

# Diverting Food Waste from Landfills Saves Money & the Environment

## NESDI Project Includes New Guidance Document for Navy Solid Waste Managers

**HAVE YOU EVER** wondered what happens to the leftover food in Navy galleys and commissaries? Unfortunately, most of it ends up at a costly landfill where it takes up space, rots, adds to area vermin and foul odors, and can pose environmental challenges. In fact, food waste takes up more space in landfills than paper or plastic.

According to the U.S. Environmental Protection Agency, this decomposing food waste emits methane, a potent greenhouse gas with 21 times the global warming potential of carbon dioxide.

Fortunately, the Naval Facilities Engineering and Expeditionary Warfare Center (NAVFAC EXWC) is working hard to solve

this problem at as many Navy installations as possible. The Navy Environmental Sustainability Development to Integration (NESDI) program's new guidance document, *Improving Non-Hazardous Solid Waste Diversion* (released in February 2014), will help installations choose the best way to remove food waste at its source and/or compost the waste that would normally end up at the landfill.

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## Why Divert Food Waste?

In response to Executive Order (EO) 13514, “Federal Leadership in Environmental, Energy, and Economic Performance,” the Department of Defense (DoD) has established the goal of diverting 50 percent of its solid waste by FY 2015. Most of the Navy already recycles its solid wastes, but about 16 to 20 percent of the waste stream at Navy installations is food scraps (uneaten food and food-preparation waste), and those numbers jump to 25 to 30 percent when food-contaminated compostable wastes (such as paper plates, towels, napkins, and cardboard boxes) are included. Since 2005, the Navy’s solid waste diversion rate has averaged between 32 and 42 percent. Diverting organic waste can increase this rate by another 10 to 15 percent, which would meet or even exceed the goal.

By increasing its diversion rate to 50 percent, the Navy will:

- Comply with EO 13514 and DoD’s non-hazardous solid waste diversion goals
- Address environmental issues associated with food waste in landfills for surrounding communities (odors, flies/vermin infestations, increase in greenhouse gas emissions)
- Avoid paying solid waste disposal fees
- Reduce fuel consumption associated with transporting waste to landfills
- Help prolong the availability of space at the local landfills for nondivertible wastes, lessening the burden for local cities to establish new landfills

- Reduce procurement costs by composting or biodigesting food waste and using the resulting organic matter as fertilizer, or by reusing otherwise unusable wastes, such as leftover cooking oil as an alternative to diesel fuel in generators.

bin systems for pulling food out of the waste stream, composting, and dehydrating. Some technologies and methods have a large footprint and operating costs; others take up little space and are inexpensive. The following are the pros and cons of a few examples of waste minimization.

Waste-processing technologies may be appropriate at some installations, but at most installations a simpler approach may work best.

—Jill Hamilton

## Techniques that Reduce, Pull Out, or Process Food Waste

There are three broad approaches to minimizing food waste:

1. Reduce the amount of food waste generated
2. Separate food waste from the solid waste stream
3. Process food waste into a usable by-product, such as compost for agriculture or liquid effluent for irrigation

Because installations have different needs and capabilities, the goal of NESDI’s Improving Non-Hazardous Solid Waste Diversion project (#478) is to find the most effective ways for each Navy installation to minimize the amount of food waste diverted to landfills. According to Jill Hamilton, an environmental engineer at NAVFAC EXWC in Port Hueneme, CA, and the Principal Investigator on this NESDI project, “waste-processing technologies may be appropriate at some installations, but at most installations a simpler approach may work best.” Simple yet effective methods include color-coded

## Source Reduction

Management practices for source reduction, such as tray-less dining, can save money and cleaning time. Also, decreasing portion sizes served in installation galleys and implementing programs that display “Taste Don’t Waste” or “Take Only What You Can Eat” signs, like the ones used in Naval Air Station (NAS) Jacksonville’s galley, can mean fewer scraps and less money spent on food that is not consumed. Source reduction, however, requires upfront planning, and data collection and can be labor-intensive.

