



## 2019 Secretary of Defense Environmental Award Sustainability - Non-Industrial Installation Marine Corps Air Station Miramar



**MCAS Miramar occupies 23,000 acres in San Diego County. Land east of Interstate 15 is primarily undeveloped training ranges, and property to the west contains the airfield, housing, and cantonment area.**

### Introduction

Marine Corps Air Station (MCAS) Miramar is located at the center of a network of Marine Corps and Navy installations and ranges in the Southwestern United States. Situated 13 miles north of downtown San Diego and approximately four miles east of the Pacific Ocean, MCAS Miramar encompasses 23,065 acres of mesas and undeveloped coastal foothills, and provides air station facilities and property, services, materiel support, and training venues in support of combat readiness for 3rd Marine Aircraft Wing and other tenants. MCAS is bisected by Interstate 15 (I-15). West of I-15, the Main Station hosts flight operations and commercial, administrative and residential facilities, while east of I-15 is East Miramar, which is primarily comprised of undeveloped training areas, small arms ranges, and warehousing. Additionally, East Miramar serves as an encroachment buffer for the station at-large. With more than 15,000 civilian Marines, contracted employees, service members and their families working and living on station and over 260 helicopters and fixed-wing aircraft assigned to the installation, MCAS Miramar is the largest air station in the Marine Corps, and plays an important role in the San Diego community as an economic engine and ambassador of the military mission.

With access to more than 65% of the Department of Defense's training ranges in the continental United States, MCAS Miramar is at the heart of modernizing Marine Corps aviation. This modernization includes \$202M in military construction (MILCON) initiated during FY17 and FY18 in advance of the West Coast basing of the F-35 Joint Strike Fighter. F-35 related construction projects include the ramp and apron expansion, construction of hangars, communications infrastructure, and simulator training facilities. Improvements will continue during FY19 and beyond, with more than \$250M slated to award in upcoming years. MCAS Miramar is a resource-resilient, self-sustaining base that enables the readiness of tenant organizations by preserving and conserving resources, reinforcing community partnerships, and modeling innovation. The station meets its mission and will continue to face new challenges by protecting, projecting, and preserving the force, by partnering with the community, and by striving for resiliency in infrastructure, energy, water, and other resources. By continuing to pursue projects that conserve resources and improve resiliency, MCAS Miramar seeks to safeguard its role in national security for decades to come.

### Background

MCAS Miramar implements sustainability practices and principles to enhance training opportunities and ensure long-term availability of training areas, improve the quality of life for military and civilian personnel and their families, and protect and preserve the natural environment. Miramar published its sustainability goals and objectives in the "Miramar Energy Strategy 2025," and continually pursues a broad range of energy resilience upgrades and improvements via an array of funding sources and procurement pathways to progress toward meeting those goals. The station's robust energy and environmental programs provide a strong foundation for innovation and improvement.



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**Energy Program** - Miramar's Energy Program utilizes innovative technologies, continual process improvement, and extensive partnering efforts to reduce energy and water use, increase the station's resilience through renewable onsite sources, and reduce greenhouse gas emissions from transportation, facilities, and construction. Numerous overlapping, multi-year initiatives allow for responsive, continual process improvements, and the energy team conducted significant planning, award, design, and execution efforts during FY17 and FY18. Aggressive focus on energy resilience, efficiency, awareness, and ethos, have resulted in investment of \$13M in research and development funding during FY17 and FY18 to expand upon microgrids, energy storage, electric vehicles, building control integration, and base-wide demand management on the station, and a roughly \$6M investment in physical improvements leading to water and energy conservation. Energy requirements at MCAS Miramar are expected to grow as the base expands to accommodate the F-35 and other emerging programs, and all new construction is required to achieve Department of Energy Interagency Sustainability Working Group Guiding Principles Validation and comply with Unified Facilities Criteria 1-200-02.



