED TO EXCLUDE AIR.

==========

Control Measures

==========

Respiratory Protection: USE NIOSH/MSHA APPROVED RESPIRATOR.
Ventilation: LOCAL EXHAUST TO KEEP <TLV. TLV
Protective Gloves: BUTYL RUBBER
Eye Protection: FACE SHIELD W/SAFETY GLASSES
Other Protective Equipment: BUTYL RUBBER BOOTS, APRON & PROTECTIVE IMPERMEABLE SUIT. EYE WASH & SAFETY SHOWER.
Work Hygienic Practices: REMOVE/LAUNDER CONTAMINATED CLOTHING BEFORE REUSE. DISCARD CONTAMINATED LEATHER ARTICLES.
Suppl. Safety & Health Data: MATERIAL TO AVOID: MOLYBDENUM CONTAINING ALLOYS SUCH AS HASTELLOY C & COPPER CONTAINING ALLOYS. METAL OXIDES, ABSORPTION OF 1,1-DIMETHYL HYDRAZINE BY RAGES, COTTON WASTE, SAWDUST, OR SIMILAR ORGANIC MATERIALS.

==========

Transportation Data

==========

Trans Data Review Date: 95132
DOT PSN Code: FHJ
DOT Proper Shipping Name: DIMETHYLHYDRAZINE, UNSYMMETRICAL
DOT Class: 6.1
DOT ID Number: UN1163
DOT Pack Group: I
DOT Label: POISON, FLAMMABLE LIQUID, CORROSIVE
IMO PSN Code: FZB
IMO Proper Shipping Name: DIMETHYLHYDRAZINE, UNSYMMETRICAL
IMO Regulations Page Number: 6132
IMO UN Number: 1163
IMO UN Class: 6.1
IMO Subsidiary Risk Label: FLAMMABLE LIQUID, CORROSIVE
IATA PSN Code: ZZY

IATA Proper Shipping Name: FORBIDDEN BY THIS MODE OF TRANSPORTATION
AFI PSN Code: JZA
AFI Symbols: T
AFI Prop. Shipping Name: DIMETHYLHYDRAZINE, UNSYMMETHRICAL
AFI Class: 6.1
AFI ID Number: UN1163
AFI Pack Group: I
AFI Label: 3, 8
AFI Special Prov: 2,A7
AFI Basic Pac Ref: 10-5
Additional Trans Data: MARK CONTAINER INHALATION HAZARD
==========
Disposal Data
==========
==========
Label Data
==========
Label Required: YES
Label Status: G
Common Name: CPE134072 UNSYMMETRICAL DIMETHYLHYDRAZINE
Special Hazard Precautions: INHALATION: NOSE/THROAT/UPPER RESPIRATORY TRACT/LUNG IRRITATION/BRONCHITIS/PULMONARY EDEMA/LIVER/KIDNEY/BLOOD/LUNG DAMAGE/FATAL. SKIN: IRRITATION/BURN. EYE: INFLAMMATION/SWELL/REDNESS/ DISCHARGE. INGESTION: GASTROINTESTINAL TRACT/STOMACH/INTESTINE IRRITATION/ HEMOLYSIS/VOMITING/DIARRHEA/NAUSEA/DIZZINESS/CYANOSIS/CONVULSIONS/CANCER. SINGLE EXPOSURE WOULD NOT LIKELY PRODUCE FETAL TOXICITY/MALFORMATIONS, BUT SEVERAL EXPOSURES MAY CAUSE EFFECTS TO FETUS. SKIN: DERMATITIS/ALLERGIC REACTION/RASH. EYES: TEMPORARY BLINDNESS/BURN/CORNEAL DAMAGE/VISION IMPAIRMENT.
Label Name: OLIN CORPORATION
Label Street: 120 LONG RIDGE ROAD
Label City: STAMFORD
Label State: CT
Label Zip Code: 06904
Label Emergency Number: 203) 356-3449

MONOMETHYLHYDRAZINE

==========
General Information
==========
Item Name: MONOMETHYLHYDRAZINE
Company's Name: OLIN CORPORATION
Company's Street: 120 LONG RIDGE ROAD
Company's City: STAMFORD
Company's State: CT
Company's Zip Code: 06904
Company's Emerg Ph #: (203) 356-3449
Company's Info Ph #: (203) 356-3449
Date MSDS Prepared: 01JAN95
Preparer's Company: OLIN CORPORATION

Preparer's St Or P. O. Box: 120 LONG RIDGE ROAD
Preparer's City: STAMFORD
Preparer's State: CT
Preparer's Zip Code: 06904
MSDS Serial Number: BXNWB
==========
Ingredients/Identity Information
==========
Proprietary: NO
Ingredient: METHYL HYDRAZINE (SUSPECTED HUMAN CARCINOGEN BY ACGIH)
95-2
Ingredient Sequence Number: 01
Percent: 95-99%
CAS Number: 60-34-4
OSHA PEL: 0.2 PPM
ACGIH TLV: 0.2 PPM

Cas: 7732-18-5
RTECS #: ZC0110000
Name: WATER
% Wt: 1-5

==========
Health Hazards Data
==========
LD50 LC50 Mixture: ORAL LD50 (RAT): 32 MG/KG Route Of Entry Inds - Inhalation: YES Skin: YES Ingestion: YES Carcinogenicity Inds - NTP: NO IARC: NO OSHA: NO Effects of Exposure: INHALATION: NOSE/THROAT/UPPER RESPIRATORY TRACT/LUNG IRRITATION, PULMONARY EDEMA, LUNG/KIDNEY/LIVER/BLOOD DAMAGE, HEMOLYSIS OF BLOOD CELLS. SKIN: SEVERE IRRITATION/BURNS/DERMATITIS. EYES: BURNS/PERMAN ENT CORNEAL DAMAGE. INGESTION: IRRITATION/BURNS OF ENTIRE GI TRACT. MONOMETHYLHYDRAZINE IS CONSIDERED MUTAGENIC. Explanation Of Carcinogenicity: NONE Signs And Symptions Of Overexposure: IRRITATION, INFLAMMATION, BRONCHITIS, VOMITING, DIARRHEA, NAUSEA, DIZZINESS, CYANOSIS, CONVULSIONS, SWELLING, REDNESS, DISCHARGE, ABDOMINAL PAIN, BLEEDING, TISSUE ULCERATION. Medical Cond Aggravated By Exposure: LIVER/KIDNEY/BLOOD DISEASES, ASTHMA, CARDIOVASCULAR DISEASE. First Aid: EYES/SKIN: IMMEDIATELY FLUSH W/LARGE AMOUNTS OF WATER FOR 15 MINS. INGESTION: IMMEDIATELY DRINK LARGE AMOUNTS OF WATER. INDUCE VOMITING. DON'T GIVE ANYTHING BY MOUTH IF UNCONSCIOUS/CONVULSIVE. INHALAT ION: REMOVE TO FRESH AIR. GIVE CPR/OXYGEN IF NEEDED. KEEP WARM & QUIET. OBTAIN MEDICAL ATTENTION IN ALL CASES.
==========
Handling and Disposal
==========
Spill Release Procedures: EVACUATE AREA & REMOVE IGNITION SOURCES. STOP SOURCE. AIR: SUPPRESS VAPORS W/WATER FOG. CONTAIN ALL LIQUID FOR TREATMENT/NEUTRALIZATION. WATER: SAFELY DIVERT FLOW AROUND AREA. REMOVE W/VACUUM SYSTEM/P UMPING DEVICE FOR TREATMENT/DISPOSAL. (SUPP) Neutralizing Agent: 5% HYPOCHLORITE SOLUTION. Waste Disposal Methods: AS A HAZARDOUS LIQUID WASTE, DISPOSE OF IAW/FEDERAL; STATE & LOCAL REGULATIONS IN A PERMITTED HAZARDOUS WASTE TREATMENT/STORAGE/DISPOSAL FACILITY BY INCINERATION. UN1244 Handling And Storage Precautions: STORE AWAY FROM IGNITION SOURCES, IN WELL-VENTILATED AREA. DON'T STORE >124F, EXPOSE TO DIRECT LIGHT. DON'T CONTAMINATE. Other Precautions: ELECTRICALLY GROUND CONTAINERS & HANDLING EQUIPMENT. MAINTAIN INERT

ATMOSPHERE AT ALL TIMES. PACKAGE ONLY IN 304/307 STAINLESS STEEL CONTAINING <1% MOLYBDENUM. MATERIAL >5 YEARS OLD SHOULD BE RETESTED BEFORE USE.

==========

Fire and Explosion Hazard Information

==========

Flash Point Method: COC
Flash Point Text: 70F
Lower Limits: 2.5
Upper Limits: 98
Extinguishing Media: CO2, DRY CHEMICAL, WATER SPRAY.
Fire Fighting Procedures: USE WATER TO COOL CONTAINERS EXPOSED TO FIRE. WEAR A SELF CONTAINED BREATHING APPARATUS IN POSITIVE PRESSURE.
Unusual Fire/Explosion Hazard: AUTO-IGNITION TEMP: 382F. ABSORPTION OF MONOMETHYLHYDRAZINE BY RAGS/COTTON WASTE/SAWDUST/SIMILAR ORGANIC MATERIALS RESULT IN SPONTANEOUS IGNITION.

==========

Control Measures

==========

Respiratory Protection: WEAR A NIOSH/MSHA APPROVED FULL-FACE POSITIVE-PRESSURE
SUPPLIED AIR RESPIRATOR IF ANY EXPOSURE OCCURS.
Ventilation: USE EXPLOSION-PROOF LOCAL EXHAUST TO MAINTAIN LEVELS <TLV.
Protective Gloves: BUTYL RUBBER
Eye Protection: SAFETY GOGGLES & FACE SHIELD
Other Protective Equipment: BUTYL RUBBER BOOTS/APRON/PROTECTIVE SUIT, EYE WASH,
SAFETY SHOWER.
Work Hygienic Practices: REMOVE/LAUNDER CONTAMINATED CLOTHING BEFORE REUSE.
Supplemental Safety and Health: PH: 11-11.5 (5% IN NEUTRAL DISTILLED WATER).
SPILLS CONT'D: LAND: DIKE/TRENCH TO CONTAIN MATERIAL. NEUTRALIZE AFTER SPILL
REDUCED TO <5% CONCENTRATED SOLUTION. DON'T PLACE BACK IN ORIGINL CONTAINER. P ROPERLY LABLE & CONTAINERIZE. CLEAN AREA W/DETERGENT & FLUSH W/WATER. MATERIAL MAY BE NEUTRALIZED FOR DISPOSAL.

==========

Precautions for Safe Handling and Use

==========

Steps If Matl Released/Spill: REMOVE ALL IGNITION SOURCES. STOP SPILL AT SOURCE AS SOON AS POSSIBLE. CONTAIN LIQUID FOR TREATMENT/NEUTRALIZATION. REMOVE W/VACUUM SYSTEM/PUMPING DEVICE. LAND SPILL: DIKE/DILUTE TO BRING CONCENTRATION OF UDMH <30% & REMOVE AS LIQUID/CONTAINERIZE.
Neutralizing Agent: ADD WATER TO 5% OR 124F.
Other Precautions: DON'T EXPOSE TO DIRECT LIGHT. STABLE FOR AT LEAST ONE YEAR IF STORED UNDER NITROGEN & TIGHTLY SEALED TO EXCLUDE AIR.

==========

Control Measures

==========

Respiratory Protection: USE NIOSH/MSHA APPROVED RESPIRATOR.
Ventilation: LOCAL EXHAUST TO KEEP <TLV. TLV
Protective Gloves: BUTYL RUBBER
Eye Protection: FACE SHIELD W/SAFETY GLASSES
Other Protective Equipment: BUTYL RUBBER BOOTS, APRON & PROTECTIVE IMPERMEABLE SUIT. EYE WASH & SAFETY SHOWER.

Work Hygienic Practices: REMOVE/Llaunder CONTAMINATED CLOTHING BEFORE REUSE. DISCARD CONTAMINATED LEATHER ARTICLES.
Suppl. Safety & Health Data: MATERIAL TO AVOID: MOLYBDENUM CONTAINING ALLOYS SUCH AS HASTELLOY C & COPPER CONTAINING ALLOYS. METAL OXIDES, ABSORPTION OF 1,1-DIMETHYL HYDRAZINE BY RAGES, COTTON WASTE, SAWDUST, OR SIMILAR ORGANIC MATERIALS.

==========

Physical/Chemical Properties

==========

B.P. Text: 189.5F
M.P/F.P Text: -62.3F
Decomp Text: 190F
Vapor Pres: 49.6
Vapor Density: 1.59
Spec Gravity: 0.87
PH: (SUPP)
Solubility in Water: MISCIBLE
Appearance and Odor: CLEAR, COLORLESS LIQUID W/AMINE ODOR.
Percent Volatiles by Volume: 100

==========

Reactivity Data

==========

Stability Indicator: YES
Stability Condition To Avoid: TEMPS >190F, STATIC DISCHARGE, DIRECT SUNLIGHT,
HEAT, SPARKS, OPEN FLAME & OTHER IGNITION SOURCES.
Materials To Avoid: STRONG OXIDIZERS/HYDROGEN PEROXIDE/NITROGEN
TETROXIDE/FLUORINE/HALOGEN FLUORIDES/FUMING NITRIC ACID/METAL OXIDES.
Hazardous Decomposition Products: CO, NITROGEN OXIDES.
Hazardous Polymerization Indicator: NO

==========

Toxicological Information

==========

==========

Ecological Information

==========

==========

MSDS Transport Information

==========

==========

Regulatory Information

==========

==========

Other Information

==========

==========

HAZCOM Label

==========

Product ID: CPE810002 MONOMETHYLHYDRAZINE
Cage: 8X135
Company Name: OLIN CORP
Street: 51 CORPORATE WOODS 9393 W 110 ST
City: OVERLAND PARK KS
Zipcode: 66210
Health Emergency Phone: 203-356-3449

Label Required IND: Y
Date Of Label Review: 12/16/1998
Status Code: C
Label Date: 12/16/1998
Origination Code: G
Hazard And Precautions: INHALATION: NOSE/THROAT/UPPER RESPIRATORY TRACT/LUNG IRRITATION, PULMONARY EDEMA, LUNG/KIDNEY/LIVER/BLOOD DAMAGE, HEMOLYSIS OF BLOOD CELLS. SKIN: SEVERE IRRITATION/BURNS/DERMATITIS. EYES: BURNS/PERMAN ENT CORNEAL DAMAGE. INGESTION: IRRITATION/BURNS OF ENTIRE GI TRACT. MONOMETHYLHYDRAZINE IS CONSIDERED MUTAGENIC. IRRITATION, INFLAMMATION, BRONCHITIS, VOMITING, DIARRHEA, NAUSEA, DIZZINESS, CYA NOSIS, CONVULSIONS, SWELLING, REDNESS, DISCHARGE, ABDOMINAL PAIN, BLEEDING, TISSUE ULCERATION.

==========
Disclaimer (provided with this information by the compiling agencies): This information is formulated for use by elements of the Department of Defense. The United States of America in no manner whatsoever expressly or implied warrants, states, or intends said information to have any application, use or viability by or to any person or persons outside the Department of Defense nor any person or persons contracting with any instrumentality of the United States of America and disclaims all liability for such use. Any person utilizing this instruction who is not a military or civilian employee of the United States of America should seek competent professional advice to verify and assume responsibility for the suitability of this information to their particular situation regardless of similarity to a corresponding Department of Defense or other government situation.