## Separation

Using simple approaches like low-cost bin systems or collection containers to separate the kitchen, cafeteria, and commissary waste can lower disposal costs because less waste will go to the landfill. Food waste separation can easily increase the rate of landfill diversion and result in immediate savings. However, food waste separation is a non-starter if processing technologies (such as compost methods, dehydrators, and decomposters) are not available or have not been set in place. Collection of post-consumer





Signage for food waste separation: compost items (napkins, food waste, and paper cups); bottles and cans (glass, aluminum, and plastics); and landfill items (bags, wrappers, and utensils).

Lance Cpl. Mitchell K. Bahzad skins a snake for food while attending Desert Environmental Survival Training at Twenty-Nine Palms, CA. MCAGCC Twmety-Nine Palms' mess hall has a liquefying decomposter which quickly breaks down food waste into a nutrient-rich liquid effluent that can be discharged into the sewer or be used in irrigation.  
Chief Journalist Dave Fliesen

compostable and food waste may require additional handling or disposal in a landfill because of contamination.

**Waste Processing**

Once the waste is separated, Navy installations wanting to divert it from landfills will need an outlet if there is no on-base option. Below are a few systems that can help.

- **Anaerobic Digester**  
An anaerobic digester can break down sewage sludge and generate methane gas, which in turn can be used to generate electricity. Studies show that combining sewage sludge and food waste enhances the performance of anaerobic digesters so more methane gas can be harvested, and remaining byproducts can be used as soil amendment.
- **Composting Techniques**  
Composting techniques include the in-vessel composter, a temperature

and moisture-controlled system that can accommodate meat and grease and provide a consistent sanitized product without taking up much space (although it has a high capital cost); vermicomposting, which uses red worms to speed up the degradation process by eating the food waste (although worms are not always a welcome addition to kitchen areas); the windrow, which generates a large volume of compost and accommodates meat and grease but requires frequent turning, a large open space, and three to six months for processing; and the aerated static pile, which can also process a high volume of compost but has high capital and energy costs.

- **Liquefying Decomposter**  
A liquefying decomposter, which can be found in Marine Corps Air Ground Combat Center (MCAGCC) Twenty-Nine Palms' mess hall,

quickly breaks down food waste into a nutrient-rich liquid effluent that can be discharged into the sewer or be used in irrigation. At wastewater treatment plants, it can enhance anaerobic digesters' methane production, and in the fields it can fertilize the crops. The cons are that it processes a limited amount of waste and requires a large amount of water.

- **Dehydrator**  
The dehydrator heats food waste at 180 degrees Fahrenheit or greater, and quickly produces reusable products in sterile bio-solids and condensate. In addition to reducing waste volume as much as 90 percent, benefits include one-person operation, no water connection requirement, and no addition of microorganisms. During a pilot test run by the Defense Commissary Agency (DeCA) from August through

September 2012, two 250-pound dehydrators reduced commissary food waste weight at MCAGCC Twenty-Nine Palms by 86 to 90 percent. Based on this, DeCA estimated that it could go from three dumpsters picked up three times a week to one dumpster picked up weekly at that location. Most dehydrators can process the food in 15 to 24 hours. But because no additional food can be placed in the machine during the cycle time, often two machines are purchased to allow for one to be filled while the other is in operation.

■ **In-Sink Grinder**

Naval Base (NB) San Diego's galley uses an in-sink grinder, an industrial-grade garbage disposal that can pulverize food waste before it enters the sewer. The ground-up waste can easily enter wastewater treatment plants without clogging the pipes. And because NB San Diego's galley does not produce much waste, only five percent of a 32-gallon container ends up as trash, comprising big bones and other items that cannot go in the grinder. Both the decomposter and the in-sink grinder send materials through the sewage system,

where the sludge may be made into compost.

**Limitations**

Using the best methods to collect and separate food and organics along with the most appropriate technologies to aid diversion, the Navy can decrease waste, recover its value, and achieve environmental compliance. Nonetheless, problems with using a new technology or practice can include cost, lack of physical space, behavior modification and the need for training. Understanding these limitations can help environmental program

Sailors and Marines man the rails aboard the amphibious assault ship USS Boxer (LHD 4) as the ship pulls away from NB San Diego. NB San Diego's galley uses an in-sink grinder, an industrial-grade garbage disposal that can pulverize food waste before it enters the sewer.