**Environmental Management System** - Recognized as a model program, the MCAS Miramar Environmental Management System (EMS) is hosted on a website that is accessible to all internet users and is continually updated with current plans, training, and inspection information. Environmental management is integrated into all day-to-day installation and tenant activities, including environmental planning, project review, compliance auditing, record keeping, and information management. Lessons learned are discussed by the EMS Cross Functional Team and incorporated into the installation's Environmental Compliance and Protection Standing Operating Procedures, which provides a framework for implementing environmental requirements and accountability installation-wide.

**Comprehensive Environmental Training and Education Program** - The Comprehensive Environmental Training and Education Program (CETEP) provides job-specific environmental online training courses for Marines, Sailors, and civilians station-wide. During FY17 and FY18 Miramar conducted 32 classroom-based instructional sessions and hosted 10 Naval Civil Engineer Corps Officers School courses for environmental staff and tenant representatives. An all-hands, general environmental awareness video is available on the EMS website, and environmental personnel provide live training to Marines and families at welcome aboard briefs, "back in the saddle" training, Earth Day and Marine Corps Community Services-sponsored events, and community expos. MCAS Miramar is the first Marine Corps installation to incorporate Energy Ethos training into the Environmental Compliance Coordinators syllabus, a best practice that is now being adopted Marine Corps-wide, and Hazardous Materials Handler, Hazardous Waste Handling Officer, and secondary Military Occupational Specialty 8056 training processes are streamlined and included in Hazardous Waste Coordinator training on station.

**Waste Management and Recycling** - The Environmental Management Department (EMD) works hand-in-hand with tenant and station organizations to ensure the proper disposal and/or recycling of regulated wastes. Hazardous Waste Coordinators (HWC) are the EMD's liaisons to each tenant unit on waste disposal issues, and they receive installation-specific HWC introductory and refresher courses and quarterly training from EMD staff.



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**personnel assigned to the Miramar QRP sort recyclables at the Recycling Center. The QRP generated more than \$207,000 during FY17 and FY18.**

In FY18, in response to emerging requirements, Miramar successfully requested an additional permit to store used tires, increasing the station's capacity to process tires by 17%. A cost-saving initiative to utilize

Defense Logistics Agency hazardous waste disposal services resulted in a savings of more than \$96,000, and the Qualified Recycling Program generated more than \$207,000 in revenues that are applied to the operating costs of the program and to providing morale, welfare, and recreation programs for active duty personnel.

***Water Quality and Storm Water Management / Low Impact Development*** - Proactive water quality management allows the station to ensure continued compliance and make improvements to facilities and water distribution. MCAS Miramar holds an

Industrial User Discharge Permit and four National Pollutant Discharge Elimination System permits, an Industrial Storm Water Discharge Permit, and a Small Non-Traditional Municipal Separate Storm Sewer System Permit, as well as 22 Food Establishment Waste Discharge permits from the City of San Diego. The Water Quality Program was subject to eleven regulatory inspections during FY17 and FY18, with no violations noted. Marine Corps Community Services implemented Low Impact Development (LID) components into the new Flight Line Mini Mart and Starbucks / Jamba Juice facilities completed in FY18. Bioretention features, grassed swales, and infiltration trenches were incorporated into the projects, which covered a combined 93,000 square feet.

***Air Quality Management*** - The air quality program maintains compliance and the regulatory relationships critical to remaining responsive to regulatory changes and implementing improvements in energy production and distribution. The EMD manages 115 permits from the San Diego County Air Pollution Control District (SDAPCD) and a registration certificate from the State of California Air Resources Board for more than 350 pieces of Tactical Support Equipment under the Statewide Portable Equipment Registration Program. During FY18, SDAPCD conducted a compliance inspection of all permit requirements with no enforcement action cited.

***Environmental Planning*** - Requirements associated with F-35 home-basing at MCAS Miramar were the EMD planning department's priority in FY17 and FY18. A Supplemental Environmental Assessment for Miramar-specific F-35 projects and an accompanying Finding of No Significant Impacts determination were finalized in November 2017. A 2016 update to the Marine Corps Aviation Plan required an evaluation (completed in FY18) of the consequence of replacing up to two planned F-35B squadrons (vertical/slow takeoff and landing) with F-35C squadrons (aircraft carrier capable). During FY17 and FY18, the EMD also prepared or provided oversight for 77 Categorical Exclusion (CATEX) documents, 55 design reviews, two Real Estate Lease Agreement Environmental Plan reviews, and 82 Multi-Use CATEX consultations. Preliminary planning discussions occurred for easement requests from the City of San Diego for the Pure Water Project, and from San Diego Gas and Electric (SDG&E) for the installation of a new gas pipeline, which was later cancelled when the California Public Utility Commission determined that the new pipeline was not required.