HYDRAZINE

==========
General Information
==========
Item Name: Hydrazine Anhydrous
Company's Name: Fisher Scientific
Company's Street: 1 Reagent Lane
Company's City: Fairlawn
Company's State: NJ
Company's Zip Code: 07410
Company's Emerg Ph #: 201-796-7100
Company's Info Ph #: 201-796-7100
Date MSDS Prepared: 01JULY1999
Safety Data Review Date: 03APR2001
==========
Ingredients/Identity Information
==========
Ingredient: Hydrazine
Ingredient Sequence Number: 01
Percent: >95.0
CAS Number: 302-01-2
OSHA PEL: 1.0 ppm
ACGIH TLV: 0.01 ppm
==========

Hazards Identification

EMERGENCY OVERVIEW Flammable. Toxic by inhalation, in contact with skin and if swallowed. Causes burns. May cause sensitization by skin contact. May cause cancer. Very toxic to aquatic organisms; may cause long-term adverse effects in the aquatic environment.Corrosive.Cancer suspect agent. Potential Health Effects Eye: May cause irreversible eye injury. Exposure to the vapors or liquid may cause temporary blindness. Causes severe eye irritation and burns. Skin: May be fatal if absorbed through the skin. Prolonged and/or repeated contact may cause irritation and/or dermatitis. May cause skin sensitization, an allergic reaction, which becomes evident upon re-exposure to this material. Contact with liquid is corrosive and causes severe burns and ulceration. Contact with the skin may dissolve hair. Ingestion: Harmful if swallowed. Causes gastrointestinal irritation with nausea, vomiting and diarrhea. May cause liver and kidney damage. Causes digestive tract burns with immediate pain, swelling of the throat, convulsions, and possible coma. Exposure may cause anemia and other blood abnormalities.
Inhalation: Harmful if inhaled. Irritation may lead to chemical pneumonitis and pulmonary edema. May cause liver and kidney damage. Causes severe irritation of upper respiratory tract with coughing, burns, breathing difficulty, and possible coma. Vapors may cause dizziness, nausea, itching, burning, and swelling of the eyes.
Chronic: Repeated inhalation may cause chronic bronchitis. May cause cancer according to animal studies. Repeated exposure may cause sensitization dermatitis. May cause reproductive and fetal effects.

First Aid Measures

Eyes: Immediately flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Get medical aid immediately. Do NOT allow victim to rub or keep eyes closed.
Skin: Get medical aid immediately. Immediately flush skin with plenty of soap and water for at least 15 minutes while removing contaminated clothing and shoes. Discard contaminated clothing in a manner which limits further exposure. Ingestion: Do NOT induce vomiting. If victim is conscious and alert, give 2-4 cupfuls of milk or water. Never give anything by mouth to an unconscious person. Get medical aid immediately. Inhalation: Get medical aid immediately. Remove from exposure to fresh air immediately. If breathing is difficult, give oxygen. Do NOT use mouth-to-mouth resuscitation. If breathing has ceased apply artificial respiration using oxygen and a suitable mechanical device such as a bag and a mask.
Notes to Physician:

Fire Fighting Measures

General Information: As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. Vapors can travel to a source of ignition and flash back. Use water spray to keep fire-exposed containers cool. Flammable liquid and vapor. Autoignition temperature varies based upon contact surface. Vapors may be heavier than air. They can spread along the ground and collect in low or confined areas. May be ignited by heat, sparks, and flame. Vapors may form an explosive mixture with air. Containers may explode when heated. Extinguishing Media: For large

fires, use water spray, fog, or alcohol-resistant foam. Use water spray to cool fire-exposed containers. Do NOT get water inside containers. For small fires, use dry chemical, carbon dioxide, or water spray. Cool containers with flooding quantities of water until well after fire is out.

Accidental Release Measures

General Information: Use proper personal protective equipment as indicated in Section 8. Spills/Leaks: Use water spray to disperse the gas/vapor. Remove all sources of ignition. Absorb spill using an absorbent, non-combustible material such as earth, sand, or vermiculite. Do not use combustible materials such as saw dust. Do not get water inside containers. A vapor suppressing foam may be used to reduce vapors. Water spray may reduce vapor but may not prevent ignition in closed spaces.

Handling and Storage

Handling: Wash thoroughly after handling. Remove contaminated clothing and wash before reuse. Use only in a well-ventilated area. Ground and bond containers when transferring material. Use spark-proof tools and explosion proof equipment. Do not get in eyes, on skin, or on clothing. Empty containers retain product residue, (liquid and/or vapor), and can be dangerous. Keep container tightly closed. Avoid contact with heat, sparks and flame. Do not ingest or inhale. Store protected from light. Do not pressurize, cut, weld, braze, solder, drill, grind, or expose empty containers to heat, sparks or open flames. Storage: Keep away from heat, sparks, and flame. Keep away from sources of ignition. Do not store in direct sunlight. Store in a tightly closed container. Store in a cool, dry, well-ventilated area away from incompatible substances. Storage under a nitrogen blanket has been recommended.

Exposure Controls, Personal Protection

Engineering Controls: Use adequate general or local explosion-proof ventilation to keep airborne levels to acceptable levels. Personal Protective Equipment Eyes: Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166. Skin: Wear appropriate protective gloves to prevent skin exposure. Clothing: Wear appropriate protective clothing to prevent skin exposure. Respirators: Follow the OSHA respirator regulations found in 29CFR 1910.134 or European Standard EN 149. Always use a NIOSH or European Standard EN 149 approved respirator when necessary.

Physical and Chemical Properties

Physical State: Waxy Solid
Appearance: colourless
Odor: strong odor - ammonia-like
pH: Not available.
Vapor Pressure: 14.4 mm Hg @ 25
Vapor Density: 1.1 @ 15C
Evaporation Rate: Not available.
Viscosity: 0.90

Boiling Point: 236 deg F
Freezing/Melting Point: 35.6 deg F
Autoignition Temperature: 518 deg F (270.00 deg C)
Flash Point: 100 deg F (37.78 deg C)
Explosion Limits, lower: 4.7
Explosion Limits, upper: 100.0
Decomposition Temperature: Not available.
Solubility: Miscible in water.
Specific Gravity/Density: 1.01 (water=1)
Molecular Formula: N2H4
Molecular Weight: 32.0414

==========

Stability and Reactivity

==========

Chemical Stability: Thermally unstable. Conditions to Avoid: Incompatible materials, light, ignition sources, combustible materials, temperatures above 150&C, strong oxidants.
Incompatibilities with Other Materials: Substance is highly reactive reducing agent. Incompatible with oxidizing agents (including air), acids, and some metal oxides and metals. Substance may spontaneously ignite in air when in contact with porous materials. Ignites on contact with dinitrogen oxide and tetroxide, hydrogen peroxide, tetryl, and nitric acid. Explodes on contact with dicyanofurazan, n-halomides, potassium, silver compounds, sodium hydroxide, titanium compounds, and trioxygen difluoride. Explosive compounds may result from contact with air, chloromethylnitrobenzene, lithium perchlorate, metal salts, methanol + nitromethane, sodium , and sodium perchlorate. Also incompatible with barium oxide or calcium oxide, benzeneseleninic acid or anhydride, calcium, carbon dioxide + stainless steel, 1-chloro-2,4-dinitrobenzene, cotton waste + heavy metals, (difluoroamino)difluoroacetonitrile, iodine pentoxide, rust, ruthenium(III) oxide, thiocarbonyl azide thiocyanate, Hazardous Decomposition Products: Oxides of nitrogen, ammonia and/or derivatives.
Hazardous Polymerization: Has not been reported.

==========

Toxicological Information

==========

RTECS#:
CAS# 302-01-2: MU7175000 LD50/LC50: CAS# 302-01-2: Dermal, guinea pig: LD50 = 190 mg/kg; Inhalation, mouse: LC50 = 252 ppm/4H; Inhalation, rat: LC50 = 570 ppm/4H; Oral, mouse: LD50 = 59 mg/kg; Oral, rat: LD50 = 60 mg/kg; Skin, rabbit: LD50 = 91 mg/kg.
Carcinogenicity: Hydrazine - ACGIH: A3 - animal carcinogen
California: carcinogen; initial date 1/1/88
NIOSH: occupational carcinogen
NTP: Suspect carcinogen
OSHA: Possible Select carcinogen
IARC: Group 2B carcinogen
Epidemiology: This substance has shown a high tumor-generating potential in multiple studies. Hydrazine has been classified as carcinogenic in many rodent studies following long-term administration. The major target tissues include: liver, lungs, and respiratory tract. Please refer to Patty's Industrial Hygiene and Toxicology for specific information. Substance is listed by CA Proposition 65. IARC has determined that there is sufficient evidence of carcinogenicity to animals and inadequate evidence for humans.

Teratogenicity: Effects on Newborn: Viability index, subcutaneous-rat TDLo=80mg/kg
Embryo or Fetus: Death and Fetotoxicity, inhalation-rat TCLo= 1mg/m3/24H. Specific Developmental Abnormalities: Central nervous system/Musculoskeletal/Urogenital, intraperitoneal-rat TDLo=30mg/kg. Reproductive Effects: Post-implantation mortality, inhalation-rat TCLo=4mg/m3/2H. Maternal Effects: Ovaries/Fallopian tubes. Inhalation, ratTCLo=5ppm/6H; Paternal Effects: Testes/Sperm duct/Epididymis. Inhalation-hamster TCLo=1ppm/6H. Neurotoxicity: No information available. Mutagenicity: DNA Damage: hamster oral 15mg/kg, rat liver 3mmol/L. DNA Inhibition: mouse oral 200mg/kg, rat oral 60mg/kg. Unscheduled DNA Synthesis: hamster ovary 250ug/L, rat oral 60mg/kg, rat lung 250ug/L. Oncogenic Transformation: human liver 80ug/L, human cell types 35mg/L. Other Studies: Please refer to RTECS MU7175000 for additional information.

Ecological Information

Ecotoxicity: Rainbow trout (fresh water) 146ppm/0.5H (Lethal) Guppy (hard water): LC50 = 3.85mg/L/96H Guppy (soft water): LC50 = 0.61mg/L/96H Bluegill sunfish: LC50 = 1.08mg/L/96H

Disposal Considerations

Dispose of in a manner consistent with federal, state, and local regulations.

Transportation Information

US DOT
Shipping Name: HYDRAZINE ANHYDROUS-POISON
Hazard Class: 8
UN Number: UN2029
Packing Group: I
Canadian TDG
Shipping Name: HYDRAZINE, ANHYDROUS
Hazard Class: 3(6.1)(8)
UN Number: UN2029
Other Information: FLASHPOINT 38 C

Regulatory Information

US FEDERAL
TSCA
CAS# 302-01-2 is listed on the TSCA inventory.
This material does not contain any Class 2 Ozone depletors.
Clean Water Act:
None of the chemicals in this product are listed as Hazardous Substances under the CWA.
None of the chemicals in this product are listed as Priority Pollutants under the CWA.
None of the chemicals in this product are listed as Toxic Pollutants under the CWA.

OSHA:

None of the chemicals in this product are considered highly hazardous by OSHA.

STATE

Hydrazine can be found on the following state right to know lists: California, New Jersey, Florida, Pennsylvania, Minnesota, Massachusetts.

The following statement(s) is(are) made in order to comply with the California Safe Drinking Water Act:

WARNING: This product contains Hydrazine, a chemical known to the state of California to cause cancer.

California No Significant Risk Level:

CAS# 302-01-2: no significant risk level = 0.04 ug/day

European/International Regulations

European Labeling in Accordance with EC Directives

Hazard Symbols: T N

Risk Phrases:

R 10 Flammable.

R 23/24/25 Toxic by inhalation, in contact with skin and if swallowed.

R 34 Causes burns.

R 43 May cause sensitization by skin contact.

R 45 May cause cancer.

R 50/53 Very toxic to aquatic organisms; may cause long-term adverse effects in the aquatic environment.

Safety Phrases:

S 53 Avoid exposure - obtain special instructions before use.

S 45 In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).

S 60 This material and/or its container must be Disposed of as hazardous waste.

S 61 Avoid release to the environment. Refer to special instructions/Safety data sheets.

WGK (Water Danger/Protection)

CAS# 302-01-2: 3

United Kingdom Occupational Exposure Limits

Canada

CAS# 302-01-2 is listed on Canada's DSL List.

CAS# 302-01-2 is listed on Canada's Ingredient Disclosure List.

Exposure Limits

CAS# 302-01-2: OEL-AUSTRALIA:TWA 0.1 ppm (0.1 mg/m3);Skin;Carcinogen

OEL-CZECHOSLOVAKIA:TWA 0.05 mg/m3;STEL 0.1 mg/m3

OEL-DENMARK:TWA 0.1 ppm (0.13 mg/m3);Skin;Carcinogen

OEL-FINLAND:TWA 0.1 ppm (0.13 mg/m3);STEL 0.3 ppm (0.4 mg/m3);Skin;Car cinogen

OEL-FRANCE:TWA 0.1 ppm (0.1 mg/m3);Carcinogen

OEL-GERMANY;Skin;Carcinogen

OEL-THE NETHERLANDS:TWA 0.1 ppm (0.13 mg/m3);Skin

OEL-THE PHILIPPINES:TWA 1 ppm (1.3 mg/m3);Skin

OEL-RUSSIA:STEL 0.1 mg/m3;Skin

OEL-SWEDEN:TWA 0.1 ppm (0.1 mg/m3);STEL 0.3 ppm (0.4 mg/m3);Skin;Carci
nogen
OEL-SWITZERLAND:TWA 0.1 ppm (0.13 mg/m3);Skin;CAR
OEL-TURKEY:TWA 1 ppm (1.3 mg/m3);Skin
OEL-UNITED KINGDOM;Skin
OEL IN BULGARIA, COLOMBIA, JORDAN, KOREA check ACGIH TLV
OEL IN NEW ZEALAND, SINGAPORE, VIETNAM check ACGI TLV

==========

Additional Information

==========

MSDS Creation Date: 7/01/1999 Revision #4 Date: 4/03/2001
The information above is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantability or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes. In no way shall the company be liable for any claims, losses, or damages of any third party or for lost profits or any special, indirect, incidental, consequential or exemplary damages, howsoever arising, even if the company has been advised of the possibility of such damages.

KEROSENE

General Information

==========

Item Name: Kerosene
Company's Name: T.W. Brown Oil Co., Inc.
Company's Street: 1857 Knoll Drive
Company's City: Ventura
Company's State: CA
Company's Country: US
Company's Zip Code: 93003
Date MSDS Prepared: 31Jan99

Chemical Name: Kerosene
CAS Number: 8008-20-6

Synonyms/Common Names: This Material Safety Data Sheet applies to the following product descriptions for Hazard Communication purposes only. Technical specifications vary greatly depending on the product, and are not reflected in this document. Consult specification sheets for technical information.
Kerosene
K1-Kerosene
Jet-A Turbine Fuel
Jet-Q Turbine Fuel
Low Aromatic Feedstock Dyed K-1 Kerosene
JP-5
JP-8
Turbine Fuel Dyed Highway #1 Diesel
#1 Diesel Fuel, On-Road
On-Highway #1 Diesel

Off-Road #1 Diesel

==========

Ingredients/Identity Information

==========

Description: Kerosene is a complex mixture of hydrocarbons from a variety of chemical processes blended to meet standardized product specifications. Composition varies greatly and includes C9 to C16 hydrocarbons with a boiling range of about 300-550 degrees F. The following is a non-exhaustive list of common components, typical percentage ranges in product, and occupational exposure limits for each. Functional and performance additives may also be present at concentrations below reporting thresholds.

Proprietary: NO
Ingredient: Hydrodesulfurized Kerosene
Ingredient Sequence Number: 01
Percent: 0-100
CAS Number: 64742-81-0
OSHA PEL: N/A -- N/A -- N/A -- N/A
ACGIH TLV: 100* -- NA -- mg/m3
Other Recommended Limit: NONE RECOMMENDED

Proprietary: NO
Ingredient: Hydrotreated distillate light
Ingredient Sequence Number: 02
Percent: 0-100
CAS Number: 64742-47-8
OSHA PEL: N/A -- N/A -- N/A -- N/A
ACGIH TLV: 100* -- NA -- mg/m3
Other Recommended Limit: NONE RECOMMENDED

Proprietary: NO
Ingredient: Kerosene, straight run
Ingredient Sequence Number: 03
Percent: 0-100
CAS Number: 8008-20-6
OSHA PEL: N/A -- N/A -- N/A -- N/A
ACGIH TLV: 100* -- NA -- mg/m3
Other Recommended Limit: NONE RECOMMENDED

The ACGIH has proposed adopting an exposure limit of 100 mg/m3 for Diesel fuel/Kerosene. NIOSH has also proposed 100 mg/m3 for an 8 hr. TWA or~14 ppm 8 hr. TWA, based on an average molecular weight of 170 for kerosene like fractions. Product may contain traces of sulfur and benzene.

==========

HAZARDS IDENTIFICATION

==========

Health Hazard Data:

1. The major effect of exposure to this product is headache, drowsiness, irritation of the eyes and nose, and lungs. Target organs include the respiratory system, nervous system, and mucous membranes.

