THE NATIONAL TRAINING CENTER AND FORT IRWIN, CA

Army Nomination for FY 2002 Secretary of Defense
Environmental Awards
Pollution Prevention—Non-Industrial Installation

INTRODUCTION

As the U.S. Army's premier field-combat training facility, the primary mission of Fort Irwin and the National Training Center (NTC) is to provide joint and combined arms training in California's harsh Mojave Desert. Located in north-central San Bernardino County, Fort Irwin encompasses 636,182 acres (slightly over 1,000 square miles) of arid basins, dry lakebeds, ridges, and mountain ranges. Approximately half of this area is restricted from training due to various logistical, physiographic, cultural, and environmental concerns. As a result, the installation is acquiring an additional 113,000 acres of adjacent land to better simulate the changing conditions of the 21st-century battlefield.

The installation challenges visiting units of 4,000 to 5,000 soldiers each month with unparalleled force-on-force and live-fire training opportunities, which consists of ten 28-day rotations (approximately 280 days) per year, with each rotation costing up to $10 million. The training played a major role in the development of tactics and training of troops in Operation Desert Storm. In support of the War on Terrorism, recent additions to the training scenario include cave and urban complexes. These complexes mirror combat conditions that soldiers would expect to encounter in theaters of engagement such as Afghanistan. Missions are supported by active duty military (4,804 personnel) and working civilian populations (3,754 personnel).

BACKGROUND

Fort Irwin has been an integral part of the central Mojave for over 60 years and is steeped in both tradition and honor. Initially called Camp Irwin, the facility was created by President Franklin Delano Roosevelt in 1940 and utilized as an Anti-Aircraft Range during World War II. The installation later became a combat training facility and mobilization center during the Korean War and Vietnam Conflict. It was designated as the NTC in 1981.

PROGRAM SUMMARY

The Environmental Division's mission is to conserve, protect, and restore our natural and cultural resources while accomplishing the military mission. Proper environmental management and coordination at the NTC is not only necessary to comply with federal, state and local regulations, but also to benefit the overall mission by preventing time delays or operational shutdowns and improving public relations.

ACCOMPLISHMENTS

Air Pollution Control

In 1994, Ft. Irwin recognized as generating a significant quantity of particulate matter less than 10 microns (PM^{10}) in size during rotation exercises and started monitoring at six different locations on the EPA six-day schedule. In addition, since 1995, there has been extensive saturation sampling at four other sites for PM^{10}. A dust study, in conjunction with U.S. Army Forces Command (FORSCOM), was initiated in 1995 to develop a mechanism to mitigate this problem. By controlling fugitive dust, preventing the exceedence of PM^{10} standards and maintaining compliance with air quality standards, this ongoing study will ensure the military can continue to train without restrictions.

PM^{10} Partisol Air Sampling Machine

Since March 1998, Fort Irwin's air pollution mitigation methods have included extensive paving of roads, parking lots and paths; laying aggregate rock for ground cover; and installing solar powered street lamps in cantonment and housing areas. In addition, ITAM has completed re-vegetation by seeding and planting shrubs and grasses, treating roads with dust-reducing products, and enhancing soil stability with biological crusts. Eighty-two permitted emission source sites are issued on Fort Irwin for use of boilers, generators, spray-painting equipment, storage tanks, fire pumps, and other machinery. In 2000, the NTC successfully made a transition from the use of chlorine in wastewater treatment to sodium hypochlorite. Gaseous chlorine use is no longer a factor in Fort Irwin's Risk Management Plan. Additionally, the use of anhydrous ammonia has been eliminated from ice making and visual support operations. These measures increase the quality of life for soldiers and families by improving air quality and maintenance of training and garrison areas for future use.

The NTC's air-quality improvement efforts have not gone unrecognized. The Mohave Desert Air Quality Management District awarded the NTC the Exemplar Award for four consecutive years (1999–2002). This award is given to organizations within the district that have demonstrated exceptional commitment to clean air by developing voluntary air pollution prevention and control efforts. Selection is based on a program's quantifiable air quality improvements, innovative approaches, long-term benefits, sound environmental philosophy, and replicability. Fort Irwin, through partnerships with ITAM, Directorate of Public Works, Anteon Corporation, Army Corps of Engineers, Johnson Controls, and Pacific Northwest National Laboratory (PNNL), has evaluated and implemented substantial measures to decrease airborne pollution at the installation.