*MC Seaman Dustin Kelling*







Volunteers from various commands onboard NAS Whidbey Island participate in the base's Annual Dumpster Dive. The teams compete for prizes by trying to recycle as much as possible from their assigned dumpster. The facility has a strong reputation for food waste reduction, and has achieved a recycling rate of 75 percent or higher since 2007.

*Photographer's Mate 2 Casey R. Jones*

managers choose the right methods and technologies for their installations.

To be successful, a food waste program must be economically sustainable. While food diversion can be done with minimal investment in research and development, if the infrastructure setup, equipment, and labor costs greatly outweigh the benefits at an installation, the program is not sustainable. For example, although DeCA has already successfully used dehydrators at some of its commissaries, a similar program to collect all of the food waste at Marine Corps Base Camp Pendleton's 16 galleys would not be cost-effective. Studies showed that the total amount of food waste disposed would require at least 48 dehydrators.

At installations that choose to compost food waste, finding space can be another issue, according to Hamilton. Installations that choose a dehydrator or liquefier would need space either inside or immediately outside of the facility.

Educating kitchen workers on how to use new technologies and training consumers to separate waste into bins

rather than throwing it into one trash container can take time. While there is a learning curve and often a tendency to fall back into former ways of handling waste, this problem can be solved once everyone is trained. This has been shown at NAS Whidbey Island, where building managers continually train incoming Sailors through face-to-face interactions, e-mails, phone calls, and brochures. Furthermore, giving people reasons to implement these

Educating kitchen workers on how to use new technologies and training consumers to separate waste into bins rather than throwing it into one trash container can take time.

practices can motivate them to change their ways. For example, while at first tray-less dining may be considered cumbersome because diners must walk back and forth to get each part of their meal together, installation managers and Sailors will soon see that cleanup is easier (no trays to wash) and the installation spends less on detergent, water, and uneaten food.

## Naval Air Station Whidbey Island Supports Successful Food Waste Reduction Program

While compiling the information to include in its guidance document, the NESDI project team visited NAS Whidbey Island. The facility has a strong reputation for food waste reduction, and has achieved a recycling rate of 75 percent or higher since 2007.

Working closely with its environmental department to coordinate and accommodate its ambitious sustainability plans, NAS Whidbey Island pulls food waste out of its commissary, galleys, food courts, offices, youth centers, delis, snack bars, daycares—every place associated with the base that generates food waste—and works to compost cups, utensils, paper towels, and more. For NAS Whidbey Island, it is especially cost-effective to recycle and eliminate as much waste as possible. Since its own landfill closed, the nearest landfill is 300 miles away. This travel distance increases the tipping fee to \$150 per ton (compared to the average of \$30 per ton in most regions). According to John Lacy, solid waste program manager for the Naval Facilities Engineering Command (NAVFAC) Northwest, who helped start the program in 1996, annual reports on five major installations show that the net dollar benefit is \$55 per ton for recycling. “We look at total costs of doing business,” Lacy says. “Our products are shipped to a transfer station and loaded onto a train that travels hundreds of miles to the nearest landfill. Everyone gets paid—collectors, transporters, railcar loaders, and shippers. But when we divert the material to on-base composting or salable material to the local loading dock, we

only pay one component of a total cost versus the landfill disposal costs. Diverting material through composting makes economic sense to us. And that defines the savings.”

Waste at the base is separated into appropriate bins and placed curbside. Don Bird is NAS Whidbey Island Recycling’s compost facility operator and equipment operator. He collects up to

compostable, and the building managers take care of it at weekly or daily staff meetings. We also present a slide show at the quarterly building managers’ meetings. A lot of Sailors come and go, and as soon as they are trained a new batch of Sailors arrives. We use every outlet we can to get the word out—we must keep our rate up to keep solid waste costs down.”

We are not running this program because it’s fun. We are doing it because it costs less than solid waste disposal.