2. NIOSH recommends that whole diesel engine exhaust be regarded as a potential occupational carcinogen. Follow OSHA and NSHA rules where diesel engine exhaust fumes may be generated.

3. A life time skin painting study by the American Petroleum Institute has shown that similar naphtha products with a boiling range of 350-700 degrees F usually produce skin tumors and/ or skin cancers in laboratory mice. Only a weak to moderate response occurred. The effect to humans has not been determined. Contact dermatitis (skin irritation) may occur with prolonged or repeated contact.

4. IARC has listed kerosene as probably carcinogenic to humans based on sufficient evidence in experimental animals and limited evidence in humans.

Hazards of Combustion Products: Carbon monoxide and carbon dioxide can be found in the combustion products of this product and other forms of hydrocarbon combustion. Carbon monoxide in moderate concentrations can cause symptoms of headache, nausea, vomiting, increased cardiac output, and confusion. Exposure to higher concentrations of carbon monoxide can cause loss of consciousness, heart damage, brain damage, and/or death. Exposure to high concentrations of carbon dioxide can cause simple asphyxiation by displacing available oxygen. Combustion of this and other similar materials should only be carried out in well ventilated areas. The National Kerosene Heater Association has released preliminary test results that indicate no increased emissions of carbon monoxide or nitrogen dioxide resulted from using red-dyed kerosene in "new generation" heaters.

Medical Condition Generally Aggravated By Exposure: Medical conditions which have the same symptoms and effects as those outlined under the health hazard information section can be aggraved by exposure to this product.

Medical Limitation: N/A

Routes Of Exposure

Inhalation: Irritation of the upper respiratory tract and eyes, with possible euphoria, dizziness, headache, discoordination, ringing in the ears, convulsions, coma, and respiratory arrest.
Skin Contact: Defatting of the skin may occur with continued and prolonged contact. Irritation and burning sensation may occur on exposure to the liquid or mists, as well as the possibility of blisters. Hair loss can occur upon chronic exposure.

Skin Absorption: Not significant.

Eye Contact: Severe burning sensation with temporary irritation and swelling of lids.

Ingestion: Irritation of the mucous membranes of throat, esophagus and stomach which may result in nausea and vomiting; central nervous system depression may occur, if absorbed (see inhalation symptoms above). If aspirated, chemical pneumonitis may occur with potentially fatal results.

Carcinogenicity Statement: Kerosene is not listed as carcinogenic by NTP, OSHA, and ACGIH. IARC has listed kerosene as a probable human carcinogen (2A).

FIRST AID MEASURES

Eyes: Immediately flush eyes with large amount of water for at least 15 minutes holding lids apart to ensure flushing of the entire eye surface. SEEK MEDICAL ATTENTION.

Skin: Wash contaminated areas with plenty of soap and water. A soothing ointment may be applied to irritated skin after thoroughly cleansing. Remove contaminated clothing and footwear. SEEK MEDICAL ATTENTION.

Inhalation: Get person out of contaminated area to fresh air. If breathing has stopped resuscitate and administer oxygen if readily available. SEEK MEDICAL ATTENTION IMMEDIATELY.

INGESTION: Never give anything by mouth to an unconscious person. If swallowed, do not induce vomiting. If vomiting occurs spontaneously, keep airway clear. SEEK MEDICAL ATTENTION IMMEDIATELY.

Note to Physician: Do not induce vomiting, use gastric lavage only. Aspiration of liquid into the lungs could result in Chemical pneumonitis. Use of adrenaline is not advised. Treat symptomatically.

FIRE AND EXPLOSION DATA

Flash Point: 100 degrees F PM (minimum)
Autoignition Temperature: 410 degrees F
Flammable Limits In Air: UEL: 5% - LEL: 0.7%

Extinguishing Media: Use dry chemical, carbon dioxide, foam or water spray. Water may be ineffective in fighting fires of liquids with low flash points, but water should be used to keep fire exposed containers cool. If a leak or spill has not ignited, use water spray to disperse the vapors and to protect persons attempting to stop a leak.

Special Fire Fighting Procedures: Pressure-demand, self contained, breathing apparatus should be provided for fire fighters in buildings or confined areas where product is stored.

Unusual Fire And Explosion Hazard: Clothing, rags, or similar organic material contaminated with the product and stored in a closed space may undergo spontaneous combustion. Vapor accumulation is possible, and flashback can occur with explosive force if vapors are ignited.

ACCIDENTAL RELEASE MEASURES

If material is spilled, steps should be taken to contain liquid and prevent discharges to streams or sewer systems and control or stop the loss of volatile materials to the atmosphere. Spills or releases should be reported, if required to the appropriate local, state and federal regulatory agencies.

Small Spills: Remove ignition sources. Absorb spilled material with non-combustible materials such as cat litter, dirt, sand, or petroleum sorbent pads/pillows. Do not use combustible materials like rags, wood

chips, or saw dust. Remove contaminated materials to an appropriate disposal container.

Large Spills: Remove ignition sources. Dike spill area with sand or dirt to contain material and cover sewers/drains. Remain upwind and keep unnecessary people away. Contact trained emergency response team for cleanup. Remove liquid using grounded suction pumps, isolate hazard area and deny entry.

HANDLING and STORAGE

Store only in approved containers. Protect containers against physical damage. Outside or detached storage is preferred. Separate from oxidizing materials. Store in cool, well ventilated area of non-combustible construction away from possible sources of ignition. Keep away from incompatible materials and follow OSHA 29 CFR 1910.106 and NFPA 30 for storage requirements.

Product Use: This product is intended for use as a fuel in engines and heaters designed for kerosene or diesel fuels, and for use in engineered processes. Use in other applications may result in higher exposures and require additional controls, such as local exhaust ventilation and personal protective equipment.

EXPOSURE CONTROLS/PERSONAL PROTECTION

Ventilation Requirements: Work in well ventilated areas using good engineering practices to process, transfer and store. Special ventilation in not required unless product is sprayed or heated. High volume use may require engineering controls.

Specific Personal Protective Equipment
Respiratory: Respiratory protection is not required unless product is sprayed or heated. Use NIOSH approved respiratory protection following manufacture's recommendations where spray, mists, or vapors may be generated. Supplied air respiratory protection is required for IDLH areas. See 29 CFR 1910.134 for OSHA Respirator Protection regulations.
Eye: Face shield and goggles or chemical goggles should be worn where mist or spray may be generated, and where splashing occurs. Shower and eyewash facilities should be accessible.

Gloves: Impermeable protective gloves such as nitrile gloves should be worn during routine handling of this product. Barrier creams may also be appropriate where tactile sensitivity is required.

Other Clothing and Equipment: Clothing contaminated with this product should be removed and laundered before reuse. Items which can not be laundered should be discarded. Allow contaminated items to air dry or hang in a well ventilated area. Spontaneous combustion or fire may result from contaminated materials being placed together before drying.

Exposure Monitoring

Biological: No applicable procedure, breath analysis for hydrocarbons has been suggested.

Personal/Area: Monitor for kerosene using both active and passive monitors employing charcoal adsorption follow by gas chromatography. An average molecular weight of 170 has been suggested as the average value to convert the determined weight of hydrocarbons to ppm. Direct reading colorimetric tubes are available to evaluate short term exposure.

PHYSICAL and CHEMICAL PROPERTIES

Appearance and Odor: Colorless to pale straw, or red oily liquid with characteristic odor.
Viscosity: Specification dependent, 1.0-1.9 cSt @ 40 degrees C for K1, 8.0 cSt max @ -4 degrees C for Jet-A.
Boiling Range @ 760 mm Hg: 304-574 degrees F (151-301 degrees C)
Vapor Density (Air=1): 4.5
Evaporation Rate (BuAc=1): N/A
Specific Gravity (H2O=1): 0.80-0.81
Bulk Density At 60 degrees F: 6.67 lbs./gal.
Solubility in H2O % by WT.: Insoluble
Freezing Point: 0 degrees F (-18 degrees C)
Vapor Pressure: 0.5 mmHg @ 20 degrees C
% Volatiles By Vol.: N/A
API Gravity: Specification dependent
pH: NA

STABILITY AND REACTIVITY INFORMATION

Conditions Contributing to Instability: Under normal conditions, the material is stable. Avoid sources of ignition such as flames, hot surfaces, sparks, and electrical equipment.

Incompatibility: Avoid contact with strong oxidizers such as chlorine, fluorine, nitrogen tetraoxide, concentrated oxygen, and sodium hypochlorite or other hypochlorites.

Hazardous Decomposition Products: Thermal decomposition products may include carbon monoxide, carbon dioxide, oxides of sulfur and nitrogen, and other toxic gases

Hazardous Polymerization: Material is not known to polymerize.

TOXICOLOGICAL INFORMATION

For detailed information, contact MSDS Assistance at (210) 592-4593

ECOLOGICAL INFORMATION

For detailed information, contact MSDS Assistance at (210) 592-4593

DISPOSAL CONSIDERATIONS

Shipment, storage, disposal, and cleanup actions of waste materials are regulated under local, state and federal rules. Contact the appropriate agencies if uncertain of applicability. Waste product and contaminated material having a flash point below 140 degrees F is considered a

hazardous waste. DOT Hazardous Waste Number D001 applies. Consult 40 CFR 262 for EPA disposal requirements.

TRANSPORT INFORMATION

DOT Proper Shipping Name	Kerosene	Diesel Fuel	Fuel, aviation, turbine engine
DOT Hazard Class*	3*	3*	3*
DOT Packing Group (PG)	III	III	III
I.D. Number	UN 1223*	NA 1993	UN 1863*
Required Labeling	Flammable Liquid	Flammable Liquid	Flammable Liquid

* Since this product has a flash point >100 degrees F and no other hazard class applies, it may be reclassed as Combustible Liquid and NA 1993 substituted for the product specific I.D.
Number above. Consult 49 CFR 173.120 for specific details.

REGULATORY INFORMATION

TSCA (Toxic Substance Control Act) Inventory
Gasoline is listed in the TSCA inventory.

SARA (Superfund Amendments and Reauthorization Act) TITLE III
This product is reportable under SARA Title III, Sections 311 & 312 as a hazardous substance.

Hazard Categories Applicable under 40 DFR 370.2 (SARA Section 311):

Acute Health	Chronic Health	Pressure	Fire	Reactive
Yes	Yes	No	Yes	No

Components Listed under 40 CFR 372.2 (SARA Section 311):
This product does not contain chemicals identified as toxic by EPA under CFR part 372 and is not subject to the reporting requirements of this section.
State Regulations:
California Proposition 65: This product does not contain chemicals known to the State of California to cause cancer, birth defects, or other reproductive harm.

OTHER INFORMATION

NFPA (National Fire Protection Association) Hazard Ratings Codes*

Fire	Health	Reactivity	Other
2	1	0	Blank

*Based on Standard System for the Identification of the Fire Hazards of Materials, NFPA No. 704 M

This material safety data sheet was prepared by T. W. Brown Oil Co., Inc. in accordance with 29 CFR 1910.1200. All information, recommendations and suggestions appearing herein concerning this product are based upon tests and data believed to be reliable, however, it is the user's responsibility to determine the safety, toxicity and suitability for his own use of the product described herein. Since the actual use by others is beyond our control, no guarantee expressed or implied is made by T. W. Brown Oil Co., Inc. as to the effects of such use, the results to be obtained or the safety and toxicity of the product nor does T. W. Brown Oil Co., Inc. assume any liability arising out of use by others of the product referred to herein. Nor is the

information herein to be construed as absolutely complete since additional information may be necessary or desirable when particular or exceptional conditions or circumstances exist or because of applicable laws or government regulations.

Government Agencies and Private Associations
ACGIH- American Conference of Governmental Industrial hygienists, (private association)

DOT- United States Department of Transportation

EPA- United States Environmental Protection Agency

IARC- International Agency for Research on Cancer, (private association)

NFPA- National Fire Protection Association, (private association)

MSHA- Mine Safety and Health Administration, U.S. Department of Labor

NIOSH- National Institute of Occupational Safety and Health, U.S. Department of Health and Human Services
NTP- National Toxicology Program, (private association)
OSHA- Occupational Safety and Health Administration, U.S. Department of Labor

Hazard and Exposure Information

Acute Hazard- An adverse health effect which occurs rapidly as a result of short term exposure.

CAS#- American Chemical Societies Chemical Abstract service registry number which identifies the product and/or ingredients.

Ceiling- The concentration that should not be exceeded during any part of the working exposure

Chronic Hazard- An adverse health effect which generally occurs as a result of long term exposure or short term exposure with delayed health effects and is of long duration

Fire Hazard- A material that poses a physical hazard by being flammable, combustible, phyrophoric or an oxidizer as defined by 29 CFR 1910.1200

Hazard Class- DOT hazard classification

IDLH- Immediately Dangerous to Life and Health, the airborne concentration below which a person can escape without respiratory protection and exposure up to 30 minutes, and not suffer debilitation or irreversible health effects. Established by NIOSH.

mg/m3- Milligrams of contaminant per cubic meter of air, a mass to volume ratio

N/A- Not available or no relevant information found

NA- Not applicable

PEL- OSHA permissible exposure limit; an action level of one half this value may be applicable

ppm- Part per million (one volume of vapor or gas in one million volumes of air)

Pressure Hazard- A material that poses a physical hazard due to the potential to become unstable reactive, water reactive or that is an organic peroxide as defined by 29 CFR 1910.1200

STEL- The ACGIH short-term exposure limit, a 15-minute time-weighted average exposure which should not be exceeded at any time during a workday, even if the 8-hour TWA is less than the TLV

8-hour TWA- The time weighted average concentration for a normal 8-hour workday and a 40-hour workweek, to which nearly all workers may be repeatedly exposed, day after day, without adverse effect.

~~W~~- Do Not Add Water- water reactive materials may produce toxic gas, extreme heat, or chemical reaction on contact with water

BENZENE

POLYSCIENCE -- BENZENE, PRODUCT #: 251C-1 - BENZENE, ACS.POLYSCIENCE -- BENZENE, PRODUCT #: 251C-1 - BENZENE, ACS.
MATERIAL SAFETY DATA SHEET
NSN: 6810002815266
Manufacturer's CAGE: 58378
Part No. Indicator: A
Part Number/Trade Name: BENZENE, PRODUCT #: 251C-1

General Information
==========
Item Name: BENZENE, ACS.
Company's Name: POLYSCIENCE
Company's Street: 7800 MERRIMAC AVE
Company's City: NILES
Company's State: IL
Company's Country: US
Company's Zip Code: 60648
Record No. For Safety Entry: 003
Tot Safety Entries This Stk#: 006
Status: SE
Date MSDS Prepared: 01MAR92
Safety Data Review Date: 05AUG94
Supply Item Manager: CX
MSDS Serial Number: BTSWC
Specification Number: 0-C-265C (RED SPEC)
Hazard Characteristic Code: F3
Unit Of Issue: CN

Unit Of Issue Container Qty: 20 LITERS
Type Of Container: METAL/PLASTIC
Net Unit Weight: 36.4 LBS

Ingredients/Identity Information

Proprietary: NO
Ingredient: BENZENE (SARA III)
Ingredient Sequence Number: 01
Percent: 100
NIOSH (RTECS) Number: CY1400000
CAS Number: 71-43-2
OSHA PEL: SEE 1910.1028
ACGIH TLV: 10 PPM; A2; 9394
Other Recommended Limit: NONE RECOMMENDED

Physical/Chemical Characteristics

Appearance And Odor: COLORLESS LIQUID.
Boiling Point: 176F,80C
Vapor Pressure (MM Hg/70 F): 7403 @20C
Vapor Density (Air=1): 2.77
Specific Gravity: 0.874
Autoignition Temperature: 928F

Fire and Explosion Hazard Data

Flash Point: 12F,-11C
Lower Explosive Limit: 1.3
Upper Explosive Limit: 7.1
Extinguishing Media: CARBON DIOXIDE, DRY CHEM POWDER OR APPROPRIATE FOAM.
WATER MAY BE EFFECTIVE FOR COOLING BUT MAY NOT EFFECT EXTINGUISHMENT
Special Fire Fighting Proc: WEAR SELF-CONTAINED BREATHING APPARATUS AND PROTECTIVE CLOTHING TO PREVENT CONTACT W/SKIN & EYES. USE WATER SPRAY TO COOL FIRE-EXPOSED CONTAINERS.
Unusual Fire And Expl Hazrds: EXTREMELY FLAMMABLE. VAPOR MAY TRAVEL CONSIDERABLE DISTANCE TO SOURCE OF IGNITION AND FLASHBACK. CONTAINER EXPLOSION MAY OCCUR UNDER FIRE CONDITIONS.