Water Pollution Control

Fort Irwin is a desert community, where summertime temperatures often exceed 115°F, and relative humidity hovers around 20% for most of the year. Transpiration averages 75 inches of water annually. In this extreme environment, water is a very valuable resource. Fort Irwin's Water Program seeks to protect and conserve this precious commodity to ensure clean water for the NTC mission and the Irwin community into the next century. The program does this through:

- production of fresh water from wells
- purification and supply of drinking water, along with "domestic" water, in a dual system
- collection and treatment of 1.2 million gallons a day of municipal wastewater
- conservation, pollution prevention, and monitoring efforts

Fort Irwin's drinking water must be treated by reverse osmosis filtration due to high fluoride levels. In 1998, this process underwent modifications to change the type of membrane used. This simple change allowed Fort Irwin to eliminate storage of **500 gallons (100%)** of sulfuric acid from a housing area, saving approximately **166,000 kilowatt-hours** of electricity and almost **33 million gallons** of water annually—equal to 3% of total production.

Fort Irwin treats its wastewater through a secondary extended aeration system to a level that allows use for irrigation and dust control without human contact. Improvements in 1999 eliminated sewage spills at the plant, improved influent quantity measurement and sampling collection, and **eliminated 8,000 pounds (100%)** of gaseous chlorine with sodium hypochlorite generators.

Closed Loop Wash Rack System

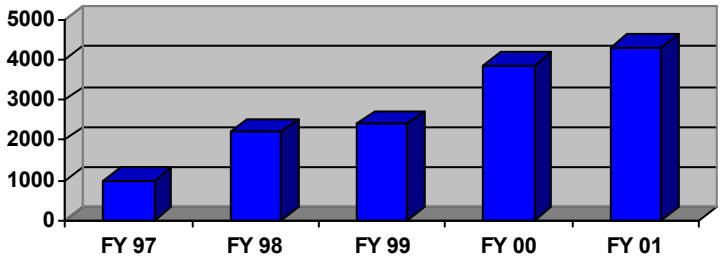
Fort Irwin washes as many as 6,000 tactical vehicles a month on wash racks. Prior to 1996, Fort Irwin's wash racks were in a general state of disrepair, consisting mainly of hoses on hose bibs draining into sludge basins, with ineffective oil skimmers. At the rate of 20 gallons per minute per hose, a rotation was using 1.5 million gallons of water for the regeneration process. In addition to this waste, the sludge basins created ideal conditions for the propagation of hydrogen sulfide–generating bacteria. In 1995, more than 70 contract workers lost time due to reported exposure to hydrogen sulfide. In 1996, Fort Irwin undertook an extensive repair and refurbishment project to modify the wash racks. The systems now utilize advanced oil-water separators, backwashing sand filters, bag filters, and ozone generators to filter, purify, and recycle all wash water through a closed-loop wash rack system. During FY00, Fort Irwin built a new state-of-the-art 26-bay closed loop wash rack system. Rotational units can wash 72 vehicles at a time, thereby saving time during the regeneration period. Only makeup water is required due to minimal evaporation. Due to these modifications, approximately **11 million gallons of water, or 1% of total production, are conserved per year**.

Waste Management and Resource Recovery

Fort Irwin is **among the first installations to exceed the DoD goal of a 40% diversion of all solid waste** currently generated by the year 2005. Fort Irwin also exceeded the California requirement to reduce the 1990-baseline disposal of non-hazardous solid waste by 50% by the year 2000. Fort Irwin diverts solid waste from the landfill by processing it through the installation recycling center and composting facility.

Fort Irwin Recycling

Fort Irwin has a state-of-the-art commingled recycling program. It provides blue containers to housing occupants and offices to deposit all recyclables, which are then sorted at the recycling center. This has resulted in an increase of more than 400% for material recycled between1997 and 2002.