—John Lacy

3,000 pounds of post-consumer food waste from all 34 locations three times per week—this totals 7,500 to 9,000 pounds of food waste that is turned into compost every week. After testing the compost, NAS Whidbey Island uses as much compost as it can and sells the rest.

Making sure the food and food-contaminated wastes are separated correctly in the bin systems, however, can be a daily battle. Oliver “Rusty” Elam, manager at NAS Whidbey Island Recycling, says NAS Whidbey Island Recycling conducts many outreach functions to educate people and change habits. In addition, Elam says, “Each building has a manager who works with the people in the buildings, and we resolve issues as we go along.” Elam adds, “Training people about which items can be composted, mostly through face-to-face communication, is crucial. They don’t always realize they can compost things like pizza boxes that have cheese and grease on the bottom. We train them by taking the building manager to their trash bins and showing them what is

“We are not running this program because it’s fun,” Lacy says. “We are doing it because it costs less than solid waste disposal.” NAS Whidbey Island’s technologies include an on-site in-vessel composter that was built in 2000. While expensive, Lacy points out that it can handle organic materials better than technologies that make aerated static piles of compost. “It’s a quantum difference,” Lacy says. “This is what allowed Whidbey to go above the 50 percent diversion mark. It’s hard to go above 50 percent without organics recycling.”

Another key component at NAVFAC Northwest, Lacy says, is the collection and processing of post-industrial wood waste and providing the wood chips that comprise the bulking agent for the food waste compost. “Last year our equipment processed 2,004 tons of wood waste, which helped us produce almost 700 tons of compost because the moisture cooks off. That is significant. Wood is a big part of the waste stream at all our installations, more than in the traditional municipal sector.”





Chief Quartermaster Jack Wymer drills a hole in a synthetic bone used for training in NMCS D's Bioskills Training Center which provides courses in advanced surgical skills, courses to enhance and hone existing skills. The facility's galley diverts 3.6 tons per week in food waste from the San Diego landfill, which extends the life of the landfill by 53 days per year.

*MC1 Anastasia Puscian*

In addition to using bio-bags to keep its 20 galley bins clean, NAS Whidbey Island now uses onboard pressure washers on the food-waste collecting trucks to clean out the bins. The water used is then dumped into the mixer area of the truck. This helps deter rats and other vermin from the scullery area. "The theory here," Elam says, "is that when we dump the containers, if we can use pressure washers to clean them out, we will stop using bio-bags and have even more solid waste source reduction."

"Whidbey Island composting has worked really hard to keep labor costs down," Elam says. "It's the most cost-effective program—we run the whole thing with two people (Bird plus one laborer) and are conscious of what we do. We also mix paper with our food waste so it gets composted instead of thrown away. Almost nothing is wasted."

Having the ability to compost also allows NAS Whidbey Island to make full use of hardcopy books. "We remove the binding with a specialized saw," Lacy says. "The result is two products: the high-quality paper, which we can sell as baled recycled paper, and the binding, which goes into and becomes part of the compost."

What's next for NAVFAC Northwest? Lacy believes a 90 percent diversion rate can be achieved, but "getting that last 10 to 12 percent requires a huge education and outreach project—we are really talking about people changing their habits. We all have challenges with that. Changing habits is not easy for anyone."

### **Navy Region Southwest Launches Hospital Galley Food Diversion Program**

Another program surveyed for the new NESDI guidance document was the award-winning Sustainable Solid Waste Program (SSWP) at Navy Region Southwest (NRSW). For over 25 years, this program has diverted construction materials, cardboard, food waste, and cooking oil, on top of the traditional paper, plastic, and metal. Some installations even make money by treating solid waste as a commodity instead of spending money to put it into landfills. Galleys at NB San Diego, such as Naval Medical Center San Diego (NMCS D), also known as Balboa Hospital, separate food from the waste stream for composting at the Greenery, the portion of the Miramar

landfill that has space set aside strictly for food waste. Culinary Specialist First Class Terrell Downs, the leading petty officer at NMCS D's Nutrition Management Department, says that Balboa's galley program "is saving the hospital a lot of money in disposal costs and helping the environment. We do 3.6 tons per week in food waste, which extends the life of the San Diego landfill by 53 days per year."