Reactivity Data

Cond To Avoid (Stability): HIGHT TEMPERATURES. SOURCES OF IGNITION.
Materials To Avoid: OXIDIZING AGENTS.
Hazardous Decomp Products: TOXIC FUMES OF CARBON MONOXIDE AND CARBON DIOXIDE.

Health Hazard Data

LD50-LC50 Mixture: LD50 (ORAL,RAT)=930 MG/KG
Route Of Entry - Inhalation: YES
Route Of Entry - Skin: YES
Route Of Entry - Ingestion: NO
Health Haz Acute And Chronic: ACUTE: HARMFUL IF SWALLOWED, INHALED, ABSORBED THRU SKIN.IRRIT TO MUC MEM & UPPER RESP TRACT.CAUSES SKIN & SEVERE EYE IRRIT.CHRONIC: CARCINOGEN.MAY ALTER GENETIC MATERIAL.BLOOD EFFECTS.

Carcinogenicity - NTP: YES
Carcinogenicity - IARC: YES
Carcinogenicity - OSHA: YES
Explanation Carcinogenicity: CONTAINS Benzene [71-43-2] WHICH IS LISTED BY NTP AND IARC AND REGULATED BY OSHA AS A CARCINOGEN.
Signs/Symptoms Of Overexp: NAUSEA, DIZZ, HEAD, NARCOTIC EFFECT.CANCER. EXHILARATION, NERVOUS EXCITATION &/OR GIDD, DEPRESS, DROWSINESS, FATIGUE. TIGHTNESS IN CHEST, BREATHLESSNESS,LOSS OF CONSC,TREMORS,CONVULS,DEATH DUE TO RESP PARA OR CIRCULATORY COLLAPSE.DRYING,SCALING DERM,2NSD SKIN INFECTIONS.BLEEDING FROM NOSE/GUMS/MUC MEM,SMALL BLISTERS,LEUKOPENIA.
Med Cond Aggravated By Exp: NONE SPECIFIED BY MANUFACTURER.
Emergency/First Aid Proc: IMMED FLUSH EYES OR SKIN W/COPIOUS AMTS OF WATER FOR @ LEAST 15MINS WHILE REMOVING CONTAMINATED CLOTHING/SHOES. IF INHALED, REMOVE TO FRESH AIR. IF NOT BREAHTING GIVE ARTIFICIAL RESPIRATION. IF BREATHING IS DIFFICULT GIVE OXYGEN. IF SWALLOWED WASH OUT MOUTH W/WATER PROVIDED PERSON IS CONSCIOUS. CALL A PHYSICIAN.

Precautions for Safe Handling and Use

Steps If Matl Released/Spill: EVACUATE AREA.SHUT OFF ALL IGNITION SOURCES.
WEAR SCBA, RUBBER BOOTS & HEAVY RUBBER GLOVES.COVER W/ACTIVATED CARBON ADSORBENT.TAKE UP & PLACE IN CLOSED CONTAINERS.TRANSPORT OUTDOOORS. VENITLATE AREA & WASH SITE AFTER MATL PICKUP IS COMPLETE.
Neutralizing Agent: NOT RELEVANT.
Waste Disposal Method: BURN IN A CHEMICAL INCINERATOR EQUIPPED W/AN AFTERBURNER & SCRUBBER BUT EXERT EXTRA CARE IN IGNITING AS THIS MATERIAL IS HIGHLY FLAMMABLE. OBSERVE ALL LOCAL, STATE AND FEDERAL LAWS.
Precautions-Handling/Storing: WEAR APPROPRIATE NIOSH/MSHA APPROVED RESP, CHEM-RESIST GLOVES, SAFTY GOGGLES, OTHER PROTECTIVE CLOTH.USE ONLY IN CHEMICAL FUME HOOD.USE NONSPARKING TOOLS
Other Precautions: DON'T BREATHE VAPOR.DON'T GET IN EYES,ON SKIN,ON CLOTHING.AVOID PROLONG/REPEAT EXPOSURE.KEEP TIGHTLY CLOSED.KEEP AWAY FROM HEAT, SPARKS, OPEN FLAME.STORE IN COOL DRY PLACE.IF FEEL UNWELL SEEK MED ADVICE (SHOW LABEL WHERE POSSIBLE).

Control Measures

Respiratory Protection: WEAR APPROPRIATE NIOSH/MSHA-APPROVED RESPIRATOR.
Ventilation: CHEMICAL FUME HOOD WHICH IS EXPLOSION PROOF.
Protective Gloves: CHEMICAL RESISTANT GLOVES.
Eye Protection: SAFETY GOGGLES.
Other Protective Equipment: PROTECTIVE SUITABLE CLOTHING TO MINIMIZE SKIN CONTACT. SAFETY SHOWER & EYE BATH.
Work Hygienic Practices: WASH CONTAMINATED CLOTHING PROMPTLY.WASH THOROUGHLY AFTER HANDLING.

Transportation Data

Trans Data Review Date: 94217
DOT PSN Code: BRS
DOT Proper Shipping Name: BENZENE
DOT Class: 3
DOT ID Number: UN1114

DOT Pack Group: II
DOT Label: FLAMMABLE LIQUID
IMO PSN Code: BXB
IMO Proper Shipping Name: BENZENE
IMO Regulations Page Number: 3185
IMO UN Number: 1114
IMO UN Class: 3.2
IMO Subsidiary Risk Label: -
IATA PSN Code: DBA
IATA UN ID Number: 1114
IATA Proper Shipping Name: BENZENE
IATA UN Class: 3
IATA Label: FLAMMABLE LIQUID
AFI PSN Code: DBA
AFI Symbols: 0
AFI Prop. Shipping Name: BENZENE
AFI Class: 3
AFI ID Number: UN1114
AFI Pack Group: II
AFI Basic Pac Ref: 7-7
N.O.S. Shipping Name: BENZENE.
Additional Trans Data: PER CTDF SHIPPING NAME:BENZENE, UNIT CAN
CONTAINS
20 LITERS. FOR PALLETIZATION REQMTS:METAL OR PLASTIC 5 GALLON
CONTAINER.
==========

Disposal Data

==========
==========

Label Data

==========
Label Required: YES
Technical Review Date: 05AUG94
Label Status: F
Common Name: BENZENE, PRODUCT #: 251C-1
Chronic Hazard: YES
Signal Word: DANGER!
Acute Health Hazard-Severe: X
Contact Hazard-Moderate: X
Fire Hazard-Severe: X
Reactivity Hazard-None: X
Special Hazard Precautions: HARMFUL IF SWALLOWED, INHALED, ABSORBED
THRU SKIN.IRRIT TO MUC MEM & UPPER RESP TRACT.CAUSES SKIN & SEVERE EYE
IRRIT.
CHRONIC: CARCINOGEN. MAY ALTER GENETIC MATERIAL (MUTAGEN).BLOOD
EFFECTS.
TARGET ORGANS: BLOOD/BLOOD MARROW/CNS. FIRST AID:IMMED FLUSH EYES OR
SKIN W/ COPIOUS AMTS OF WATER FOR @ LEAST 15MINS WHILE REMOVING
CONTAMINATED CLOTHING/SHOES. IF INHALED, REMOVE TO FRESH AIR. IF NOT
BREAHTING GIVE ARTIFICIAL RESPIRATION. IF BREATHING IS DIFFICULT GIVE
OXYGEN. IF SWALLOWED WASH OUT MOUTH W/WATER PROVIDED PERSON IS
CONSCIOUS. CALL A PHYSICIAN.
Protect Eye: Y
Protect Skin: Y
Protect Respiratory: Y
Label Name: POLYSCIENCE
Label Street: 7800 MERRIMAC AVE

Label City: NILES
Label State: IL
Label Zip Code: 60648
Label Country: US

TOLUENE

MSDS Number: T3913 --- Effective Date: 11/17/99

==
General Information
= =

Company's Name: Mallinckrodt Baker, Inc.
Company's Street: 222 Red School Lane
Company's City: Phillipsburg
Company's State: NJ
Company's Country: US
Company's Zip Code: 08865
Company's Emerg Ph #: 908-859-2151
Company's Info Ph #: 1-800-582-2537
Safety Data Review Date: 17Nov1999

==
Product Identification
= =

Synonyms: Methylbenzene; Toluol; Phenylmethane
CAS No.: 108-88-3
Molecular Weight: 92.14
Chemical Formula: C6H5-CH3
Product Codes:
J.T. Baker: 5375, 5584, 5809, 5812, 9336, 9351, 9364, 9456, 9457, 9459, 9460, 9462, 9466, 9472, 9476
Mallinckrodt: 4483, 8091, 8092, 8604, 8608, 8610, 8611, V560

==
Composition/Information on Ingredients
==

Ingredient	CAS No	Percent	Hazardous
Toluene	108-88-3	100%	Yes

==
Hazards Identification
==

Emergency Overview

POISON! DANGER! HARMFUL OR FATAL IF SWALLOWED. HARMFUL IF INHALED OR ABSORBED THROUGH SKIN. VAPOR HARMFUL. FLAMMABLE LIQUID AND VAPOR. MAY AFFECT LIVER, KIDNEYS, BLOOD SYSTEM, OR CENTRAL NERVOUS SYSTEM. CAUSES IRRITATION TO SKIN, EYES AND RESPIRATORY TRACT.

J.T. Baker SAF-T-DATA(tm) Ratings (Provided here for your convenience)

Health Rating: 2 - Moderate
Flammability Rating: 3 - Severe (Flammable)
Reactivity Rating: 0 - None
Contact Rating: 1 - Slight
Lab Protective Equip: GOGGLES; LAB COAT; VENT HOOD; PROPER GLOVES;
CLASS B EXTINGUISHER
Storage Color Code: Red (Flammable)

Potential Health Effects

Inhalation:
Inhalation may cause irritation of the upper respiratory tract. Symptoms of overexposure may include fatigue, confusion, headache, dizziness and drowsiness. Peculiar skin sensations (e. g. pins and needles) or numbness may be produced. Very high concentrations may cause unconsciousness and death.
Ingestion:
Swallowing may cause abdominal spasms and other symptoms that parallel over-exposure from inhalation. Aspiration of material into the lungs can cause chemical pneumonitis, which may be fatal.
Skin Contact:
Causes irritation. May be absorbed through skin.
Eye Contact:
Causes severe eye irritation with redness and pain.
Chronic Exposure:
Reports of chronic poisoning describe anemia, decreased blood cell count and bone marrow hypoplasia. Liver and kidney damage may occur. Repeated or prolonged contact has a defatting action, causing drying, redness, dermatitis. Exposure to toluene may affect the developing fetus.
Aggravation of Pre-existing Conditions:
Persons with pre-existing skin disorders or impaired liver or kidney function may be more susceptible to the effects of this substance. Alcoholic beverage consumption can enhance the toxic effects of this substance.
==========
First Aid Measures
==========
Inhalation:
If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. CALL A PHYSICIAN IMMEDIATELY.
Ingestion:
Aspiration hazard. If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. Get medical attention immediately. If vomiting occurs, keep head below hips to prevent aspiration into lungs.
Skin Contact:
In case of contact, immediately flush skin with plenty of soap and water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. Call a physician immediately.
Eye Contact:

Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

First Aid Measures

Fire:
Flash point: 7C (45F) CC
Autoignition temperature: 422C (792F)
Flammable limits in air % by volume:
lel: 3.3; uel: 19
Flammable liquid and vapor!
Dangerous fire hazard when exposed to heat or flame. Vapors can flow along surfaces to distant ignition source and flash back.
Explosion:
Above flash point, vapor-air mixtures are explosive within flammable limits noted above. Contact with strong oxidizers may cause fire or explosion. Sensitive to static discharge.
Fire Extinguishing Media:
Dry chemical, foam or carbon dioxide. Water may be used to flush spills away from exposures and to dilute spills to non-flammable mixtures.
Special Information:
In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode. Water spray may be used to keep fire exposed containers cool.

Accidental Release Measures

Ventilate area of leak or spill. Remove all sources of ignition. Wear appropriate personal protective equipment as specified in Section 8. Isolate hazard area. Keep unnecessary and unprotected personnel from entering. Contain and recover liquid when possible. Use non-sparking tools and equipment. Collect liquid in an appropriate container or absorb with an inert material (e. g., vermiculite, dry sand, earth), and place in a chemical waste container. Do not use combustible materials, such as saw dust. Do not flush to sewer! If a leak or spill has not ignited, use water spray to disperse the vapors, to protect personnel attempting to stop leak, and to flush spills away from exposures. US Regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of reportable quantities. The toll free number for the US Coast Guard National Response Center is (800) 424-8802.

J. T. Baker SOLUSORB(R) solvent adsorbent is recommended for spills of this product.

Handling and Storage

Protect against physical damage. Store in a cool, dry well-ventilated location, away from any area where the fire hazard may be acute. Outside or detached storage is preferred. Separate from incompatibles. Containers should be bonded and grounded for transfers to avoid static sparks. Storage and use areas should be No Smoking areas. Use non-sparking type tools and equipment, including explosion proof ventilation. Containers of this material may be hazardous when empty

since they retain product residues (vapors, liquid); observe all warnings and precautions listed for the product.

Exposure Controls/Personal Protection

Airborne Exposure Limits:
Toluene:
- OSHA Permissible Exposure Limit (PEL): 200 ppm (TWA); 300 ppm (acceptable ceiling conc.); 500 ppm (maximum conc.).
- ACGIH Threshold Limit Value (TLV): 50 ppm (TWA) skin, A4 - Not Classifiable as a Human Carcinogen.

Ventilation System: A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, Industrial Ventilation, A Manual of Recommended Practices, most recent edition, for details.

Personal Respirators (NIOSH Approved): If the exposure limit is exceeded, a half-face organic vapor respirator may be worn for up to ten times the exposure limit or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. A full-face piece organic vapor respirator may be worn up to 50 times the exposure limit or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. For emergencies or instances where the exposure levels are not known, use a full-face piece positive-pressure, air-supplied respirator. WARNING: Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.

Skin Protection: Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact.

Eye Protection: Use chemical safety goggles and/or a full face shield where splashing is possible. Maintain eye wash fountain and quick-drench facilities in work area.

Physical and Chemical Properties

Appearance: Clear, colorless liquid.
Odor: Aromatic benzene-like.
Solubility: 0.05 gm/100gm water @ 20C (68F).
Specific Gravity: 0.86 @ 20C / 4 C
pH: No information found.
% Volatiles by volume @ 21C (70F): 100
Boiling Point: 111C (232F)
Melting Point: -95C (-139F)
Vapor Density (Air=1): 3.14
Vapor Pressure (mm Hg): 22 @ 20C (68F)
Evaporation Rate (BuAc=1): 2.24

Stability and Reactivity

Stability: Stable under ordinary conditions of use and storage.
Containers may burst when heated.
Hazardous Decomposition Products:
Carbon dioxide and carbon monoxide may form when heated to decomposition.

Hazardous Polymerization: Will not occur.
Incompatibilities: Heat, flame, strong oxidizers, nitric and sulfuric acids, chlorine, nitrogen tetraoxide; will attack some forms of plastics, rubber, coatings.
Conditions to Avoid: Heat, flames, ignition sources and incompatibles.

Toxicological Information

Toxicological Data:
Oral rat LD50: 636 mg/kg; skin rabbit LD50: 14100 uL/kg; inhalation rat LC50: 49 gm/m3/4H; Irritation data: skin rabbit, 500 mg, Moderate; eye rabbit, 2 mg/24H, Severe. Investigated as a tumorigen, mutagen, reproductive effector.
Reproductive Toxicity:
Has shown some evidence of reproductive effects in laboratory animals.

--------\Cancer Lists\----------

		---NTP Carcinogen---	
Ingredient	Known	Anticipated	IARC Category
Toluene (108-88-3)	No	No	3

Ecological Information

Environmental Fate:
When released into the soil, this material may evaporate to a moderate extent. When released into the soil, this material is expected to leach into groundwater. When released into the soil, this material may biodegrade to a moderate extent. When released into water, this material may evaporate to a moderate extent. When released into water, this material may biodegrade to a moderate extent. When released into the air, this material may be moderately degraded by reaction with photochemically produced hydroxyl radicals. When released into the air, this material is expected to have a half-life of less than 1 day. This material is not expected to significantly bioaccumulate. This material has a log octanol-water partition coefficient of less than 3.0.
Bioconcentration factor = 13.2 (eels).
Environmental Toxicity:
This material is expected to be toxic to aquatic life. The LC50/96-hour values for fish are between 10 and 100 mg/l.

