

# Public Health Review Report

29 September 2017



## Marine Corps Air Station (MCAS) Beaufort
## Marine Corps Recruit Depot (MCRD) Parris Island
## Laurel Bay Military Housing

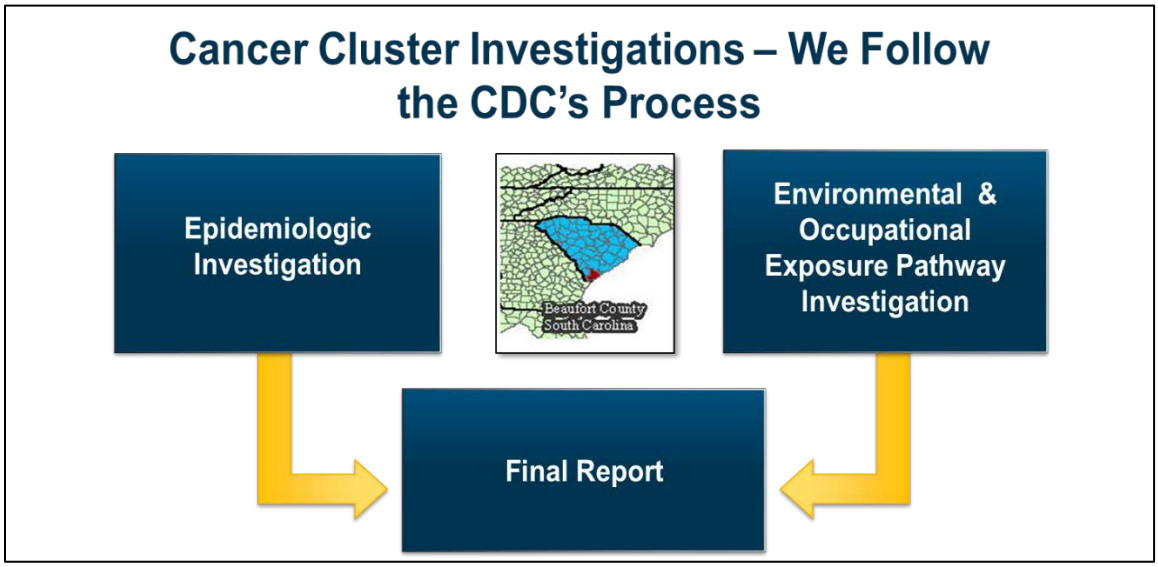
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# Executive Summary

In June of 2015, responding to residents' concerns, the United States (U.S.) Marine Corps (USMC) requested the Navy and Marine Corps Public Health Center (NMCPHC) investigate the incidence of pediatric cancers at Laurel Bay Military Housing (LBMH) in Beaufort, South Carolina, which residents believed may be associated with environmental exposures.

NMCPHC follows the U.S. Centers for Disease Control and Prevention's (CDC) process for performing Public Health Reviews (PHRs) that are associated with evaluating potential cancer risks in a population (CDC 2013a). This process is comprised of two steps: (1) an epidemiologic investigation and (2) an environmental and occupational exposure pathway investigation. The results of these two investigations are integrated into the final PHR. Subject matter experts (SMEs) in industrial hygiene (IH), drinking water, environmental restoration, human health risk assessment, ionizing radiation, radon assessment and mitigation, occupational and environmental medicine, toxicology and epidemiology reviewed a large number of environmental and occupational (e.g., workplace) documents and medical records data associated with LBMH, Marine Corps Air Station (MCAS) Beaufort, and Marine Corps Recruit Depot (MCRD) Parris Island to evaluate the potential relationship, if any, between environmental exposures to chemicals and pediatric cancers in the LBMH population. It is important to note that while the epidemiologic investigation focused on children, the environmental and occupational investigation evaluated complete exposure pathways (air, water, soil, soil gas) to constituents (e.g., chemicals) of concern (COCs) that are also applicable to adults.



This PHR Report describes the actions taken at LBMH, MCAS Beaufort, and MCRD Parris Island to address the concerns, as expressed by residents, regarding pediatric cancers they believe may have resulted from children's suspected or unknown environmental exposures at LBMH or parental exposures in the workplace. These actions included:

- Performing an epidemiological review of medical databases to identify and confirm the diagnosis of pediatric cancer and the type of cancer in children whose sponsor resided within a 30 mile radius of LBMH and MCRD Parris Island
- Reviewing medical literature to determine known environmental risk factors for each confirmed cancer type
- Evaluating complete exposure pathways to known environmental risk factors for those occupationally exposed in the workplace at MCAS Beaufort and MCRD Parris Island, and/or environmentally exposed at LBMH
- Gathering and reviewing available historical occupational and environmental records for LBMH, MCAS Beaufort, and MCRD Parris Island
- Conducting on-site reconnaissance at LBMH, MCAS Beaufort, and MCRD Parris Island
- Assessing the need for collecting additional environmental or occupational data (e.g., reports, historical records) to fill identified data gaps (e.g., for sites with incomplete or insufficient data for characterizing environmental or occupational concerns or potential pathways of exposures)