To set up Balboa Hospital's program, Jose Amuchastegui, the regional solid waste manager for the NRSW SSWP, conducted research on food waste, working closely with the food-service locations and staff. "Starting a food waste program takes a lot of effort and commitment from the folks in the kitchen," Amuchastegui says. "Fortunately, the Balboa galley was looking to increase diversion of food waste. My research found potential places and led these people to start composting food." These include the galley managers (Navy officers and Sailors) and the kitchen staff (civilian contractors). Amuchastegui then coordinated with the City of San Diego's Environmental Services Department, which owns the local Miramar landfill. Because participants

in this program must meet certain City requirements, Amuchastegui acted as the link between the hospital and the City and made sure all the requirements were met.

bin marking and contamination avoidance. Downs says that while training all 75 full-time galley employees took a few months, "everything is going very smoothly now."

## Starting a food waste program takes a lot of effort and commitment from the folks in the kitchen.

—Jose Amuchastegui

Amuchastegui and his staff then bought and strategically placed the appropriate bins inside the kitchen and common areas—one for food waste, one for mixed recyclables, and one for general trash—and labeled them accordingly. They placed special containers outside of the kitchen for general trash and food waste. The food waste container must be locked at all times to prevent contamination from non-food items because Miramar Greenery will only accept 10 percent contamination. (Anything with more than 10 percent is offloaded to the trash.) The City then inspected the kitchen and the bins and took photos, which it used to create and present a 30-minute, individualized briefing to train workers on

Amuchastegui's research helped make even more positive changes. He discovered that Balboa Hospital's current contracted hauler needed to refurbish its 30-to-45-cubic-yard container, which had been used as a compactor for all the trash, including food. The compactor was being serviced three times per week, but Amuchastegui managed to modify the contract to reduce servicing to twice a week and added a smaller (6-cubic-yard) container for general trash, thereby using the compactor solely for food waste. Amuchastegui says that "subtracting the extra day of service created enough of a cost savings to add the six cubic yards. And we will keep the 30-to-45 cubic yard container, but for food waste only."



The first official load of food waste from the NMCS D galley being dumped at the Miramar Greenery for composting on December 10, 2013.



Equipment aerates compost at the Miramar Greenery, a portion of the City of San Diego's local landfill that has an area strictly for processing food waste into a rich compost.





SEAL candidates participate in Surf Passage at NAB Coronado—one of many physically demanding evolutions that are a part of the first phase of SEAL training. Navy SEALs are the maritime component of U.S. Special Forces and are trained to conduct a variety of operations from the sea, air and land. The base was the site of a NRSW food waste pilot program.

*MC1 Michael Russell*

Behavior modification at the galley, Amuchastegui says, can be a challenge. At Balboa, the Sailors managing the galley recently modified the contract to require kitchen staff to segregate the food waste, but “since there is no mandate that you must recycle food waste,” Amuchastegui adds, “people must be motivated. Here in the Navy we always struggle because there are always other priorities, so if you don’t have it in you to use a blue container versus a black or a gray container, you may just throw it into the first available container. It’s challenging to change people’s minds, but that is what we are here for. We do training and marketing so people know the Navy has a recycling program. We try to be at every recycling event on base. We set up booths with promotional items and brochures and answer questions and promote it, to affect a culture change throughout the Navy. We also have open houses, where we encourage people to visit and show them around the recycling yards so they can see and understand what we do.”

Amuchastegui also was the recycling coordinator for Naval Amphibious Base (NAB) Coronado, which was the pilot for a food waste program. “We had everything prepared to start that program,” he says, “but ran into a problem at the end” relating to the cost of transporting the food waste from the NAB Coronado galley to the Miramar landfill. Because NAVFAC transportation personnel had no place to clean the special food waste containers (to prevent residue and odor), Amuchastegui found a local contractor to haul the refuse and service the bins. But as soon as he submitted the contract modification to cover this extra cost, the federal government sequestration banned all contract modifications. Having a compactor pick up and service a 30-to-45-cubic-yard container would cost \$100 per trip to the landfill, whereas having a small 6-cubic-yard container serviced costs \$67 each time. “That is a huge savings,” Amuchastegui says. “But because there was no compactor for the NAB Coronado galley, I could

not use the formula I used at Balboa, and it was not cost effective. To start segregating the food waste, we’ll need to add another container, which is extra money, and it’s hard to get extra money these days.”