Disposal Considerations

Whatever cannot be saved for recovery or recycling should be handled as hazardous waste and sent to a RCRA approved incinerator or disposed in a RCRA approved waste facility. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

Transport Information

Domestic (Land, D.O.T.)

Proper Shipping Name: TOLUENE
Hazard Class: 3

UN/NA: UN1294
Packing Group: II
Information reported for product/size: 390LB

International (Water, I.M.O.)

Proper Shipping Name: TOLUENE
Hazard Class: 3.2
UN/NA: UN1294
Packing Group: II
Information reported for product/size: 390LB

Regulatory Information

--------\Chemical Inventory Status - Part 1\----------

Ingredient	TSCA	EC	Japan	Australia
Toluene (108-88-3)	Yes	Yes	Yes	Yes

--------\Chemical Inventory Status - Part 2\----------

Ingredient	Korea	DSL	--Canada-- NDSL	Phil.
Toluene (108-88-3)	Yes	Yes	No	Yes

--------\Federal, State & International Regulations - Part 1\---------

Ingredient	RQ	-SARA 302- TPQ	List	------SARA 313----- Chemical Catg.
Toluene (108-88-3)	No	No	Yes	No

--------\Federal, State & International Regulations - Part 2\----------

Ingredient	CERCLA	-RCRA- 261.33	-TSCA- 8(d)
Toluene (108-88-3)	1000	U220	No

Chemical Weapons Convention: No TSCA 12(b): No CDTA: Yes
SARA 311/312: Acute: Yes Chronic: Yes Fire: Yes Pressure: No
Reactivity: No (Pure / Liquid)
WARNING:
THIS PRODUCT CONTAINS A CHEMICAL(S) KNOWN TO THE STATE OF CALIFORNIA TO CAUSE BIRTH DEFECTS OR OTHER REPRODUCTIVE HARM.

Australian Hazchem Code: 3[Y]E
Poison Schedule: S6
WHMIS:
This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

Other Information

NFPA Ratings: Health: 2 Flammability: 3 Reactivity: 0
Label Hazard Warning:
POISON! DANGER! HARMFUL OR FATAL IF SWALLOWED. HARMFUL IF INHALED OR ABSORBED THROUGH SKIN. VAPOR HARMFUL. FLAMMABLE LIQUID AND VAPOR. MAY AFFECT LIVER, KIDNEYS, BLOOD SYSTEM, OR CENTRAL NERVOUS SYSTEM. CAUSES IRRITATION TO SKIN, EYES AND RESPIRATORY TRACT.
Label Precautions:
Keep away from heat, sparks and flame.

Keep container closed.
Use only with adequate ventilation.
Wash thoroughly after handling.
Avoid breathing vapor.
Avoid contact with eyes, skin and clothing.
Label First Aid:
Aspiration hazard. If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. If vomiting occurs, keep head below hips to prevent aspiration into lungs. If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes. Remove contaminated clothing and shoes. Wash clothing before reuse. In all cases call a physician immediately.
Product Use:
Laboratory Reagent.
Revision Information:
No changes.
Disclaimer:
****

Mallinckrodt Baker, Inc. provides the information contained herein in good faith but makes no representation as to its comprehensiveness or accuracy. This document is intended only as a guide to the appropriate precautionary handling of the material by a properly trained person using this product. Individuals receiving the information must exercise their independent judgment in determining its appropriateness for a particular purpose. MALLINCKRODT BAKER, INC. MAKES NO REPRESENTATIONS OR WARRANTIES, EITHER EXPRESS OR IMPLIED, INCLUDING WITHOUT LIMITATION ANY WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE WITH RESPECT TO THE INFORMATION SET FORTH HEREIN OR THE PRODUCT TO WHICH THE INFORMATION REFERS. ACCORDINGLY, MALLINCKRODT BAKER, INC. WILL NOT BE RESPONSIBLE FOR DAMAGES RESULTING FROM USE OF OR RELIANCE UPON THIS INFORMATION.

****

Prepared by: Strategic Services Division
Phone Number: (314) 539-1600 (U.S.A.)

XYLENE

MSDS Number: X2000 --- Effective Date: 01/14/02

==
General Information
==

Company's Name: Mallinckrodt Baker, Inc.
Company's Street: 222 Red School Lane
Company's City: Phillipsburg
Company's State: NJ
Company's Country: US
Company's Zip Code: 08865
Company's Emerg Ph #: 908-859-2151

Company's Info Ph #: 1-800-582-2537
Safety Data Review Date: 17Nov1999

Product Identification

Synonyms: Dimethyl benzene, xylol, methyltoluene
CAS No.: 1330-20-7
Molecular Weight: 106.17
Chemical Formula: C6H4(CH3)2
Product Codes: J.T. Baker: 5377, 5810, 5813, 9483, 9489, 9490, 9493, 9494, 9499, 9516, X516
Mallinckrodt: 8664, 8668, 8671, 8672, 8685, 8802, V052

Composition/Information on Ingredients

Ingredient	CAS No	Percent	Hazardous
m-Xylene	108-38-3	40 - 65%	No
o-Xylene	95-47-6	15 - 20%	No
p-Xylene	106-42-3	< 20%	No
Ethyl Benzene	100-41-4	15 - 25%	Yes

Hazards Identification

Emergency Overview

DANGER! HARMFUL OR FATAL IF SWALLOWED. VAPOR HARMFUL. AFFECTS CENTRAL NERVOUS SYSTEM. CAUSES SEVERE EYE IRRITATION. CAUSES IRRITATION TO SKIN AND RESPIRATORY TRACT. MAY BE HARMFUL IF ABSORBED THROUGH SKIN. CHRONIC EXPOSURE CAN CAUSE ADVERSE LIVER, KIDNEY, AND BLOOD EFFECTS. FLAMMABLE LIQUID AND VAPOR.

SAF-T-DATA(tm) Ratings (Provided here for your convenience)

Health Rating: 2 - Moderate (Life)
Flammability Rating: 2 - Moderate
Reactivity Rating: 1 - Slight
Contact Rating: 3 - Severe
Lab Protective Equip: GOGGLES; LAB COAT; VENT HOOD; PROPER GLOVES; CLASS B EXTINGUISHER
Storage Color Code: Red (Flammable)

Potential Health Effects

Inhalation:
Inhalation of vapors may be irritating to the nose and throat. Inhalation of high concentrations may result in nausea, vomiting, headache, ringing in the ears, and severe breathing difficulties which may be delayed in onset. Substernal pain, cough, and hoarseness are also reported. High vapor concentrations are anesthetic and central nervous system depressants.
Ingestion:
Ingestion causes burning sensation in mouth and stomach, nausea, vomiting and salivation. Minute amounts aspirated into the lungs can

produce a severe hemorrhagic pneumonitis with severe pulmonary injury or death.
Skin Contact:
Skin contact results in loss of natural oils and often results in a characteristic dermatitis. May be absorbed through the skin.
Eye Contact:
Vapors cause eye irritation. Splashes cause severe irritation, possible corneal burns and eye damage.
Chronic Exposure:
Chronic inhalation can cause headache, loss of appetite, nervousness and pale skin. Repeated or prolonged skin contact may cause a skin rash. Repeated exposure of the eyes to high concentrations of vapor may cause reversible eye damage. Repeated exposure can damage bone marrow, causing low blood cell count. May damage the liver and kidneys.
Aggravation of Pre-existing Conditions:
Persons with pre-existing skin disorders or eye problems, or impaired liver, kidney, blood, or respiratory function may be more susceptible to the effects of the substance.

==========

First Aid Measures

==========

Inhalation:
Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Call a physician immediately.
Ingestion:
Aspiration hazard. If swallowed, vomiting may occur spontaneously, but DO NOT INDUCE. If vomiting occurs, keep head below hips to prevent aspiration into lungs. Never give anything by mouth to an unconscious person. Call a physician immediately.
Skin Contact:
Immediately flush skin with plenty of soap and water for at least 15 minutes while removing contaminated clothing and shoes. Get medical attention. Wash clothing before reuse. Thoroughly clean shoes before reuse.
Eye Contact:
Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

==========

Fire Fighting Measures

==========

Fire:
Flash point: 29C (84F) CC
Autoignition temperature: 464C (867F)
Flammable limits in air % by volume:
lel: 1.0; uel: 7.0
Explosion:
Above flash point, vapor-air mixtures are explosive within flammable limits noted above. Contact with strong oxidizers may cause fire. Sealed containers may rupture when heated. Sensitive to static discharge.
Fire Extinguishing Media:
Dry chemical, foam or carbon dioxide. Water spray may be used to keep fire exposed containers cool, dilute spills to nonflammable mixtures, protect personnel attempting to stop leak and disperse vapors.
Special Information:

In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode. Vapors can flow along surfaces to distant ignition source and flash back.

Accidental Release Measures

Ventilate area of leak or spill. Remove all sources of ignition. Wear appropriate personal protective equipment as specified in Section 8. Isolate hazard area. Keep unnecessary and unprotected personnel from entering. Contain and recover liquid when possible. Use non-sparking tools and equipment. Collect liquid in an appropriate container or absorb with an inert material (e. g., vermiculite, dry sand, earth), and place in a chemical waste container. Do not use combustible materials, such as saw dust. Do not flush to sewer! If a leak or spill has not ignited, use water spray to disperse the vapors, to protect personnel attempting to stop leak, and to flush spills away from exposures. US Regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of reportable quantities. The toll free number for the US Coast Guard National Response Center is (800) 424-8802.

J. T. Baker SOLUSORB® solvent adsorbent is recommended for spills of this product.

Handling and Storage

Protect against physical damage. Store in a cool, dry well-ventilated location, away from any area where the fire hazard may be acute. Outside or detached storage is preferred. Separate from incompatibles. Containers should be bonded and grounded for transfers to avoid static sparks. Storage and use areas should be No Smoking areas. Use non-sparking type tools and equipment, including explosion proof ventilation. Containers of this material may be hazardous when empty since they retain product residues (vapors, liquid); observe all warnings and precautions listed for the product. Do Not attempt to clean empty containers since residue is difficult to remove. Do not pressurize, cut, weld, braze, solder, drill, grind or expose such containers to heat, sparks, flame, static electricity or other sources of ignition: they may explode and cause injury or death.

Exposure Controls/Personal Protection

Airborne Exposure Limits:
-OSHA Permissible Exposure Limit (PEL):
100 ppm (TWA) xylene
100 ppm (TWA) ethylbenzene
-ACGIH Threshold Limit Value (TLV):
100 ppm (TWA) 150 ppm (STEL) xylene
Carcinogen Category (xylene): A4
100 ppm (TWA) 125 ppm (STEL) ethyl benzene
Ventilation System:
A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, Industrial

Ventilation, A Manual of Recommended Practices, most recent edition, for details. Use explosion-proof equipment.
Personal Respirators (NIOSH Approved):
If the exposure limit is exceeded and engineering controls are not feasible, a half-face organic vapor respirator may be worn for up to ten times the exposure limit, or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. A full-face piece organic vapor respirator may be worn up to 50 times the exposure limit, or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. For emergencies or instances where the exposure levels are not known, use a full-face piece positive-pressure, air-supplied respirator. WARNING: Air-purifying respirators do not protect workers in oxygen-deficient atmospheres. Where respirators are required, you must have a written program covering the basic requirements in the OSHA respirator standard. These include training, fit testing, medical approval, cleaning, maintenance, cartridge change schedules, etc. See 29CFR1910.134 for details.
Skin Protection:
Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact.
Eye Protection:
Use chemical safety goggles and/or a full face shield where splashing is possible. Maintain eye wash fountain and quick-drench facilities in work area.

Physical and Chemical Properties

The following physical data is for xylene.
Appearance: Clear, colorless liquid.
Odor: Characteristic odor.
Solubility: Insoluble in water.
Specific Gravity: 0.86 @ 20C/4C
pH: Not applicable.
% Volatiles by volume @ 21C (70F): 100
Boiling Point: 137 - 140C (279 - 284F)
Melting Point: -25C (-13F)
Vapor Density (Air=1): 3.7
Vapor Pressure (mm Hg): 8 @ 20C (68F)
Evaporation Rate (BuAc=1): 0.7

Stability and Reactivity

Stability:
Stable under ordinary conditions of use and storage.
Hazardous Decomposition Products:
Involvement in a fire causes formation of carbon monoxide and unidentified organic components.
Hazardous Polymerization:
Will not occur.
Incompatibilities:
Strong oxidizing agents and strong acids.
Conditions to Avoid:
Heat, flames, ignition sources and incompatibles.

Toxicological Information

Toxicological Data:
Xylene: oral rat LD50: 4300 mg/kg; inhalation rat LC50: 5000 ppm/4H; skin rabbit LD50: > 1700 mg/kg; Irritation eye rabbit: 87 mg mild (Std. Draize); irritation skin rabbit 500 mg/24 moderate (Std. Draize); investigated as a tumorigen, mutagen, reproductive effector.
Ethyl benzene: oral rat LD50: 3500 mg/kg; skin rabbit LD50: 17800 uL/kg; investigated as a tumorigen, mutagen, reproductive effector.
Reproductive Toxicity:
May cause teratogenic effects.

--------\Cancer Lists\----------

Ingredient	Known	---NTP Carcinogen--- Anticipated	IARC Category
m-Xylene (108-38-3)	No	No	3
o-Xylene (95-47-6)	No	No	3
p-Xylene (106-42-3)	No	No	3
Ethyl Benzene (100-41-4)	No	No	2B

Ecological Information

Environmental Fate:
Following data for xylene: When released into the soil, this material may evaporate to a moderate extent. When released into the soil, this material is expected to leach into groundwater. When released into the soil, this material may biodegrade to a moderate extent. When released into water, this material may evaporate to a moderate extent. When released into water, this material may biodegrade to a moderate extent. When released into the air, this material may be moderately degraded by reaction with photochemically produced hydroxyl radicals. When released into the air, this material is expected to have a half-life of less than 1 day. This material is not expected to significantly bioaccumulate. (mixed xylenes: octanol / water partition coefficient 3.1 - 3.2; bioconcentration factor = 1.3, eels)
Environmental Toxicity:
For xylene: This material is expected to be slightly toxic to aquatic life. The LC50/96-hour values for fish are between 10 and 100 mg/l.

Disposal Considerations

Whatever cannot be saved for recovery or recycling should be handled as hazardous waste and sent to a RCRA approved incinerator or disposed in a RCRA approved waste facility. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

Transport Information

Domestic (Land, D.O.T.)

Proper Shipping Name: XYLENES
Hazard Class: 3
UN/NA: UN1307
Packing Group: III
Information reported for product/size: 398LB

International (Water, I.M.O.)