***Cultural Resources*** - Buildings at Miramar over 50 years of age have been evaluated and determined to be ineligible for listing on the National Register of Historic Places, and 188 Archaeological sites have been identified, including 10 that are eligible for listing on the Register. In FY17 and FY18, the station completed Section 106



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NHPA consultation for F-35 related construction, for demolition of two bunkers in East Miramar, and in support of the City of San Diego's Pure Water – North City Project, all of which resulted in a “no historic properties affected” outcome. In 2018 MCAS Miramar shared a draft of the Integrated Cultural Resources Management Plan update, slated for completion in FY19, with local Indian Tribes and Archaeological/Historical groups. All archaeological artifacts from the station continue to be curated at the San Diego Archaeological Center.



**MCAS Miramar is one of only two military installations with a National Natural Landmark on site. Miramar Mounds NNL contains 1,500 vernal pools and hosts numerous threatened and endangered plant and wildlife species.**

**Natural Resources** - Miramar has eleven federally listed threatened and endangered species, thousands of acres of regionally sensitive habitat, important habitat linkages, and the largest concentration of rare vernal pool wetlands in Southern California. Miramar Mounds National Natural Landmark (NNL) is one of only two NNL aboard U.S. military installations. In FY18 the station completed a vernal pool and wetland habitat restoration project as mitigation for MV-22-related MILCON projects, and broke ground on a similar project that will continue into FY22 in support of F-35 MILCON. In 2009, Miramar was one of the first installations in the DoN to initiate an off-installation habitat compensation project by partnering with the San Dieguito River Park Joint Powers Authority at the Sycamore Westridge Preserve, and the station is working the same approach to mitigate impacts from F-35 construction. This preserves installation lands for mission activities rather than habitat conservation.

### Summary of Accomplishments

Miramar's advances in sustainability have been recognized at several levels. In FY17, MCAS Miramar achieved a platinum level of performance for maintaining an outstanding energy program, and the station was the overall Marine Corps small shore installation SECNAV Energy Award winner for FY18, in recognition of achievements in meeting energy and water management goals, and excellence in the areas of energy conservation and efficiency, energy resilience, renewable energy, new technology, training innovation, and awareness efforts. MCAS Miramar achieved a 5% reduction in energy intensity versus the 2015 baseline, a 47% reduction in water intensity versus the 2007 baseline, and now sources 52% of total energy consumption from on-site renewable energy sources. Numerous specific achievements contributed to Miramar's successes.



**The building-level demonstration microgrid uses 100% renewable power and provides complete off-grid load management capability.**

**Microgrid Implementation** - Miramar hosts a new 100% renewable, building-level demonstration microgrid with total off-grid capability which integrates battery storage, controllable photovoltaic (PV), electric vehicles, and complete load management within the building, including heating, ventilation and air conditioning (HVAC), lights, and plug loads. The Battery Storage Building Level Microgrid Demonstration was recognized in FY17 as the Office of Secretary of Defense Environmental Security Technology Certification Program (ESTCP) Project of the Year, and received the U.S. Department of Energy Federal Energy and Water Management Project Award.



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In September 2017, MCAS Miramar broke ground on an installation-wide microgrid project, which constructs a new power plant, builds a new Energy and Water Operations Center, and establishes a basewide microgrid control system. The microgrid will be capable of supporting more than 100 mission-critical facilities for three weeks in the event of a grid outage, including emergency services, flight line operations, and communications. The system leverages all available resources to provide complete redundancy to the local utility, including two 1.4 megawatt (MW) natural gas generators, two 1.8 MW diesel generators, two 1.6 MW landfill gas-fueled generators, battery storage, and more than 1.2 MW of PV. A sophisticated control system allows the microgrid to automatically optimize power generation and shed load, generating cost savings by offsetting electricity purchases, reducing peak demand charges, and allowing participation in utility demand-response programs.



