

## **Fiscal Year 2010 Environmental Award Submission, Naval Station Great Lakes Sustainability – Non-Industrial Installation**

### **Introduction**

Naval Station Great Lakes (NS Great Lakes) has served as the “Quarterdeck of the Navy” in transforming civilians into Sailors, and Sailors into highly qualified technicians since 1911. As the single site for recruit training, Naval Station Great Lakes’ mission is to develop men and women into highly skilled, disciplined and motivated Sailors for the fleet. NS Great Lakes is also home to Training Support Center Great Lakes, where most of the Navy’s surface warfare specialty training takes place, and to the Naval Hospital Corps School, which is the sole naval training site for Hospital Corpsmen. Total base population is over 25,000 military service members, family dependants, civilians, and contractor personnel. Annually, more than 37,000 men and women complete recruit training with over 175,000 visitors attending weekly Pass-in-Review graduation ceremonies. Additionally, over 25,000 Sailors attend initial and advanced training schools. Over 37 tenant commands and organizations reside at Great Lakes representing all branches of the Department of Defense, including: Navy Recruiting District Chicago; Marine Air Control Group 48; the U. S. Military Entrance Processing Command; Navy Drug Screening Lab; Naval Institute for Dental and Biomedical Research; Naval Health Clinic Great Lakes; Naval Facilities Engineering Command Midwest; Navy Region Midwest Reserve Component Command; and many others. The installation also hosts two flag commands – Commander, Navy Region Midwest and Commander, Naval Service Training Command.

NS Great Lakes is located on 1,920 acres along the shores of Lake Michigan in northern Lake County, Illinois and is 30 miles north of the city of Chicago. The base is within the incorporated limits of the city of North Chicago and bounded by the village of Lake Bluff and Chicago’s “Gold Coast” to the south. The natural environment include: lakefront beaches, rare dune ecosystems, coastal wetlands, inland ravine and hardwood forests. The surrounding built-community ranges from picturesque private golf course and residential subdivisions in rural settings to highly developed light industrial, chemical and pharmaceutical industry and lower socio-economic urban residential communities.

A socially moderate political climate is predominant in Lake County, with strong support for environmental stewardship and sustainability. Lake County is one of the fastest growing counties in the United States, with over 40% growth over the past 20 years, and is expected to grow another 38% by 2050. The county has adopted a strategic goal of promoting a sustainable environment as outlined in their “Strategy for a Sustainable Lake County” that incorporates energy efficiency and conservation, water supply planning and conservation, solid waste recycling, pollutant reduction, and protecting and restoring ecosystems and open space.

NS Great Lakes resides within the Chicago Area Severe Non-Attainment Area for Ozone and Particulate Matter 2.5 air contaminants, and is also within highly regulated watersheds that flow to Lake Michigan. Lake Michigan and the Great Lakes contain 20% of the world’s freshwater resources and supply drinking water to over 33 million people in the U. S. and Canada. The installation has a nationally registered historic district and 45 historically significant contributing buildings.

## **Background:**

Although NS Great Lakes is not an industrial installation, its large size, population, infrastructure, support services and unique medical and training simulators combine to create complex environmental and sustainability challenges. Primary environmental aspects include air emissions and natural resource consumption in heating and cooling the over 9.6 million SF of administrative and training buildings. A central heating plant with 1.2 Million MBTU capacity generates steam heat, hot water, as well as generates 20% of the bases electrical needs. Advanced trainers such as the gas turbine trainers and fire fighting trainers provide further air emission challenges regulated under a Title V Clean Air Act Permit. The large medical and dental research, laboratories, and treatment facilities also result in unique environmental challenges to manage hazardous wastes and wastewater discharges. An aggressive construction program and proximity within the Lake Michigan Watershed area and an impaired waterway in Pettibone Creek result in challenging stormwater management, low impact development and permitting for construction and industrial sites. Large fuel storage near shorelines and Navy operations and recreational waterborne activity result in the installation being classified as a Substantial Harm Facility per the Oil Pollution Act of 1990, requiring an aggressive spill prevention and spill response capability. The Historic District and contributing facilities offer challenges in balancing cultural preservation with energy efficiency and modern mission requirements.

Leadership commitment and a strong culture of teamwork across commands and tenants at NS Great Lakes have driven successes across the full spectrum of environmental sustainability. The installation leads the Navy in sustainable vehicle fleet and alternative fuels use, sustainable laundry services, sustainable construction, and energy conservation. With the smallest environmental staff and leanest budget of any large CONUS installation, the NS Great Lakes team has leveraged support from higher echelons, forged partnerships with external agencies, industry, academia, and environmental groups and has engaged the local community to sustain effective environmental stewardship programs. An Environmental Management System (EMS)-centric approach is used to focus on significant aspects. The team has aggressively pursued targets and objectives, which resulted in substantial pollution reductions, energy and natural resource conservation, and a pursuit of clean energy initiatives to meet fleet and facility needs.