Proper Shipping Name: XYLENES
Hazard Class: 3
UN/NA: UN1307
Packing Group: III
Information reported for product/size: 398LB

Regulatory Information

--------\Chemical Inventory Status - Part 1\----------

Ingredient	TSCA	EC	Japan	Australia
m-Xylene (108-38-3)	Yes	Yes	Yes	Yes
o-Xylene (95-47-6)	Yes	Yes	Yes	Yes
p-Xylene (106-42-3)	Yes	Yes	Yes	Yes
Ethyl Benzene (100-41-4)	Yes	Yes	Yes	Yes

--------\Chemical Inventory Status - Part 2\----------

		--Canada—		
Ingredient	Korea	DSL	NDSL	Phil.
m-Xylene (108-38-3)	Yes	Yes	No	Yes
o-Xylene (95-47-6)	Yes	Yes	No	Yes
p-Xylene (106-42-3)	Yes	Yes	No	Yes
Ethyl Benzene (100-41-4)	Yes	Yes	No	Yes

--------\Federal, State & International Regulations - Part 1\--------

	-SARA 302-		------SARA 313------	
Ingredient	RQ	TPQ	List	Chemical Catg.
m-Xylene (108-38-3)	No	No	Yes	No
o-Xylene (95-47-6)	No	No	Yes	No
p-Xylene (106-42-3)	No	No	Yes	No
Ethyl Benzene (100-41-4)	No	No	Yes	No

--------\Federal, State & International Regulations - Part 2\--------

		-RCRA-	-TSCA-
Ingredient	CERCLA	261.33	8(d)
m-Xylene (108-38-3)	1000	No	No
o-Xylene (95-47-6)	1000	No	No
p-Xylene (106-42-3)	100	No	Yes
Ethyl Benzene (100-41-4)	1000	No	No

Chemical Weapons Convention: No TSCA 12(b): No CDTA: No
SARA 311/312: Acute: Yes Chronic: Yes Fire: Yes Pressure: No
Reactivity: No (Mixture / Liquid)
Australian Hazchem Code: 3[Y]
Poison Schedule: None allocated.
WHMIS:
This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

Other Information

NFPA Ratings: Health: 2 Flammability: 3 Reactivity: 0
Label Hazard Warning:
DANGER! HARMFUL OR FATAL IF SWALLOWED. VAPOR HARMFUL. AFFECTS CENTRAL NERVOUS SYSTEM. CAUSES SEVERE EYE IRRITATION. CAUSES IRRITATION TO SKIN

AND RESPIRATORY TRACT. MAY BE HARMFUL IF ABSORBED THROUGH SKIN. CHRONIC EXPOSURE CAN CAUSE ADVERSE LIVER, KIDNEY, AND BLOOD EFFECTS. FLAMMABLE LIQUID AND VAPOR.
Label Precautions:
Keep away from heat, sparks and flame.
Avoid contact with eyes, skin and clothing.
Keep container closed.
Use only with adequate ventilation.
Avoid breathing vapor.
Wash thoroughly after handling.
Label First Aid:
Aspiration hazard. If swallowed, vomiting may occur spontaneously, but DO NOT INDUCE. If vomiting occurs, keep head below hips to prevent aspiration into lungs. Never give anything by mouth to an unconscious person. Call a physician immediately. If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. In all cases get medical attention immediately.
Product Use:
Laboratory Reagent.
Revision Information:
MSDS Section(s) changed since last revision of document include: 3.
Disclaimer:
****
Mallinckrodt Baker, Inc. provides the information contained herein in good faith but makes no representation as to its comprehensiveness or accuracy. This document is intended only as a guide to the appropriate precautionary handling of the material by a properly trained person using this product. Individuals receiving the information must exercise their independent judgment in determining its appropriateness for a particular purpose. MALLINCKRODT BAKER, INC. MAKES NO REPRESENTATIONS OR WARRANTIES, EITHER EXPRESS OR IMPLIED, INCLUDING WITHOUT LIMITATION ANY WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE WITH RESPECT TO THE INFORMATION SET FORTH HEREIN OR THE PRODUCT TO WHICH THE INFORMATION REFERS. ACCORDINGLY, MALLINCKRODT BAKER, INC. WILL NOT BE RESPONSIBLE FOR DAMAGES RESULTING FROM USE OF OR RELIANCE UPON THIS INFORMATION.
****
Prepared by: Environmental Health & Safety
Phone Number: (314) 654-1600 (U.S.A.)

JP-8

==========
General Information
==========
Company's Name: HOVENSA L.L.C.
Company's Street: 1 Estate Hope
Company's City: Christiansted
Company's State: VI

Company's Country: US
Company's Zip Code: 00820-5652
Company's Emerg Ph #: CHEMTREC (800)424-9300
Company's Info Ph #: Safety Department (340) 692-3000
Date MSDS Revised: January 1999

==========

Ingredients/Identity Information

==========

Proprietary: NO
Ingredient: Kerosene
Ingredient Sequence Number: 01
Percent: 100
NIOSH (RTECS) Number:
CAS Number: 8008-20-6
OSHA PEL: 5 mg/m^3 as mineral oil mist
ACGIH TLV: 1997 NOIC - 100 mg/m3, mskin, A3

Proprietary: NO
Ingredient: Naphthalene
Ingredient Sequence Number: 02
Percent: Typically 0.04
NIOSH (RTECS) Number:
CAS Number: 91-20-3
OSHA PEL: 10 ppm
ACGIH TLV: 10 / 15 ppm, A4

A complex combination of hydrocarbons including naphthenes, paraffins, and aromatics

==========

HAZARDS IDENTIFICATION

==========

EMERGENCY OVERVIEW
CAUTION!
OSHA/NFPA COMBUSTIBLE LIQUID - SLIGHT TO MODERATE IRRITANT - EFFECTS CENTRAL NERVOUS SYSTEM - HARMFUL OR FATAL IF SWALLOWED
Moderate fire hazard. Avoid breathing vapors or mists. May cause dizziness and drowsiness. May cause eye irritation and skin irritation (rash). Long-term, repeated exposure may cause skin cancer.
If ingested, do NOT induce vomiting, as this may cause chemical pneumonia (fluid in the lungs).
EYES
Contact with liquid or vapor may cause mild irritation.
SKIN
May cause skin irritation with prolonged or repeated contact.
Practically non-toxic if absorbed following acute (single) exposure.
Liquid may be absorbed through the skin in toxic amounts if large areas of skin are repeatedly exposed.
INGESTION
The major health threat of ingestion occurs from the danger of aspiration (breathing) of liquid drops into the lungs, particularly from vomiting. Aspiration may result in chemical pneumonia (fluid in the lungs), severe lung damage, respiratory failure and even death.
Ingestion may cause gastrointestinal disturbances, including irritation, nausea, vomiting and diarrhea, and central nervous system (brain) effects similar to alcohol intoxication. In severe cases,

tremors, convulsions, loss of consciousness, coma, respiratory arrest, and death may occur.
INHALATION
Excessive exposure may cause irritation to the nose, throat, lungs and respiratory tract. Central nervous system (brain) effects may include headache, dizziness, loss of balance and coordination, unconsciousness, coma, respiratory failure, and death
WARNING: the burning of any hydrocarbon as a fuel in an area without adequate ventilation may result in hazardous levels of combustion products, including carbon monoxide, and inadequate oxygen levels, which may cause unconsciousness, suffocation, and death.
CHRONIC EFFECTS and CARCINOGENICITY
Similar products produced skin cancer and systemic toxicity in laboratory animals following repeated applications. The significance of these results to human exposures has not been determined – see Section 11 Toxicological Information.
MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE
Irritation from skin exposure may aggravate existing open wounds, skin disorders, and dermatitis (rash).

==========
FIRST AID MEASURES
==========
EYES
In case of contact with eyes, immediately flush with clean, low-pressure water for at least 15 min. Hold eyelids open to ensure adequate flushing. Seek medical attention.
SKIN
Remove contaminated clothing. Wash contaminated areas thoroughly with soap and water or waterless hand cleanser. Obtain medical attention if irritation or redness develops.
INGESTION
DO NOT INDUCE VOMITING. Do not give liquids. Obtain immediate medical attention. If spontaneous vomiting occurs, lean victim forward to reduce the risk of aspiration. Monitor for breathing difficulties. Small amounts of material which enter the mouth should be rinsed out until the taste is dissipated.
INHALATION
Remove person to fresh air. If person is not breathing, ensure an open airway and provide artificial respiration. If necessary, provide additional oxygen once breathing is restored if trained to do so. Seek medical attention immediately.
==========
FIRE FIGHTING MEASURES
==========
FLAMMABLE PROPERTIES:
FLASH POINT:> 100^{o} F (38^{o}C) TCC
AUTOIGNITION POINT: 410^{o}F (210^{o}C)
OSHA/NFPA FLAMMABILITY CLASS: 2 (COMBUSTIBLE)
LOWER EXPLOSIVE LIMIT (%):0.7
UPPER EXPLOSIVE LIMIT (%):5.0

FIRE AND EXPLOSION HAZARDS
Vapors may be ignited rapidly when exposed to heat, spark, open flame or other source of ignition. When mixed with air and exposed to an ignition source, flammable vapors can burn in the open or explode in confined spaces. Being heavier than air, vapors may travel long

distances to an ignition source and flash back. Runoff to sewer may cause fire or explosion hazard.

EXTINGUISHING MEDIA

SMALL FIRES: Any extinguisher suitable for Class B fires, dry chemical, CO2, water spray, fire fighting foam, or Halon.

LARGE FIRES: Water spray, fog or fire fighting foam. Water may be ineffective for fighting the fire, but may be used to cool fire-exposed containers.

FIRE FIGHTING INSTRUCTIONS

Small fires in the incipient (beginning) stage may typically be extinguished using handheld portable fire extinguishers and other fire fighting equipment. Firefighting activities that may result in potential exposure to high heat, smoke or toxic by-products of combustion should require NIOSH/MSHA- approved pressure-demand self-contained breathing apparatus with full facepiece and full protective clothing.

Isolate area around container involved in fire. Cool tanks, shells, and containers exposed to fire and excessive heat with water. For massive fires the use of unmanned hose holders or monitor nozzles may be advantageous to further minimize personnel exposure. Major fires may require withdrawal, allowing the tank to burn. Large storage tank fires typically require specially trained personnel and equipment to extinguish the fire, often including the need for properly applied fire fighting foam.

See Section 16 for the NFPA 704 Hazard Rating

==========

ACCIDENTAL RELEASE MEASURES

==========

ACTIVATE FACILITY'S SPILL CONTINGENCY OR EMERGENCY RESPONSE PLAN.

Evacuate nonessential personnel and remove or secure all ignition sources. Consider wind direction; stay upwind and uphill, if possible.

Evaluate the direction of product travel, diking, sewers, etc. to confirm spill areas. Spills may infiltrate subsurface soil and groundwater; professional assistance may be necessary to determine the extent of subsurface impact.

Carefully contain and stop the source of the spill, if safe to do so. Protect bodies of water by diking, absorbents, or absorbent boom, if possible. Do not flush down sewer or drainage systems, unless system is designed and permitted to handle such material. The use of fire fighting foam may be useful in certain situations to reduce vapors. The proper use of water spray may effectively disperse product vapors or the liquid itself, preventing contact with ignition sources or areas/equipment that require protection.

Take up with sand or other oil absorbing materials. Carefully shovel, scoop or sweep up into a waste container for reclamation or disposal - caution, flammable vapors may accumulate in closed containers.

Response and clean-up crews must be properly trained and must utilize proper protective equipment (see Section 8).

==========

HANDLING and STORAGE

==========

HANDLING PRECAUTIONS

Handle as a combustible liquid. Keep away from heat, sparks, and open flame! Electrical equipment should be approved for classified area.

Bond and ground containers during product transfer to reduce the possibility of static-initiated fire or explosion.

Special slow load procedures for "switch loading" must be followed to avoid the static ignition hazard that can exist when higher flash point material (such as fuel oil) is loaded into tanks previously containing low flash point products (such as this product) - see API Publication 2003, "Protection Against Ignitions Arising Out Of Static, Lightning and Stray Currents.

STORAGE PRECAUTIONS

Keep away from flame, sparks, excessive temperatures and open flame. Use approved vented containers. Keep containers closed and clearly labeled. Empty product containers or vessels may contain explosive vapors. Do not pressurize, cut, heat, weld or expose such containers to sources of ignition.

Store in a well-ventilated area. This storage area should comply with NFPA 30 "Flammable and Combustible Liquid Code". Avoid storage near incompatible materials. The cleaning of tanks previously containing this product should follow API Recommended Practice (RP) 2013 "Cleaning Mobile Tanks In Flammable and Combustible Liquid Service" and API RP 2015 "Cleaning Petroleum Storage Tanks".

WORK/HYGIENIC PRACTICES

Emergency eye wash capability should be available in the near proximity to operations presenting a potential splash exposure. Use good personal hygiene practices. Avoid repeated and/or prolonged skin exposure. Wash hands before eating, drinking, smoking, or using toilet facilities. Do not use as a cleaning solvent on the skin. Do not use solvents or harsh abrasive skin cleaners for washing this product from exposed skin areas. Waterless hand cleaners are effective. Promptly remove contaminated clothing and launder before reuse. Use care when laundering to prevent the formation of flammable vapors which could ignite via washer or dryer. Consider the need to discard contaminated leather shoes and gloves.

==========

EXPOSURE CONTROLS and PERSONAL PROTECTION

==========

ENGINEERING CONTROLS

Use adequate ventilation to keep vapor concentrations of this product below occupational exposure and flammability limits, particularly in confined spaces.

EYE/FACE PROTECTION

Safety glasses or goggles are recommended where there is a possibility of splashing or spraying.

SKIN PROTECTION

Gloves constructed of nitrile, neoprene, or PVC are recommended. Chemical protective clothing such as of E.I. DuPont Tychem®, Saranex® or equivalent recommended based on degree of exposure. Note: The resistance of specific material may vary from product to product as well as with degree of exposure.

Consult manufacturer specifications for further information.

RESPIRATORY PROTECTION

A NIOSH/MSHA-approved air-purifying respirator with organic vapor cartridges or canister may be permissible under certain circumstances where airborne concentrations are or may be expected to exceed exposure limits or for odor or irritation. Protection provided by air-purifying respirators is limited. Refer to OSHA 29 CFR 1910.134, ANSI Z88.2-1992, NIOSH Respirator Decision Logic, and the manufacturer for additional guidance on respiratory protection selection. Use a positive pressure, air-supplied respirator if there is a potential for uncontrolled release, exposure levels are not known, in oxygen-deficient

atmospheres, or any other circumstance where an air-purifying respirator may not provide adequate protection.

PHYSICAL and CHEMICAL PROPERTIES

APPEARANCE
Pale yellow to water-white liquid
ODOR
Characteristic petroleum distillate odor
BASIC PHYSICAL PROPERTIES
BOILING RANGE: 280 to 572°F (140 to 300°C)
VAPOR PRESSURE: 0.029 psia @ 100°F (38°C)
VAPOR DENSITY (air = 1): AP 4.5
SPECIFIC GRAVITY (H2O = 1): 0.75 - 0.80
PERCENT VOLATILES: 100 %
EVAPORATION RATE: Slow; varies with conditions
SOLUBILITY (H2O): Negligible

TOXICOLOGICAL PROPERTIES

ACUTE TOXICITY
Acute dermal LD50 (rabbits): > 5 g/kg
Acute oral LD50 (rats): > 25 g/kg
Primary dermal irritation: mildly irritating (rabbits)
Primary eye irritation: mildly irritating (rabbits)
Guinea pig sensitization: negative
CHRONIC EFFECTS AND CARCINOGENICITY
Carcinogenicity: OSHA: NO
IARC: NO
NTP: NO
ACGIH: 1997 NOIC: A3
Dermal carcinogenicity: positive (mice)
Studies have shown that similar products produce skin cancer or skin tumors in laboratory animals following repeated applications without washing or removal. The significance of this finding to human exposure has not been determined. Other studies with active skin carcinogens have shown that washing the animal's skin with soap and water between applications reduced tumor formation.

ECOLOGICAL INFORMATION

Keep out of sewers, drainage areas and waterways. Report spills and releases, as applicable, under Federal and State regulations.

DISPOSAL CONSIDERATIONS

Consult federal, state and local waste regulations to determine appropriate disposal options.

TRANSPORTATION INFORMATION

PROPER SHIPPING NAME:
Fuel, Aviation, turbine engine
HAZARD CLASS and PACKING GROUP: 3, PG III
DOT IDENTIFICATION NUMBER: UN 1863
DOT SHIPPING LABEL: FLAMMABLE LIQUID

May be reclassified for transportation as a COMBUSTIBLE LIQUID under conditions of DOT 49 CFR 173.120(b)(2).

REGULATORY INFORMATION

U.S. FEDERAL, STATE, and LOCAL REGULATORY INFORMATION

This product and its constituents listed herein are on the EPA TSCA Inventory. Any spill or uncontrolled release of this product, including any substantial threat of release, may be subject to federal, state and/or local reporting requirements. This product and/or its constituents may also be subject to other regulations at the state and/or local level. Consult those regulations applicable to your facility/operation.

CLEAN WATER ACT (OIL SPILLS)

Any spill or release of this product to "navigable waters" (essentially any surface water, including certain wetlands) or adjoining shorelines sufficient to cause a visible sheen or deposit of a sludge or emulsion must be reported immediately to the National Response Center (1-800-424-8802) or, if not practical, the U.S. Coast Guard with follow-up to the National Response Center, as required by U.S. Federal Law. Also contact appropriate state and local regulatory agencies as required.