**The Energy and Water Operations Center opened in 2018, and will serve as the command center for the microgrid.**

MCAS Miramar collaborated with University of California, San Diego (UCSD) to use a \$5M California Energy Commission Electric Program Investment Charge (EPIC) grant, which was awarded in FY18 to UCSD, to install 3 MW of large-scale energy storage into the MCAS Miramar microgrid and provide demand-response capability of up to 1.6 MW through the HVAC controls. The project provides significant operational and environmental benefits, including the integration of 3.2 MW of landfill gas generated power, reduced demand charges, continuity in power provision during a public utility outage, reduced reliance on diesel generators as the primary source of backup power, and the expansion of Miramar's onsite renewable portfolio to 75% by FY20.

**Landfill Gas Power Generation and the San Diego Pure Water Project** - In 2012, MCAS Miramar began utilizing 3.2 MW of renewable energy produced at the on-site landfill managed by the City of San Diego as part of the City's Pure Water Program. The program will provide approximately one third of San Diego's water supply using proven technology to produce safe, high quality water from wastewater reclamation, treatment, and distribution. During FY17 and FY18 MCAS Miramar conducted numerous environmental reviews and supported and executed several real estate actions for project easements, enabling significant progress on this decade-long initiative. Related negotiations during FY18 with the City of San Diego to enter into an Intergovernmental Support Agreement (IGSA), the first in the Navy to enhance energy resilience, will enable the station to procure an additional 1.6 MW of landfill power as part of the City's Pure Water Program and expand MCAS Miramar's landfill gas power to 4.8 MW, boosting the station's renewable electrical portfolio to an unprecedented 75%. The initiative involves significant collaboration between government entities and is a model of water-energy nexus.

**Vehicle-to-Grid Technology** - MCAS Miramar is expanding innovative energy and mobility efforts by equipping six hybrid-electric passenger and cargo vans with vehicle-to-grid (V2G) technology. V2G technology uses emission-free vehicles to add resilience to the electrical grid by connecting the vans via bi-directional electric vehicle charging stations. The vehicles function as large mobile, rechargeable batteries that balance energy loads by charging during off-peak times and sending power back to the grid when demand is high or if the electric supply is disrupted. The CEC-funded pilot project, led by Lawrence Berkeley National Lab and awarded in 2017, assesses the long-term feasibility of using vehicles with V2G technology to provide energy storage for microgrid operations.



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**Recycled Water Expansion** - MCAS Miramar realized a significant reduction in potable water use through a multifaceted water conservation program. Since 2009 Miramar has had an internally-managed distribution system for reclaimed water (RCW) used for irrigation, construction, dual-plumbed buildings, and street sweeping. Utility expansion projects during FY17 and FY18 converted a significant number of major irrigation sites on the installation to RCW, increasing RCW infrastructure by more than 5 miles, and totaling a 47% conversion to RCW irrigation. Future expansion will include RCW connections into evaporative cooling towers. An additional project converted all of Miramar's vehicle and aircraft wash racks to isolated recirculated water systems, resulting in a savings of 75% of potable water at these facilities. Additional best practices implemented in FY17 and FY18 include using central irrigation controls for reliable conservation, installing thousands of low- or no-flow water fixtures, and providing water conservation educational resources to base personnel. Potable water use at Miramar has decreased over 54% since 2009, and as of 2017, the base's total water use was 35% recycled. The station is on track to meet its goal of 50% RCW use by 2030.