The NS Great Lakes EMS in 2009 and 2010 included key objectives to reduce energy use, reduce greenhouse gas emissions, reduce mercury in wastewater discharge, and improve stormwater pollution prevention during construction activities. These objectives have received commanding officer and leadership commitment and have driven operational planning for all commands and tenants through the EMS Management Cross Functional Team and Base Energy Advisory Board. The installation has actively engaged with outside partners to share technology and to benefit from technology advances in industry and academia. Partnerships include the Region 5 Sustainability Network with USEPA and six states, pollution prevention partnership with the Illinois EPA, ex-officio membership in the Solid Waste Agency of Lake County and Lake County Stormwater Management Commission, conservation partnerships with the Illinois Audobon Society, Openlands, Lawrence Berkley National Laboratory, participation on the Lake County Emergency Planning Committee, North Chicago Community High School, Goodwill industries, and Forest City Military Communities, LLC, housing, among others.

The installation has an active program to promote green procurement and includes a local specification in all contracts to require preferable products, where economically feasible. All office paper and supplies include recycled content above federal goals. The environmental staff regularly trains purchasers and credit card holders on green procurement expectations. To further illustrate the installation's commitment to environmental protection, their oil spill team annually participates in local and regional spill preparedness and events and was the first external Navy Region team to respond to the Deepwater Horizon oil spill in June 2010.

## **Program Summary**

The NS Great Lakes Sustainability Program incorporates environmental and mission sustainment into facility and operational planning. The installation has an excellent compliance record and trust-based relationships with state and federal regulators. NS Great Lakes established objectives to reduce impacts to the installation budget, while protecting the environment and sustaining the training mission. Sustainable development, construction and energy are incorporated into the base master plan, regional shore infrastructure plan, and in the energy advisory board and EMS cross functional team efforts. These efforts have resulted in a dramatic 29% energy intensity reduction -- nearly double the federal goal, to date. Total regulated air emissions (and associated greenhouse gases) have been slashed from 773 tons in 2003 to 118 tons in 2009, an 85% reduction as a result of fuel substitutions, power plant process changes and green construction. Additionally, 17 tons of hazardous air pollutants have been eliminated through laundry process changes. Innovative food waste pulper-extractor systems reduce galley waste by 70%. A new bio-reactor system is being piloted that potentially will reduce galley waste by 95%. The installation increased recycling and solid waste diversion by 57% in 2009 by expanding the types of materials collected. Material substitutions have reduced hazardous waste generation by 60% from 2008 levels, driving the installation to near small quantity generator status. Toxic wastewater concentrations have also been reduced by 90% through incorporation of industry-leading dental wastewater treatment systems and use of best management practices. These initiatives have reduced energy costs by over \$10 million per year, reduced environmental compliance costs, reduced impacts to the environment and correspondingly improved public perception and support for the Navy mission. These factors combine to support overall mission sustainment through reduced operating costs and improved mission socio/political support. The installation has been recognized with environmental and energy excellence awards from NAVFAC and has received Blue and Gold Department of Navy Energy and Water Management Level of Achievements from ASN (I&E).

## **Accomplishments**

**Green Fleet** – NS Great Lakes is the Navy's leader in implementing sustainable practices in operated vehicle fleets. Their visionary transportation leaders have planned and implemented a holistic approach to a sustainable fleet, with tremendous successes to date and further enhancements are planned. Over the past several years, they have aggressively recapitalized their fleet with alternative-fueled vehicles, developed fueling stations for Compressed Natural Gas, E-85 Ethanol, and BD-20 Bio-Diesel, and implemented innovative fuel management systems to increase alternative fuel use. Current inventory includes 403 alternative-fueled vehicles, which represents 61% of the total fleet. 192 other vehicles have been converted to BD-20 Bio-Diesel to further promote reliance on sustainable fuels and reduce pollutant

emissions. This team has plans to significantly increase electric vehicles in future acquisitions and is planning to install a number of electrical charging stations at key locations across the installation. A key component to their successful program is an automated chip key refueling system that is programmed to allow only the use of alternative fuel in vehicles that are flex fuel capable. This feature has increased alternative fuel consumption by 20% in the past two years to a total of 39,875 gallons of E-85 Ethanol and CNG fuels consumed in 2010.