CERCLA SECTION 103 and SARA SECTION 304 (RELEASE TO THE ENVIRONMENT)

The CERCLA definition of hazardous substances contains a "petroleum exclusion" clause which exempts crude oil, refined, and unrefined petroleum products and any indigenous components of such. However, other federal reporting requirements (e.g., SARA Section 304 as well as the Clean Water Act if the spill occurs on navigable waters) may still apply.

SARA SECTION 311/312 - HAZARD CLASSES

ACUTE HEALTH	CHRONIC HEALTH	FIRE	SUDDEN RELEASE OF PRESSURE	REACTIVE
X	X	X	--	--

SARA SECTION 313 - SUPPLIER NOTIFICATION

This product does not contain toxic chemicals subject to the reporting requirements of section 313 of the Emergency Planning and Community Right-To-Know Act (EPCRA) of 1986 and of 40 CFR 372.

CANADIAN REGULATORY INFORMATION (WHMIS)

Class B, Division 3 (Combustible Liquid) Class D, Division 2, Subdivision B (Toxic by other means)

OTHER INFORMATION

NFPA® HAZARD RATING

HEALTH: 0 Negligible

FIRE: 2 Moderate

REACTIVITY: 0 Negligible

HMIS® HAZARD RATING

HEALTH: 1 * Slight

FIRE: 2 Moderate

REACTIVITY: 0 Negligible

* CHRONIC SUPERSEDES MSDS DATED: 11/04/96

ABBREVIATIONS:

AP = Approximately

< = Less than

> = Greater than

N/A = Not Applicable

N/D = Not Determined

ppm = parts per million

ACRONYMS:

ACGIH	American Conference of Governmental Industrial Hygienists
AIHA	American Industrial Hygiene Association
ANSI	American National Standards Institute (212) 642-4900
API	American Petroleum Institute (202) 682-8000
CERCLA	Comprehensive Emergency Response, Compensation, and Liability Act
DOT	U.S. Department of Transportation [General info: (800) 467-4922]
EPA	U.S. Environmental Protection Agency
HMIS	Hazardous Materials Information System
IARC	International Agency For Research On Cancer
MSHA	Mine Safety and Health Administration
NFPA	National Fire Protection Association (617)770-3000
NIOSH	National Institute of Occupational Safety and Health
NOIC	Notice of Intended Change (proposed change to ACGIH TLV)
NTP	National Toxicology Program
OPA	Oil Pollution Act of 1990
OSHA	U.S. Occupational Safety & Health Administration
PEL	Permissible Exposure Limit (OSHA)
RCRA	Resource Conservation and Recovery Act
REL	Recommended Exposure Limit (NIOSH)
SARA	Superfund Amendments and Reauthorization Act of 1986 Title III
SCBA	Self-Contained Breathing Apparatus
SPCC	Spill Prevention, Control, and Countermeasures
STEL	Short-Term Exposure Limit (generally 15 minutes)
TLV	Threshold Limit Value (ACGIH)
TSCA	Toxic Substances Control Act
TWA	Time Weighted Average (8 hr.)
WEEL	Workplace Environmental Exposure Level (AIHA)
WHMIS	Canadian Workplace Hazardous Materials Information System\

DISCLAIMER OF EXPRESSED AND IMPLIED WARRANTIES
Information presented herein has been compiled from sources considered to be dependable, and is accurate and reliable to the best of our knowledge and belief, but is not guaranteed to be so. Since conditions of use are beyond our control, we make no warranties, expressed or implied, except those that may be contained in our written contract of sale or acknowledgment. Vendor assumes no responsibility for injury to vendee or third persons proximately caused by the material if reasonable safety procedures are not adhered to as stipulated in the data sheet. Additionally, vendor assumes no responsibility for injury to vendee or third persons proximately caused by abnormal use of the material, even if reasonable safety procedures are followed. Furthermore, vendee assumes the risk in their use of the material.

TRIETHYLAMINE

ALDRICH CHEMICAL SUB OF SIGMA-ALDRICH -- TRIETHYLAMINE, 99%, 13206-3ALDRICH CHEMICAL SUB OF SIGMA-ALDRICH -- TRIETHYLAMINE, 99%, 13206-3
MATERIAL SAFETY DATA SHEET
NSN: 681000N014995
Manufacturer's CAGE: 60928

Part No. Indicator: A
Part Number/Trade Name: TRIETHYLAMINE, 99%, 13206-3

General Information

Company's Name: ALDRICH CHEMICAL CO INC./SUB OF SIGMA-ALDRICH CORP
Company's Street: 1001 W. ST. PAUL AVE
Company's P. O. Box: 355
Company's City: MILWAUKEE
Company's State: WI
Company's Country: US
Company's Zip Code: 53201
Company's Emerg Ph #: 414-273-3850
Company's Info Ph #: 414-273-3850/FAX -4979
Record No. For Safety Entry: 001
Tot Safety Entries This Stk#: 001
Status: SMJ
Date MSDS Prepared: 08MAY90
Safety Data Review Date: 19JUN95
Supply Item Manager: CX
MSDS Serial Number: BKNKW
Hazard Characteristic Code: F3

Ingredients/Identity Information

Proprietary: NO
Ingredient: TRIETHYLAMINE (SARA III)
Ingredient Sequence Number: 01
Percent: 99
NIOSH (RTECS) Number: YE0175000
CAS Number: 121-44-8
OSHA PEL: 25 PPM/15 STEL
ACGIH TLV: 10 PPM/15 STEL; 9293

Physical/Chemical Characteristics

Appearance And Odor: COLORLESS LIQUID.
Boiling Point: 192F,89C
Melting Point: -175F,-115C
Vapor Pressure (MM Hg/70 F): 51.75 @20C
Vapor Density (Air=1): 3.5
Specific Gravity: 0.726

Fire and Explosion Hazard Data

Flash Point: 20.0F,-6.7C
Lower Explosive Limit: 1.2%
Upper Explosive Limit: 8%
Extinguishing Media: CARBON DIOXIDE, DRY CHEMICAL POWDER, ALCOHOL OR POLYMER FOAM.
Special Fire Fighting Proc: WEAR NIOSH/MSHA APPROVED SCBA AND FULL PROTECTIVE EQUIPMENT (FP N). PREVENT CONTACT WITH SKIN AND EYES.
Unusual Fire And Expl Hazrds: FLAMMABLE LIQUID. VAPOR MAY TRAVEL CONSIDERABLE DISTANCE TO SOURCE OF IGNITION AND FLASH BACK. EMITS TOXIC FUMES UNDER FIRE CONDITIONS.

Reactivity Data

==========
Cond To Avoid (Stability): NONE SPECIFIED BY MANUFACTURER.
Materials To Avoid: ACIDS, OXIDIZING AGENTS.
Hazardous Decomp Products: THERMAL DECOMPOSITION MAY PRODUCE CO, CO*2 AND
NO*X.
Conditions To Avoid (Poly): NONE SPECIFIED BY MANUFACTURER.
==========
Health Hazard Data
==========
LD50-LC50 Mixture: LD50:(ORL,RAT)460 MG/KG; (SEE SUPP DATA)
Route Of Entry - Inhalation: YES
Route Of Entry - Skin: YES
Route Of Entry - Ingestion: YES
Health Haz Acute And Chronic: ACUTE:HARMFUL IF INGESTED, INHALED, OR ABSORBED THROUGH SKIN. CAUSES BURNS. MATL IS EXTREMELY DESTRUCTIVE TO TISS OF MUC MEMB & UPPER RESP TRACT, EYES & SKIN. INHAL MAY BE FATAL AS RESULT OF SPASM, INFLAMM & EDEMA OF LARYNX & BRONCHI, CHEM PNEUM & PULMONARY EDEMA. TARGET ORGANS:CNS, LIVER, KIDNEYS, HEART.
Carcinogenicity - NTP: NO
Carcinogenicity - IARC: NO
Carcinogenicity - OSHA: NO
Explanation Carcinogenicity: NONE SPECIFIED BY MANUFACTURER.
Signs/Symptoms Of Overexp: BURNING SENSATION, COUGHING, WHEEZING, LARYNGITIS, SHORTNESS OF BREATH, HEADACHE, NAUSEA AND VOMITING.
Med Cond Aggravated By Exp: NONE SPECIFIED BY MANUFACTURER.
Emergency/First Aid Proc: EYES:IMMED FLUSH W/COPIOUS AMTS OF WATER FOR AT IMMED FLUSH W/COPIOUS AMTS OF WATER FOR AT LEAST 15 MIN WHILE REMOVING CONTAMD CLTHG/SHOES. WASH CONTAMD CLTHG BEFORE REUSE. INHAL:REMOVE TO FRESH AIR. SUPPORT BRTHG (GIVE O*2/ARTF RESP), CALL MD. INGEST:CALL MD IMMEDIATELY (FP N).
==========
Precautions for Safe Handling and Use
==========
Steps If Matl Released/Spill: EVACUATE AREA. SHUT OFF SOURCES OF IGNIT. WEAR NIOSH/MSHA APPRVD SCBA, RUBBER BOOTS, HEAVY RUBBER GLOVES. ABSORB ON SAND OR VERMICULITE & PLACE IN CLOSED CNTNRS FOR DISPOSAL. VENTILATE AREA & WASH SPILL SITE AFTER MATERIAL PICKUP IS COMPLETE.
Neutralizing Agent: NONE SPECIFIED BY MANUFACTURER.
Waste Disposal Method: BURN IN CHEMICAL INCINERATOR EQUIPPED W/ AFTERBURNER & SCRUBBER BUT EXERT EXTRA CARE IN IGNITING AS MATERIAL IS HIGHLY FLAMMABLE. OBSERVE ALL FEDERAL, STATE AND LOCAL LAWS.
Precautions-Handling/Storing: STORE IN COOL, DRY PLACE. KEEP AWAY FROM HEAT, SPARKS & OPEN FLAME. KEEP TIGHTLY CLOSED. AVOID PRLNGD/RPTD EXPOS. DO NOT BREATHE VAPOR.
Other Precautions: LACHRYMATOR. TOXIC. CORROSIVE. READILY ABSORBED THROUGH SKIN. DO NOT GET IN EYES, ON SKIN OR CLOTHING.
==========
Control Measures
==========
Respiratory Protection: WEAR APPROPRIATE NIOSH/MSHA APPROVED RESPIRATOR.
Ventilation: USE ONLY IN CHEMICAL FUME HOOD.
Protective Gloves: CHEMICAL RESISTANT GLOVES.
Eye Protection: CHEMICAL WORKERS GOGGLES,(SEE SUPP DATA)
Other Protective Equipment: PROTECTIVE CLOTHING. SAFETY SHOWER AND EYE BATH.

Work Hygienic Practices: WASH THOROUGHLY AFTER HANDLING.
Suppl. Safety & Health Data: LD50-LC50 MIX:LD50:(ORL,MUS)546 MG/KG;
(SKN,
RBT) 570 MG/KG. EYE PROT:MAY ADD FULL LENGTH FACESHIELD TO GOGGLES (FP
N).
==========
Transportation Data
==========
Trans Data Review Date: 91259
DOT PSN Code: ORX
DOT Proper Shipping Name: TRIETHYLAMINE
DOT Class: 3
DOT ID Number: UN1296
DOT Pack Group: II
DOT Label: FLAMMABLE LIQUID, CORROSIVE
IMO PSN Code: OWN
IMO Proper Shipping Name: TRIETHYLAMINE
IMO Regulations Page Number: 3285
IMO UN Number: 1296
IMO UN Class: 3.2
IMO Subsidiary Risk Label: CORROSIVE
IATA PSN Code: YNM
IATA UN ID Number: 1296
IATA Proper Shipping Name: TRIETHYLAMINE
IATA UN Class: 3
IATA Subsidiary Risk Class: 8
IATA Label: FLAMMABLE LIQUID & CORROSIVE
AFI PSN Code: YNM
AFI Prop. Shipping Name: TRIETHYLAMINE
AFI Class: 3
AFI ID Number: UN1296
AFI Pack Group: II
AFI Label: 8
AFI Basic Pac Ref: 7-7
==========
Disposal Data
==========
==========
Label Data
==========
Label Required: YES
Technical Review Date: 24APR91
Label Date: 23APR91
Label Status: G
Common Name: TRIETHYLAMINE, 99%, 13206-3
Signal Word: DANGER!
Acute Health Hazard-Moderate: X
Contact Hazard-Severe: X
Fire Hazard-Severe: X
Reactivity Hazard-None: X
Special Hazard Precautions: ACUTE: MAY BE FATAL IF INHALED. DO NOT
BREATHE VAPOR/MIST. KEEP CONTAINER CLOSED. USE ONLY WITH ADEQUATE
VENTILATION. CAUSES EYE, SKIN AND RESPIRATORY TRACT BURNS. DO NOT GET
IN EYES, ON SKIN OR CLOTHING. WASH THOROUGHLY AFTER HANDLING. EXTREMELY
FLAMMABLE LIQUID AND VAPOR. VAPOR MAY CAUSE FLASH FIRE. KEEP AWAY FROM
HEAT, SPARKS, AND FLAME.
CHRONIC: CNS, KIDNEY, LIVER AND HEART DAMAGE.

Protect Eye: Y
Protect Skin: Y
Protect Respiratory: Y
Label Name: ALDRICH CHEMICAL CO
Label P.O. Box: 355
Label City: MILWAUKEE
Label State: WI
Label Zip Code: 53201
Label Country: US
Label Emergency Number: 414-273-3850

DIMETHYLANILINE

BUFFALO COLOR -- DIMETHYLANILINE, 065-4180BUFFALO COLOR --
DIMETHYLANILINE, 065-4180
MATERIAL SAFETY DATA SHEET
NSN: 681000N019451
Manufacturer's CAGE: 0EUE3
Part No. Indicator: A
Part Number/Trade Name: DIMETHYLANILINE, 065-4180
==========
General Information
==========
Company's Name: BUFFALO COLOR CORPORATION
Company's Street: 959 RT 46 E SUITE 403
Company's City: PARISPPANY
Company's State: NJ
Company's Zip Code: 07054
Company's Emerg Ph #: 201-316-5600 800-424-9300(CHEMTREC)
Company's Info Ph #: 716-827-4500 716-827-4549
Record No. For Safety Entry: 001
Tot Safety Entries This Stk#: 001
Status: SMJ
Date MSDS Prepared: 26NOV90
Safety Data Review Date: 14OCT91
MSDS Preparer's Name: CAROL LASCHINGER
Preparer's Company: SAME
MSDS Serial Number: BLGQR
Hazard Characteristic Code: T3
==========
Ingredients/Identity Information
==========
Proprietary: NO
Ingredient: DIMETHYLANILINE (N,N-DIMETHYL-ANILINE) (SARA III)
Ingredient Sequence Number: 01
Percent: 99.7
NIOSH (RTECS) Number: BX4725000
CAS Number: 121-69-7
OSHA PEL: S, 5 PPM/10 STEL
ACGIH TLV: S,5 PPM/10 STEL;9192

Proprietary: NO
Ingredient: N-METHYL ANILINE

Ingredient Sequence Number: 02
Percent: 0.3
NIOSH (RTECS) Number: BY4550000
CAS Number: 100-61-8
OSHA PEL: S, 0.5 PPM
ACGIH TLV: S, 0.5 PPM; 9192

Proprietary: NO
Ingredient: ANILINE (SARA III)
Ingredient Sequence Number: 03
Percent: 0.05
NIOSH (RTECS) Number: BW6650000
CAS Number: 62-53-3
OSHA PEL: S, 5 PPM
ACGIH TLV: S, 2 PPM; 9293

Proprietary: NO
Ingredient: SUPP DATA: RECOM STORAGE TEMP IS 50-100 F. KEEP CLSD TO PROT
FROM LIGHT & PVNT EVAPORATION. RE-USE OF CNTNRS (SEE ING 5)
Ingredient Sequence Number: 04
NIOSH (RTECS) Number: 9999999ZZ
OSHA PEL: NOT APPLICABLE
ACGIH TLV: NOT APPLICABLE