### **Heating, Ventilation and Air Conditioner Coatings** -

Another initiative reduces component degradation and energy loss in cooling towers. Cooling equipment exposed to solar radiation, jet fuel exhaust, and other corrosive agents fail quickly, requiring repair and replacement, and the lack of protective coatings result in high rates of solar heat transfer and energy loss. A \$526K project was awarded and implemented during FY17 and FY18 to apply chemical coatings to cooling tower components to prevent corrosion, contain and prevent leaks, and reduce annual maintenance requirements by approximately 50%. The coating will repel mold spores, dirt, and other organic debris from condenser coil fins and tubes, improving airflow and reducing energy use, and enduring benefits include postponing capital expenditures for new equipment by 10 to 15 years.



**Chemical protective coatings applied to HVAC units reduce the need for maintenance and replacement, and help the equipment operate more efficiently.**

### **Collaborative Partnerships and Outreach**

**Readiness and Environmental Protection Integration (REPI) Program** - In July 2018, MCAS Miramar, with support from the MCIWEST REPI office and NAVFAC Southwest Real Estate and Environmental personnel, executed a \$1.5M agreement with the Endangered Habitat Conservancy for the perpetual management and preservation of 409 acres of undeveloped land acquired with \$4M of REPI and matching partner funds, residing two miles east of the station and under the main aircraft approach corridor. The agreement protects the MCAS Miramar mission by providing credits for relieving on-station field training constraints associated with the federally threatened California gnatcatcher (*Polioptila californica*). This accomplishment is the culmination of five years of work compiling data and coordinating with the United States Fish and Wildlife Service (USFWS), and in future years, collaboration will continue to determine how to apply conservation credits to regulatory relief to ensure sustained training capabilities in critical aviation support missions.

**Defense-Community Partnerships** - MCAS Miramar leads the Navy and Marine Corps in using new partnership frameworks such as the IGSA and REPI agreement, strengthening relationships and assuring sustained community support in a rapidly changing environment. Partnership with government, academia, and other defense agencies include USFWS, Bureau of Land Management, SDAPCD, and the City of San Diego's Department of Environmental Health. The California Energy Commission, California Public Utilities Commission, and University of California, San Diego have been integral to Miramar's energy initiatives, and



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organizations such as the Endangered Habitat Conservancy provide invaluable support to furthering conservation efforts that will sustain the military mission.



**The Water Conservation Garden is used to test new technologies and resilience of native vegetation, and to educate the station on water conservation issues.**

**Research and Outreach** - The Environmental and Energy Programs at MCAS Miramar actively seek out opportunities to keep the installation and community at large informed and engaged. Interpretive kiosks and viewing platforms are provided for visitors to the station's vernal pools. Miramar's professional botanist manages the station's native plant and water conservation research garden, which serves to educate the station population and project landscape architects on native plant species and encourage their incorporation in new project design. Projects in FY17 and FY18 installed a "purple pipe" system in the garden, which allows the station to evaluate the effects of recycled water on native plant species, and a prototype walkway through the garden to evaluate the use of new materials ahead of constructing a larger interpretive trail in the Miramar Mounds National Natural Landmark. Environmental conservation staff provide frequent presentations to station personnel, regional command staff, and local non-governmental agencies (NGOs); host field trips for NGO's, colleges, and regulators; share

research data with local and regional entities; provide research support and access for universities and colleges; and represent the Command on the Mission Trails Regional Park Citizens Advisory Committee. The station also provides outreach through multiple station-wide cleanup events, Earth Day events, and household hazardous waste collections, and by facilitating recycling at the MCAS Miramar Air Show, conducting Facility Response Plan training and drills with station Emergency Responders, hosting booths highlighting environmental and energy topics at Miramar's annual health fairs, and providing information to station residents at base housing information meetings.

### **Conclusion**

Sustaining the military mission at MCAS Miramar is an interdisciplinary, all-hands effort, and through strong partnerships, implementation of innovative technologies, robust outreach programs, and continued focus on compliance, conservation and pollution prevention, the station made significant strides in FY17 and FY18 in reducing environmental impacts, realizing cost savings, and improving the resiliency of the station. MCAS Miramar and its partners intend to build on the successes of the past two years to meet 2020 renewable energy and water reduction goals, continue responsible stewardship of resources, maintain compliance, and maintain the station's enduring role as an integral part of the San Diego community and a power projection platform for America's force in readiness.