AFV Type	Quantity
CNG	42
E-85	287
Electric	11
Hybrid	63

The NS Great Lakes transportation team has also been very effective in reducing vehicle usage and resulting air emissions and fuel consumption through implementation of shuttle bus service, vehicle usage surveys, vehicle pool consolidations, and ride-sharing programs. The installation entered a partnership with Goodwill Industries, Inc. to provide base-wide shuttle services for Sailors and contract workers. A rigid survey and monitoring of vehicle use resulted in the reduction of 20% of vehicles base-wide and increased ride-sharing which facilitated the elimination over 110 older vehicles with worse emissions and fuel mileage as compared to newer inventory.

The installation has shared its successes and enhanced awareness of alternative fueled vehicles with our surrounding community and region-wide through off-site demonstrations and vehicle displays held in conjunction with Earth Day and Navy Day events at the North Chicago Community High School, St. Louis Science Center and Arch National Park, Navy Pier in Chicago, IL and in environmental and energy fairs hosted at the installation.

**Green Laundry** – NS Great Lakes manages the largest laundry services in the Navy. Nation-wide uniform issue is also managed at Great Lakes. The large population of recruit and student Sailors and the 48 bachelor housing facilities create the large demand for laundering of clothing and linens. Historically, the dry-cleaning services for uniform cleaning produced 17 tons of hazardous air pollutants annually from perchloroethylene-based cleaning solvents. The traditional washing of over 4 million pounds of other clothing and linens used excessive amounts of water, detergent, and energy. A team of staff and technicians from the environmental department, Navy Exchange laundry, bachelor housing, and Goodwill Industries, Inc. worked together to develop and implement a comprehensive plan to reduce air emissions, water, detergent and energy use. As a result, a state-of-the-art Navy Exchange laundry facility was completed in FY 2009 with new non-hazardous dry cleaning solvent machines and highly efficient tunnel washing and drying equipment. These improvements eliminated all of the base’s 17 tons of regulated hazardous air pollutants. The tunnel washers use only 10% of the water and detergent consumption as compared to traditional machines and have resulted in a 40% reduction in energy use at the facility. These systems process multiple 700 - pound batches of clothing concurrently, with conveyors and automated equipment moving them through wash, rinse and then press and drying modules. Wash water is filtered and reused, and the systems operate at lower temperature requirements, with less detergent required. Annual energy savings equate to 182,000 kWh per year. Water use savings are estimated at 45 million gallons per year, and wastewater discharges are reduced 40 million gallons per year. Greenhouse gas emission reductions are estimated at 1.06 million lbs of CO<sub>2</sub> per year. To expand on successes with their on-station laundry, the installation entered into a partnership

with Goodwill Industries, Inc. that resulted in the development of a similar off-station contracted laundry facility that supports Navy bachelor housing needs using similar technology.

**Green Construction** - NS Great Lakes is a leader in sustainable construction. Since FY 2000 when a bachelor enlisted quarters project earned a pioneer certification under the U.S. Green Building Council LEED v.1 the installation has incorporated green building design elements in 17 construction projects. In 2009, the Atlantic Fleet Drill Hall construction project again pioneered green building design in receiving the first gold certification under the new challenging LEED NC v.2.2 standard. This building has been designed with a myriad of sustainability features, from energy efficiency, water conservation, low impact development, transportation access, use of recycled content materials, low-VOC paints and materials, and local provided content. This 58,000 SF training facility holds classrooms and open assembly drill space for use by 1,354 recruits and Sailors each week at Recruit Training Command. This building exceeds EPACK 1992 water conservation standards by 45% through use of ultra-low-flow plumbing fixtures. Energy conservation measures include use of occupancy sensors, low lighting load, DDC controls, four pipe heating/cooling, and zoned air handling systems. The building systems meet ASHRAE 90.1-2004 and ASHRAE 55 standards. Unique window treatments adjust automatically for optimal thermal comfort while supporting natural daylighting and views. The site was designed to maintain 60% open space and reduce stormwater runoff by 35% as compared to pre-developmental conditions, and 81% of pollutant loads are removed from storm runoff. Use of native buffalo grass for landscaping reduces irrigation water use and grounds maintenance.

Another building with construction completed in FY 10, the “P-744 Special Programs Barracks,” has similar sustainable design aspects to the Atlantic Drill Hall and is awaiting final Green Building Council certification. This building is expected to meet LEED v.2.2 Silver, as a minimum.