In response to issues at LBMH, MCAS Beaufort developed a Laurel Bay Health Study website to provide information and awareness and includes the following documents (http://www.beaufort.marines.mil/Resources/Laurel-Bay-Health-Study/):

- Public Updates
- Technical Information
- Fact Sheets
- Frequently Asked Questions
- Posters
- Information from Previous Open House Forums
- Upcoming Environmental Sampling
- Briefing Materials

Specific environmental and occupational programs or areas evaluated or reviewed in the PHR included:

- Environmental – Environmental Restoration Program, Drinking Water Program, Lead in Drinking Water in Priority Areas Program, Radiation Safety Program, Navy's Radon Assessment and Mitigation Program, Pest Control Management Program, Underground Storage Tanks (UST) and Public Private Venture (PPV) Housing
- Occupational – Industrial Hygiene and Occupational and Environmental Medicine Programs

NMCPHC concludes, based on the types and number of pediatric cancers observed and the evaluation of their recognized risk factors, it is unlikely that an environmental or occupational

exposure is associated with these cancers. The term "unlikely" means that the evidence is insufficient to connect the environmental and occupational conditions to the observed cancers. Current epidemiologic methods are not adequate to determine if there were other factors, like genetic errors or modifications, in these cases. See Section 2 (Epidemiological Investigation) of this report for further details and discussion.

PHR investigations are complex, time intensive, and typically comprise multiple, iterative steps, with each step building on the previous step. A conservative, health-protective, and comprehensive approach has been taken to investigate the potential health concerns at LBMH, MCAS Beaufort, and MCRD Parris Island. The Navy and USMC have taken action where necessary in response to information obtained during the PHR as opposed to waiting for the PHR to be completed to take action. This Executive Summary condenses the results of the following sections of the PHR:

- Epidemiological Investigation
- Environmental Investigation and Occupational (Workplace) Investigation
- Conclusions/Findings
- Recommended Risk Management Actions

## Epidemiological Investigation

NMCPHC was requested to identify and validate all pediatric cancer cases for children who lived or were conceived in the Beaufort area to determine if the observed cancer rates exceeded what would be expected in this population. This epidemiologic investigation did not include adult cancers.

- Study Area: Children (including those conceived) of active duty Marine Corps and Navy service members assigned to work at MCAS Beaufort and MCRD Parris Island from January 2002 to December 2016. These dates were chosen because medical data was not available prior to 2002. The study was based on sponsor zip codes within a 30-mile radius of the study area including LBMH (See Figure 1 – Epidemiological Investigation Study Area).
- Study Population: Children born after 01 January 2002 up to 31 December 2016 were selected based on the sponsor assignment in the study area. The study population scope was expanded to include active duty personnel from squadrons that deployed through MCAS Beaufort with zip codes outside the study area.
- Study Cases: Fifteen (15) cases in the study population were validated through the review of electronic health records.
- Study Types: Five (5) types of cancers were validated to date: acute lymphoblastic leukemia (ALL), acute myeloid leukemia (AML), neuroblastoma, Wilms tumor, and soft tissue sarcoma (e.g., infantile rhabdomyosarcoma).

- Risk Factors: Three (3) of the five (5) validated cancer types have known environmental risk factors (ionizing radiation and benzene).

**Incidence** in epidemiology is a measure of the probability of occurrence of new cases of disease or injury in a population over a specified period of time. Although sometimes expressed simply as the number of new cases during some time period, it is better expressed as a proportion or a rate with a denominator.

The National Cancer Institute uses a minimum of 16 cases of a specific cancer to calculate a valid cancer rate (National Cancer Institute 2003). Cancer rates were not calculated for this study because none of the cancer types had at least 16 cases. While rates were not calculated, the observed case counts in the study population were consistent with the expected distribution by pediatric cancer type for the same types of cancers in the general pediatric population.

Pediatric cancer, although less common than adult cancer, is the second leading cause of death in children ages 5-14 (American Cancer Society 2014). The incidence rate of pediatric cancer in the U.S. for 2013, the most recent year for which the CDC had data available, was 16.8 cases per 100,000 children over a calendar year (U.S. Cancer Statistics Working Group [USCSWG] 2016). There are more than 200 types of cancer but the majority of the proportion of malignant cases that develop in children ages 0-14 years are:

- ALL (26%)
- Brain and central nervous system (21%)
- Neuroblastoma (7%)
- Non-Hodgkin lymphoma (6%)
- Wilms tumor (5%)
- AML (5%)
- Bone tumors (4%)
- Hodgkin lymphoma (4%)
- Rhabdomyosarcoma (3%)
- Retinoblastoma (3%)
- Other types (16%)

Epidemiology is the study of the distribution of disease and risk factors or determinants of disease in specified populations and is considered the basic science of public health.