Tons Recycled, FY97–FY01

Fort Irwin recycling management continuously provides training to enhance public awareness of recycling procedures. The Environmental Division publishes articles in the post newspaper and celebrates Earth Day and America Recycles Day with the elementary schools. Because Fort Irwin is in such a remote location, the cost to deposit one ton of trash in the Fort Irwin on-site class III landfill is $178.00. The cost to deposit one ton of trash in an off-site public landfill is $220.00 per ton, and the cost to recycle one ton of trash is $78.00. In addition to the sales, the overall cost savings from the recycling program includes the cost avoidance of reduced landfill operation, which was **$384,694** in FY00, **$430,000** in FY01, and **$358,000** in FY02.

Compost Facility

The Fort Irwin Compost Program spans three areas of environmental concern: solid wastes, air quality, and water conservation. As the NTC, Fort Irwin annually produces around 20,000 cubic yards of wood waste in the form of pallets, ammo boxes, and target scrap. In the past, this wood was periodically burned, which generated smoke for months. In addition, the Fort Irwin community annually produces about 10,000 cubic yards of green waste, which was formerly stockpiled at an unauthorized dumpsite on post. The wastewater treatment plant produces about 900 tons of Class A sewer sludge annually, which was formerly landfilled at a cost of $178 a ton.

The compost facility resulted from Fort Irwin's desire to dispose of waste streams in an environmentally friendly manner. Currently operating under a pilot program, it uses the **Ag-Bag system**, an in-vessel technology that places the composting material inside a plastic bag 500 foot long and 10 feet in diameter. Air is introduced into the bag to control the temperature. Wet composting material is put into the bags, and the moisture is held in for the duration of the processing. As a result, water resources are conserved. During FY00–FY02, Fort Irwin diverted **2,600 tons** of sewage sludge and **60,000 cubic yards** of waste wood, or **100% of these waste streams**.

Toxic & Hazardous Waste Management

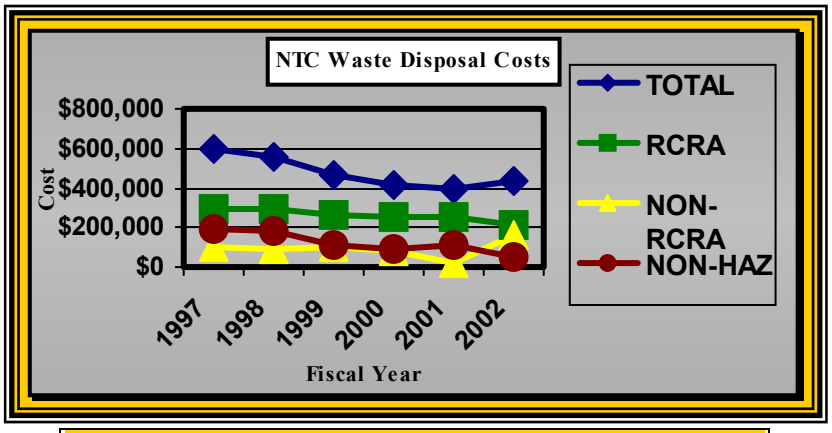
Sources: The primary hazardous waste source is the operation and maintenance of military support vehicles. Hazardous substances include POL products such as diesel fuel, motor oil, JP-8, used oil, hydraulic oil, anti-freeze, degreasing solvents, and battery acid. Contaminated soils are generated primarily from field exercises where JP-8 and other POL spills may occur. Fort Irwin produces approximately 4,200 tons of POL–contaminated soils per year. Waste is also generated from the routine servicing of the installation's wash racks.

Management: Hazardous waste is generated/accumulated at approximately 70 sites on Fort Irwin. The Hazardous Waste Service Contractor collects the waste from the sites every 45 days and transfers it to one of two consolidation points. In 1999, Fort Irwin applied for and received a waiver to circumvent DRMO and independently arrange for the disposal of installation-generated hazardous waste.

Fort Irwin regularly inspects all 70 sites for regulatory compliance. These inspections are conducted daily, weekly, monthly and quarterly by the Hazardous Waste/Material Handler and/or the Hazardous Waste/Material Manager assigned at the unit level. Inspections have helped Fort Irwin to stay in compliance. The Fort boasts a perfect track record of **zero notices of violation (NOVs) issued for five consecutive years (1997–2001)**. During this time, Fort Irwin had numerous regulatory inspections, including a multimedia inspection from EPA Region IX.