**Energy Conservation** – NS Great Lakes leads the Navy in energy reduction as compared to the energy intensity reduction goals established by EO 13423. The installation has already achieved over 29% energy reduction and is 14% ahead of the established reduction goal. The energy management team has a sustained history of identifying innovative ways to improve energy performance in buildings, with nine phases of building system upgrades completed in 2009

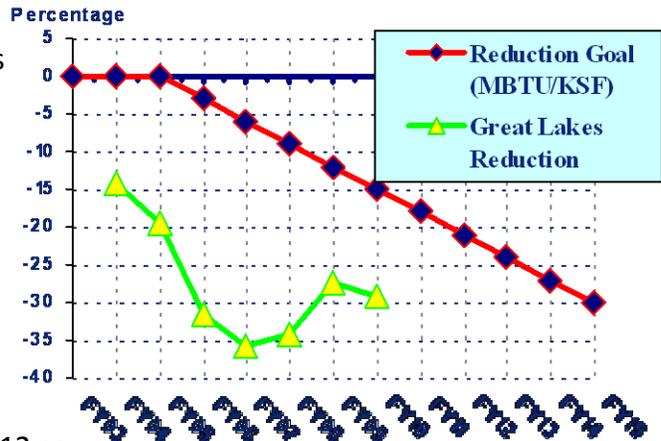
Installation Comparison	Energy Reduction (since FY 03 Baseline)
NS Great Lakes	-29.2%
EO 13423 Goal	-15.0%

through use of Utility Energy Service Contracts (UESC) with local utility providers Exelon Corporation and Peoples Energy. These contracts upgraded lighting, heating ventilation and air conditioning (HVAC) systems, and improved thermal insulation. The aging steam heat plant was also upgraded by leveraging energy provider capital that resulted in improvements to boilers, construction of a gas turbine cogeneration plant, and installation of heat recovery steam generators to capture energy lost through boiler inefficiency.

In the past two years, the installation formalized an improved energy program with a new base-wide instruction and establishment of an Energy Management Team, an Installation energy advisory board, hiring a full-time energy manager and a contracted resource efficiency manager (REM), and designating building energy managers for all facilities on the installation. This tiered energy management team has greatly increased energy awareness across the installation

through clear Command Leadership commitment, frequent communication using several media, hosting energy fairs, and through face-to-face training.

In FY 2010, two additional contract actions were awarded that will take energy efficiency to state-of-the-art levels in 54 buildings across the installation. A \$20.4 million Energy Savings Performance Contract (ESPC) was awarded that will significantly enhance direct digital control systems for 90 buildings and further improve lighting, HVAC and install variable frequency drive chiller systems, upgrade plumbing fixtures, and upgrade steam and boiler systems. This project affects 3.7 million SF (36% of the installation's total building space) and is estimated to reduce these buildings energy intensity by a further 13% and will save \$2.1 million per year in energy costs (4% base-wide reduction). NS Great Lakes also completed an energy audit and planning effort that resulted in a major military construction project – P-816 “Decentralize Steam Energy” being programmed for FY 2012 as



one of the Navy's first major energy construction projects. This \$85 million project seeks competitive proposals from sustainable energy design-build firms to improve the efficiency of facility heat and hot water systems and is expected to result in \$9.2million per year savings in energy costs and up to a potential 15% reduction in total energy intensity. Also in FY 09/10 the base implemented a unique continuous process improvement initiative that integrated building maintenance and energy savings during periods of reduced recruit populations that is improving lifecycle sustainment and reducing total ownership costs.

Also completed in FY 09 through FY 10, a wind monitoring station was installed and operated to collect meteorological data for analyzing potential wind turbine generation locations. This data is now being analyzed, and environmental studies are underway to assess wind energy as a clean energy source for the future. Two wind turbine projects are in the planning phase, for the Marine Air Control Group and the NS Great Lakes Energy Management Team. The installation is also working a partnership with the Illinois Institute of Technology to further wind energy technology through on-and-off station demonstration projects.

NS Great Lakes has been a leader in supporting EO 13514 in partnering with industry and academia in hosting Environmental Security Technology Certification Program (ESTCP) demonstration projects. A “continuous automated commissioning” project is underway in collaboration with United Technologies, and the Lawrence Berkley National Laboratory. This project developed a high-end energy model for three buildings and monitors actual building system performance with predicted expectations to highlight under-performing components that are then scheduled for maintenance. Other demonstration projects proposed with this national laboratory and awaiting grant funding include: 1) “solar redirecting window film” with 3M Corporation to improve thermal performance and daylighting, and 2) “chiller control optimization” also with United Technologies. NS Great Lakes has also been selected by the Naval Facilities Engineering Service Center as a test site under their TECHVAL Program to implement a “direct replacement LED lighting” demonstration project.