Proprietary: NO
Ingredient: INGRED 4: FOR OTHER MATLS IS NOT RECOMMENDED.
Ingredient Sequence Number: 05
NIOSH (RTECS) Number: 9999999ZZ
OSHA PEL: NOT APPLICABLE
ACGIH TLV: NOT APPLICABLE
==========
Physical/Chemical Characteristics
==========
Appearance And Odor: CLEAR, LIGHT YELLOW LIQUID, CHARACTERISTIC AMINE ODOR.
Boiling Point: 380F, 194C
Vapor Pressure (MM Hg/70 F): 1 @ 30 C
Vapor Density (Air=1): 4.2
Specific Gravity: 0.96
Solubility In Water: 1.6/ 100 G H2O
==========
Fire and Explosion Hazard Data
==========
Flash Point: 163F, 73C
Flash Point Method: TCC
Lower Explosive Limit: 1.0%
Extinguishing Media: FOAM, CARBON DIOXIDE, DRY CHEMICAL.
Special Fire Fighting Proc: USE NIOSH/MSHA APPROVED SCBA & FULL PROT EQUIP
(FP N). AVOID CONT W/LIQ & VAPS. CLEAR AREA DOWNWIND OF INCIDENT. COOL CNTNRS EXPOSED TO HEAT W/H2O. (SUPP DATA)
Unusual Fire And Expl Hazrds: VAPS & LIQ ARE TOXIC AND FLAMMABLE. MAY FORM EXPLOSIVE MIXTURES WITH AIR. DANGEROUS WHEN HEATED TO DECOMP. MAY EMIT TOXIC FUMES OF ANILINE.
==========
Reactivity Data

==========
Stability: YES
Cond To Avoid (Stability): EXCESSIVE TEMPERATURES PROMOTE DECOMPOSITION.
Materials To Avoid: ACIDS, OXIDIZING MATERIALS, ALDEHYDES IN ACIDIC MEDIUM. UNCONTROLLED CONTACT CAN LEAD TO VIOLENT REACTIONS.
Hazardous Decomp Products: NOX, CO. ALSO POSSIBLE NITRILES; AROMATIC AMINES; ALDEHYDES; ACIDS; CYANIDE; PHENOLS.
Hazardous Poly Occur: NO
Conditions To Avoid (Poly): NOT RELEVANT.
==========
Health Hazard Data
==========
LD50-LC50 Mixture: LD50: (ORAL,RAT) 1300 MG/KG.
Route Of Entry - Inhalation: YES
Route Of Entry - Skin: YES
Route Of Entry - Ingestion: YES
Health Haz Acute And Chronic: CYANOSIS (BLUE COLORATION OF LIPS, NAIL BEDS, EYELIDS), HEADACHE, FATIGUE, DIZZINESS, FAST LABORED BREATHING, INCREASED PULSE, CARDIAC ARREST, CONVULSIONS, COMA, DEATH. EXCESSIVE CHRONIC EXPOSURE CAN AFFECT LIVER, SPLEEN, KIDNEYS, BLOOD.
Carcinogenicity - NTP: NO
Carcinogenicity - IARC: NO
Carcinogenicity - OSHA: NO
Explanation Carcinogenicity: NOT RELEVANT.
Signs/Symptoms Of Overexp: SEE HEALTH HAZARDS.
Med Cond Aggravated By Exp: NONE KNOWN.
Emergency/First Aid Proc: IF CASE OF CONT GET MED ATTN. REMOVE PERSON FROM EXPOS SITE. EYE/SKIN: FLUSH IMMED W/LRG AMTS OF WATER FOR AT LEAST 15 MIN WHILE REMOVING CONTAM CLTHG, INCLUDING SHOES. SHOWER THORO & DON CLEAN, DRY CLTHG & CLEAN SHOES. THORO CLEANSING OFF ENTIRE CONTAM AREA OF BODY INCLUDING HAIR, SCALP, NAILS, NOSTRILS & EAR CANALS, IS OF UTMOST IMPORTANCE. DISCARD ALL CONTAM CLTHG & SHOES. INGEST: (SUPP DATA)
==========
Precautions for Safe Handling and Use
==========
Steps If Matl Released/Spill: CLEAN UP SPILLS PROMPTLY, AVOID CONT W/LIQ OR VAP FORMS. VENT IMMED AREA, CLEAR AREA DOWNWIND. ABSORB SPILLS USING "SPEEDY DRY" OR SIMILAR ABSORB. SHOVEL & SWEEP UP SATURATED ABSORB MATL. HOSE AREA DOWN W/H2O. PERSONS NOT WEARING PROT (SUPP DATA)
Neutralizing Agent: NONE SPECIFIED BY MANUFACTURER.
Waste Disposal Method: DEPOSIT ABSORB MATL SATURATED W/PROD IN SEPARATE LABELED, LEAKPROOF CNTNR & TAKE TO APPRVD TREATMENT, STORAGE OR DISPOSAL
FACILITY.
Precautions-Handling/Storing: VAP & LIQ FORMS ARE TOXIC IF BRTH, SWALLOWED/ABSORB THRU SKIN. DIMETHYLANILINE ON SKIN HAS POOR WARNING PROPERTIES.
Other Precautions: IT IS RAPIDLY ABSORB THRU SKIN & CAUSES CYANOSIS. DO NOT GET INTO EYES, ON SKIN OR CLTHG. AVOID BRTHG VAP. USE W/ADEQ VENT. EATING & SMOKING SHD NOT BE PERMITTED IN AREA WHERE DIMETHYLANILINE IS HANDLED, PROCESSED, OR STORED. (SUPP DATA)
==========
Control Measures
==========

Respiratory Protection: USE NIOSH/MSHA APPROVED ORG VAP RESP IF CONC IS 100-1000% (1X TO 10X) OF OSHA STANDARD. NIOSH/MSHA APPROVED SCBA IF CONC EXCEEDS 1000% (10X) OF OSHA STANDARD.
Ventilation: SHD BE SUFFICIENT TO KEEP CONC BELOW EXPOS LIMIT VALUE WITH USE OF LOCAL EXHAUST WHERE NEEDED.
Protective Gloves: IMPERVIOUS GLOVES (FP N).
Eye Protection: CHEM WORK GOG/FULL LENGTH FACESHLD(FP N)
Other Protective Equipment: APPROPRIATE, CLEAN CLOTHING TO PREVENT SKIN CONTACT INCLUDING LONG SLEEVED SHIRT, BUTTONED AT WRIST.
Work Hygienic Practices: REMOVE CONTAM CLOTHING AND SHOES IMMEDIATELY AND DISCARD. DO NOT WEAR CONTAMINATED SHOES.
Suppl. Safety & Health Data: FIRE FIGHT PROC: (WATER WILL SPREAD SPILLED MATL.) FIRST AID PROC: IF PERSON IS CONSCIOUS, INDUCE VOMIT. SUPPORT BREATHING W/ARTF RESP, IF NEC. SPILL PROC: EQUIP & CLOTHING SHD BE RESTRICTED FROM AREA OF SPILLS & LEAKS. OTHER PREC: DIMETHYLANILINE SHD BE HANDLED IN CLSD SYS, USING STEEL PIPLINES & EQUIP. (SEE ING 4)

==========

Transportation Data

==========

Trans Data Review Date: 91343
DOT PSN Code: FFJ
DOT Proper Shipping Name: N,N- DIMETHYLANILINE *
DOT Class: 6.1
DOT ID Number: UN2253
DOT Pack Group: II
DOT Label: POISON
IMO PSN Code: FVD
IMO Proper Shipping Name: N,N- DIMETHYLANILINE *
IMO Regulations Page Number: 6131
IMO UN Number: 2253
IMO UN Class: 6.1
IMO Subsidiary Risk Label: -
IATA PSN Code: JSM
IATA UN ID Number: 2253
IATA Proper Shipping Name: N,N- DIMETHYLANILINE *
IATA UN Class: 6.1
IATA Label: TOXIC
AFI PSN Code: JSM
AFI Prop. Shipping Name: N,N- DIMETHYLANILINE *
AFI Class: 6.1
AFI ID Number: UN2253
AFI Pack Group: II
AFI Basic Pac Ref: 10-9

==========

Disposal Data

==========

==========

Label Data

==========

Label Required: YES
Technical Review Date: 14OCT91
Label Date: 14OCT91
Label Status: G
Common Name: DIMETHYLANILINE, 065-4180
Chronic Hazard: YES
Signal Word: WARNING!
Acute Health Hazard-Moderate: X

Contact Hazard-None: X
Fire Hazard-Moderate: X
Reactivity Hazard-None: X
Special Hazard Precautions: COMBUSTIBLE.ACUTE: VAPOR/LIQUID FORMS ARE TOXIC IF INHALED, SWALLOWED OR ABSORBED THROUGH SKIN. DIMETHYLANILINE IS
READILY ABSORBED THRU SKIN AND CAUSES CYANOSIS, HEADACHE, FATIGUE, DIZZINESS, FAST LABORED BREATHING, INCREASED PULSE, CARDIAC ARREST, CONVULSIONS, COMA, AND DEATH. DO NOT GET IN EYES, ON SKIN OR CLOTHING. AVOID BREATHING VAPOR. USE WITH ADEQUATE VENTILATION. EATING AND SMOKING SHOULD NOT BE PERMITTED IN AREA WHERE THIS PRODUCT IS HANDLED, PROCESSED, OR STORED. CHRONIC EFFECTS: CAN AFFECT LIVER, SPLEEN KIDNEYS AND BLOOD.
Protect Eye: Y
Protect Skin: Y
Protect Respiratory: Y
Label Name: BUFFALO COLOR CORPORATION
Label Street: 959 RT 46 E SUITE 403
Label City: PARISPPANY
Label State: NJ
Label Zip Code: 07054
Label Emergency Number: 201-316-5600 800-424-9300(CHEMTREC)

THIS PAGE INTENTIONALLY LEFT BLANK

APPENDIX E
LANCE EA EXECUTIVE SUMMARY

U.S. ARMY WHITE SANDS MISSILE RANGE
WHITE SANDS MISSILE RANGE, NEW MEXICO 88002-5048

ENVIRONMENTAL ASSESSMENT
CONTROL NUMBER EA005-96

XO#_____ MPBA#_____

TITLE: Lance Missile Target Environmental Assessment

PROPONENT:
Robert W. Stewart
Robert Stewart
MTD-MT
678-6125
DATE: 15 Mar 96

CONCURRENCE:
for Thomas A. Ladd DirDES
Peggy L. Hoffer
Chief, Environmental Services Division
678-2224
DATE: 23 MAR 96

Sharon K. Castelo
White Sands Missile Range OPSEC POC
678-1205
DATE: 19 Mar 96

RECOMMENDS:

The attached Environmental Assessment has been reviewed and the Finding of No Significant Impact is approved for publication.

Thomas A. Ladd
Thomas A. Ladd
Director, Environment and Safety
DATE: 23 MAR 96

PCPT Udy
Judge Advocate
DATE: 20 Mar 96

APPROVED:

Jerry L. Laws
Brigadier General, USA
Commanding
DATE: 28 MAR 96

EXECUTIVE SUMMARY

LANCE began flight testing in 1965 at White Sands Missile Range and was fielded in the 1970's for use by the United States and other North Atlantic Treaty Organization countries. The Lance missile system has been replaced by Army Tactical Missile System (Army TACMS), which incorporates the latest technology. Air Defense missiles, which are in the development and production stages, need to test their ability to intercept targets. It is proposed that LANCE be utilized as a target for other air defense weapons.

LANCE is a single-stage, two phase, liquid bi-propellant vehicle consisting of a warhead section and an M5 missile main assembly totaling 6.13 m in length. The missile has two different payload configurations; light and heavy. LANCE will not carry explosive warheads when being used as a target. The payload section will be modified to contain ballast, instrumentation, or a combination of both. LANCE travels a ballistic trajectory capable of traveling up to 130 km. LANCE is equipped with limited telemetry instrumentation.

The missile requires a solid propellant gas generator to produce a boost and sustain phase during the launch process. The liquid propellant which drives the missile during flight consists of a fuel and an oxidizer; unsymmetrical dimethylhydrazine (UDMH) and inhibited red fuming nitric acid (IRFNA), respectively.

Two types of testing will be associated with utilizing LANCE as a target, tracking and interception missions. Tracking missions consist of launching a LANCE and tracking the missile with instrumentation. Interception missions involve launching a LANCE missile and intercepting it with a missile which is presently being developed and tested. Both testing scenarios will utilize existing launch and impact areas. If the testing parameters of the tracking instrumentation or intercepting missile require the use of a non-existing launch or impact area, then additional environmental evaluations will be required, such as a Record of Environmental Concern, prior to use.

Utilization of LANCE as targets allows the project to eliminate the remaining missiles (estimated at 120 missiles). This opportunity avoids the traditional disposal phase (static tests and dismantling the missile) which does not make the most efficient use of resources and would create hazardous waste.

Any ballistic missile is viable alternative to using LANCE as a target, however there are some testing scenarios for which these alternatives are not suitable based on their flight patterns, range, availability, etc. Production of alternative targets continues unlike LANCE, therefore, the use of LANCE as targets decreases the necessary resources.

If LANCE is not used as a target, then the remaining missiles will have to be disposed of in a potentially very costly (both monetarily and environmentally) manner. There are two steps for this alternative. First, static tests are required to eliminate as much of the fuel as possible. The second step is to cut open the tanks and extract the residual fuel, at which point the residual fuel and the tanks must be handled as hazardous waste. There is concern by the general public regarding the creation and storage of unnecessary hazardous waste. The unused propellants of this missile are more hazardous than the emissions when burned or exploded.

The no action alternative is not an option for the Lance missile system program. The missiles must be utilized or disposed.

Potential environmental consequences are briefly discussed below.

Monolithic impacts in hydrologically sensitive areas (i.e. ABC-1, Denver, and Rhodes WIT) could potentially pollute the ground water with residual liquid propellants where the water table is shallow. For this reason, these areas have been restricted from use for monolithic impacts. These areas can be utilized only if the LANCE missile is equipped with either a device which will cause the missile to become unstable prior to impact (resulting in a surface impact), or if the missile is made to explode on impact burning all residual fuel.

LANCE will not use Pup WIT as an impact area to any extent. The hazards associated with the chemicals which fuel LANCE are potentially damaging to the White Sands pupfish or their habitat. Therefore, to prevent a "may affect" situation the area will be avoided.

Described activites will not place an extreme demand on the domestic water supply.

Monolithic impacts associated with utilizing LANCE as a target for a tracking test will produce a crater approximately 3 – 4.5 m wide and 2.2 – 3.6 m deep and the missile would bury itself up to 4.5 – 6 m below the surface. The crater will remain open for six months allowing the propellants to dissipate. After six months, the crater will be filled and the missile will remain in place. Equipment used to fill the crater is generally a backhoe or armor plated grader. Soil which was forced out of the ground upon impact is used to fill the hole. If additional soil is required it is obtained from mounds located within the WIT. Off road vehicle use has been restricted to recovery operations when deemed necessary to reduce the potential soil erosion. Drip pans are required whenever generators are used to mitigate potential soil contamination associated with fueling operations.

Vegetation may be slightly altered by LANCE. Efforts to minimize the effect include, having fore support on standby and limiting offroad vehicle use. LANCE will utilize existing launch and impact areas. Launch areas are generally cleared of all vegetation and either covered with a layer of base course gravel or are left barren. Impact area are maintained in nearly bare ground to bare ground conditions for the purpose of data collection and debris recovery. The possibility for listed threatened and endangered species to occur within these areas is very remote. Prior to use of areas outside of existing launch and impact areas, a survey for listed plant and animal taxa will be conducted.

Faunal communities also have the potential to be effected by LANCE. Only those animals within the immediate area have the potential to be destroyed by direct impact or by contact of residual UDMH. Wildlife species around these areas are either acclimated to the increased activity or have vacated the areas. Loss of a few individuals of wildlife species, that commonly in habit impact area, will not effect their entire populations. Potential for threatened or endangered species occurring within these areas is remote.

Noise resources that could have a potential impact are those associated with launch

process. A majority of the existing launch facilities are remotely located and the noise levels will not be significant by the time it reaches a highly populated area. Wildlife species present within 500 m will likely vacate the area dues to the increased activity or will find refuge from the noise in burrows.

Emissions created by missiles, radar equipment, and ground vehicles will be released into the atmosphere. The quantity released is not significant when compared to yearly estimates for emissions created by daily commuters to WSMR. Released emissions will quickly dissipate due to favorable climatic and topographic features associated with WSMR thus reducing the potential for any adverse impact.

Activities associated with using LANCE as targets will not alter the climate of the area.