Hazardous Waste Minimization

The NTC and Fort Irwin have proactively reduced hazardous waste costs by implementing a comprehensive integrated approach to waste management. Under this approach, pollution prevention measures are incorporated into daily activities at several levels across a broad range of multi-functional users. The result of this cradle-to-grave management philosophy has been a substantial annual cost savings of approximately **$2 million** to the installation. This accomplishment has improved mission readiness and soldier quality of life without compromising environmental concerns.



Combined Effect of P2 Initiatives on NTC Waste Disposal Costs Amounted to a 30% Reduction in Disposal Costs From 1997–2002

Environmental Education

The NTC and Fort Irwin has established a Hazardous Materials/Waste Handler's Training Program. This program is required for all unit Environmental Awareness Officers, Hazardous Materials/Waste Managers, Hazardous Materials/Waste Handlers and their alternates. The training consists of an initial 40-hour course and an 8-hour annual refresher class. Another training program has been established for all incoming rotational environmental clean-up teams to ensure that they receive hazardous materials/waste spill response training required by the State of California. Fort Irwin has also developed a community education and public awareness program that includes educational displays and public educational brochures such as soldier pocket books, brochures on endangered species, air quality, cultural resources and native wildlife.

HAZARDOUS MATERIAL CONTROL CENTER (HMCC or "HAZMART")

The HAZMART effectively reduces waste generation and improves compliance by centralizing the purchase, storage, distribution and management of hazardous material. Since implementing the HAZMART program, Fort Irwin has greatly reduced the volume of hazardous materials stored at individual shops and maximized material turn-in/re-use options. The table below summarizes the savings in terms of the value of free issue items—purchased but unused supplies returned to the HAZMART for free distribution—utilized by the NTC and rotation.

UNITS	FY00	FY01	FY02	Totals
Rotations	$135,474	$162,895	$498,000	$796,369
Fort Irwin	$90,611	$87,863	$138,000	$316,474
Total Cost Savings = $1,112,843				

Summary of Savings in Terms of the Value of Free Issue Items
Re-utilized by the NTC and Rotational Units

Anti-freeze Recycling

Fort Irwin initiated an anti-freeze recycling program in 1997. The table below summarizes the cost savings achieved through this program.

Fiscal Year	Recycle Cost/gal	Recycle Cost-Total	Virgin Cost-Total	Disposal Cost-Total	Gallons Recycled	Total Savings
1997	$2.62	$31,125.60	$59,400.00	$13,305.60	11,880	$41,580.00
1998	$2.80	$28,028.00	$50,050.00	$11,211.20	10,010	$33,233.20
1999	$2.99	$41,907.84	$70,080.00	$15,697.92	14,016	$43,870.08
2000	$3.20	$81,200.00	$126,875.00	$28,420.00	25,375	$74,095.00
2001	$4.00	$54,600.00	$68,250.00	$15,288.00	13,650	$28,938.00
2002	$4.30	$95,030.00	$95,914.00	$25,415.00	22,100	$26,299.00
TOTAL SAVINGS = $248,015.28						

Re-refined Oil

In September of FY00, Fort Irwin implemented the DLA Closed Loop Re-refined Oil Program (CLROP). Used oil is consolidated by the installation Hazardous Waste Service Contractor and is then picked up by the DLA contractor for re-refining at no cost. The re-refined oil is then purchased from the DLA contractor through the HAZMART. HAZMART personnel re-package the bulk material into customer-requested quantities to facilitate standard operations. The program is saving approximately $50,000 a year through the reduction of used oil disposal and the reduced price of purchasing re-refined products.

Fiscal Year	Qty. Waste Oil Disposed of through CLROP - No cost	Former Disposal Cost through DRMO - $.87 gal
FY 2000	13,481 gallons	$11,728.47
FY 2001	88,136 gallons	$76,678.32
FY 2002	69,093 gallons	$60,110.41
Total CLROP Disposal Cost Savings = $148,516.33		

Propane Gas Recovery

The rotational units at NTC generate large quantities of partially used propane cylinders used for heating and cooking operations. These propane cylinders were accumulated at the end of every rotation for disposal as hazardous waste. Disposal costs through DRMO average $123.00 per cylinder. In 1996, Fort Irwin partnered with the Installation's Hazardous Waste Service Contractor (HAZCO) and developed a closed-loop system that evacuates and recovers the remaining propane from the cylinder. The recovered gas is then reintroduced as a usable product after repackaging in refillable containers. The valve stems are pulled from the empty cylinders and they are recycled as scrap metal. The total cost for this action is $1.97 per cylinder. As of October 2002, Fort Irwin had processed 60,430 propane cylinders at a cost of $1.97 per cylinder instead of DRMO's $123.00 per cylinder. The cost savings from October 1997 to October 2002 was approximately 7.3 million dollars. A total of 700 gallons of propane has been recovered and reused. A total of 62 tons of metal has been recycled.