“Projects will not go far without commitment from the galley or dining facility staff,” says Amuchastegui. “The NESDI guidance document is a great tool to provide them so they know what to do. We will be the middlemen, making sure we coordinate and meet the proper requirements. A big priority is to minimize the amount of food that is being prepared, but that is up to the folks at the dining facilities. They are the ones who are making it happen. By not sending food waste to the landfill, we can extend the life of the landfill, which will benefit the Navy.”

The SSWP has a presence on Facebook at [www.facebook.com/SSWProgram](http://www.facebook.com/SSWProgram), and on the web at [www.cnrc.navy.mil/regions/cnrsw/om/environmental\\_support/recycling.html](http://www.cnrc.navy.mil/regions/cnrsw/om/environmental_support/recycling.html).

## How Installations Can Start Diverting Food Waste: The New NESDI Guidance Document

To help other Navy installations get started in food diversion, the NESDI guidance document, “Improving Non-Hazardous Solid Waste Diversion,” describes how a typical installation can find the correct tools for handling food waste at each site. The information included in the guidance is based on site visits to NAS Whidbey Island and University of California, Davis, along with interviews with 16 other DoD and private sector food service facilities. The guidance features a matrix to identify installations where food diversion would be beneficial. Factors to consider include:

- Economic feasibility
- Where the food waste will be processed (on or off-site)
- Amounts and quantity of feedstocks (waste types) available
- Goals/scope of the program
- Permitting requirements
- Simplicity and convenience for users

Approximately 15 percent of Navy installations that generate one or more tons of solid waste per day participate in composting, primarily green or landscaping waste. Of these, only two or three incorporate food waste. With the NESDI guidance document, NAVFAC EXWC expects at least half of the installations that currently compost to begin incorporating food diversion into their operations.

After consolidating the information on current and emerging techniques used for separating food from

organics, green waste, and recyclables, the guidance document will identify applicable techniques to individual candidate sites to help facilitate future implementations. Eventually, increasing implementations will support integration of relevant best management practices and technologies throughout the DoD and make food waste separation and diversion a standard requirement.


program should be easier and more cost-effective than starting a new composting program, NAVFAC EXWC will work to convince existing Navy composting programs to include food separation/diversion in their program.

To get a copy of the NESDI guidance document, you can visit the NAVFAC EXWC Environmental Technical

NAVFAC EXWC expects at least half of the installations that currently compost to begin incorporating food diversion into their operations.

Phase II of this NESDI project—pending funding—will identify appropriate Navy installations to set up a demonstration. This will involve identification of practices and/or technologies, the potential acquisition of equipment, training, logging of diverted food on a biweekly basis, and determination of the best end point for diverted food. The demonstration(s) will be fully documented and a final report will be written.

At the conclusion of the project, NAVFAC EXWC will revise the Navy’s Integrated Solid Waste Management Plan guidance to address food waste diversion. Because adding food separation to an existing composting

Publications web site at: [www.navfac.navy.mil/navfac\\_worldwide/specialty\\_centers/exwc/products\\_and\\_services/ev/ev-pubs.html](http://www.navfac.navy.mil/navfac_worldwide/specialty_centers/exwc/products_and_services/ev/ev-pubs.html). The document name is *Improving Non-Hazardous Solid Waste Diversion, Food Waste (NESDI #478)* and the document number is UG-NAVFAC-EXWC-EV-1403. You can also contact Jill Hamilton at the information provided below for a copy. 

### CONTACT

Jill Hamilton  
Naval Facilities Engineering and Expeditionary Warfare Center  
805-982-4892  
DSN: 551-4892  
[jill.hamilton@navy.mil](mailto:jill.hamilton@navy.mil)