POL–Contaminated Soil Recycling and Land Farm Operations

NTC has ten rotations a year and generates over 4,200 tons of contaminated soil (CS) from the POL spills caused by training vehicle maneuver accidents. Before 1996, NTC was disposing of the CS off-post at $0.09 per pound. Fort Irwin also has 150,000 tons of CS stockpiled as a result of regulatory changes that altered past disposal practices.

In 1996, Fort Irwin initiated a two-part solution to resolve the situation. First a POL–bioremediation land farm was constructed to treat CS generated from current and future fuel spills. Bioremediation at the land farm costs $0.06 per pound, and the treated soil is used as alternate daily cover in the landfill. The following chart summarizes the savings Fort Irwin has achieved through land farming.

Options	1999	2000	2001	2002
Cost of Disposal Through DRMO	$795,960.00	$756,360.00	$740,160.00	$465,727.00
Cost of Land Farming	$530,640.00	$504,240.00	$493,440.00	$310,484.00
Savings	$265,320.00	$252,120.00	$246,720.00	$155,243.00
Total Savings = 917,403.00				

Secondly, in cooperation with Cunningham Davis Corporation (CDC), Fort Irwin developed a process of incorporating the CS in a cold-mix asphalt process. The product is then used to pave roads, maintenance areas, and parking lots. This process encapsulates the POL contaminants in the CS. To date, Fort Irwin has depleted 19,035.1 tons of existing CS. This process **saves 40% of the cost** of disposal of CS plus paving with new asphalt and provides a usable product.

CONCLUSION

Fort Irwin has consistently set goals beyond the minimum and continues to raise its performance levels. Fundamental milestones, such as exceeding the DoD 40% solid waste reduction goal, meeting the FORSCOM zero-defect policy for NOVs during a five-year period, realizing a 30% reduction in hazardous waste disposal costs, achieving water use savings of 44 million gallons per year and energy use savings of 166,000 kwh per year have been attained. Through the development and implementation of innovative management and educational programs, Fort Irwin demonstrates true commitment to continual improvement in environmental quality.

Program	Annual Cost Avoidance	Performance Metric
Water Pollution Control		Change in reverse osmosis filtration membrane resulted in 500 gal of sulfuric acid eliminated; 166K kwh saved, and 33M gal H20 saved annually
Closed Loop Wash Rack		6000 tactical vehicles per month; new 26-bay wash rack saves 11M gal H2O annually
Recycling	$407,347	400% increase for recycling in 5 years, or an average of 80% per year over the baseline in FY 1997
Compost Facility		20K cubic yards wood waste annually; 10K cubic yards green waste annually; 900 tons class A sludge; diversion of 2000 tons sewage sludge and 40K cubic yards waste wood in FY00–01
Toxic and Hazardous Waste Management - Contaminated Soil	$254,053	4200 tons CS produced/bio-remediated per year. 19 tons of CS depleted (recycled) to date; saves 40% of disposal cost
Hazardous Waste Accumulation, Handling, and Disposal		No NOVs in 5 years, well ahead of the FORSCOM Zero NOV by FY 2005 goal
Hazardous Waste Minimization	$2,000,000	30% reduction in disposal costs over 5 years
HAZMART	$238,420	HW solvent waste stream reduced 99% since 1992 baseline year (from 143 tons to less than 1 ton)
Anti-freeze Recycling	$44,340	Average annual recycling of 15K gallons of anti-freeze

Program	Annual Cost Avoidance	Performance Metric
Re-refined Oil	$44,200	50,808 gallons (average gal. Per year for FY00 and 02) disposed through closed loop re-refined oil program
Environmental Education		300 people HM/WH Training program and 220 received HM/Waste Spill Response training
Total annual cost avoidance = $2,988,360		