While cancer is rare in a pediatric population, the types of cancer observed in this study are the most commonly seen in a pediatric population. The probability that a child will develop a cancer before age 15 is about 1 child in 408 children (American Cancer Society 2014). If you follow a group of 408 children from birth to 15 years of age, on average, you are likely to observe one cancer case. In a cohort of more than 10,000 – 15,000 children who lived in the study area at some time over the 14 year study period, one would expect to find more than 20 cancer cases. Also, the incidence of ALL, the most prevalent pediatric cancer, peaks at ages 2-4

and remains higher than other cancers until 9 or 10 years of age (American Cancer Society 2014). Therefore, it is important to note that in an area with a relatively large number of young families concentrated around a military base, we would expect to see more pediatric cancer cases because there are more children living in the area. Because of this, cancer cases might appear to occur with higher frequency within a community even when the number of cases is actually within or below the expected rate for the population, adding to the perception of an excess of cancer cases in a community.

A component of doing a cancer investigation is a comparison of the observed cancer incident rates to the expected cancer rates for a population to see if there are more cases than expected. The comparison rates are obtained from the state or national cancer registries that collect incident malignant cancer cases and report the rates. To make a statistically valid comparison, a minimum of 16 cases for each cancer type is required (National Cancer Institute 2003). Study cancer incidence rates, for the purpose of comparison with general population and state (South Carolina) cancer incidence rates, could not be calculated due to the low number of cancers validated in the study. Because the development of various cancer types is multifactorial, it is not scientifically valid to group all cancers together as a single health outcome. Because the incidence rates cannot be calculated, a description of each type of validated cancer diagnosed among the study population, associated risk factors and latency are provided in Section 2 (Epidemiological Investigation).

The cause of most childhood cancers is unknown (Agency for Toxic Substances and Disease Registry [ATSDR] *Undated*). Unlike cancers found in adults, childhood cancers are usually not related to lifestyle risk factors. Genetic predisposition (family history), radiation exposure, viruses and diseases, prenatal health problems, and chemical exposure are some of the factors linked to childhood cancers.

## Environmental and Occupational (Workplace) Investigation

A review of available documents and reports pertaining to environmental sites that represent past and/or present potentially contaminated or regulated areas of concern on LBMH, MCAS Beaufort, and MCRD Parris Island was performed as part of the PHR to determine if a potential public health hazard exists to children living in LBMH as a result of environmental releases of hazardous substances from past use, handling, and disposal practices. The U.S. Navy Environmental Restoration Program (ER Program) was the primary source of documents/reports that were reviewed for the PHR. The ER Program began in the early 1980s in response to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA).

In addition, available documentation of occupational/workplace exposures were reviewed to determine whether or not environmental risk factors (e.g., ionizing radiation, benzene), as identified in the Epidemiological Investigation, were present in the workplace and were

characterized through IH exposure assessments with appropriate occupational medical surveillance.

Reports and other IH documents identified and reviewed for the PHR were primarily produced under the U.S. Navy Safety and Occupational Health Program (NAVOSH Program). The NAVOSH Program began in the 1970s in response to the Occupational Safety and Health Administration Act (OSHA Act).

Documents and reports associated with each environmental site were reviewed to determine the relevance of each in answering the following questions:

- Is there a complete exposure pathway for COCs (e.g., chemicals) in air, water, soil, or soil gas by ingestion, inhalation, or dermal contact which could have contributed to the incidence of cancer (see the Complete Exposure Pathway graphic on page ES-8 and Appendix A – NMCPHC Exposure Pathways Fact Sheet)
- What are all the exposure routes (ingestion, dermal, inhalation)?
- What are the COCs that may be present in air, water, soil, or soil gas?




*Complete Exposure Pathway*

The PHR is an iterative process meaning that the review of findings and/or recommendations appearing in one report reviewed often led to looking for a follow-up report or information on a data gap. Some information was readily available and some was not. If data gaps were identified, NMCPHC then requested additional information to fill the data gap and reduce the uncertainty.

Due to the number of environmental sites identified at MCAS Beaufort and MCRD Parris Island, their varying sizes and COCs, the sites were categorized to rank their potential for exposure. Sites were categorized as follows:

1. **Potential for Local Impact:** This category was assigned to sites with potential exposures for a limited number of people who have access to the sites or to the immediate area next to the sites where the contaminants are contained. Exposures are expected to only occur as a result of direct contact with on-site contamination. Sites identified as no further action (NFA) were automatically placed in this category.
2. **Potential for Regional Impact:** This category was assigned to sites with potential exposures for people at LBMH as a result of off-site migration of contamination; therefore, this category includes potential exposures for people who do not have direct access to the site, as well as those who do. Sites considered regional risks are more likely to be a potential concern for public health as they could affect a larger number of people.

## Ionizing Radiation

As identified in the Epidemiological Investigation (Section 2), ionizing radiation is one of the potential environmental risk factors for three of the five types of confirmed pediatric cancers (i.e., soft tissue sarcoma, AML, and ALL). Potential sources of occupational exposure to ionizing radiation include non-destructive testing of materials using radioactive sources, working in the field of diagnostic x-rays, and naturally occurring radioactive materials like radon. Potential sources of environmental exposure to ionizing radiation include radon and medical diagnostic and treatment procedures (x-rays, fluoroscopy, nuclear medicine, and Computerized Axial Tomography [CAT] scans).

Therefore, the Radiation Safety Programs at MCAS Beaufort and MCRD Parris Island were reviewed to assess the occupational exposure and the control of ionizing radiation in the workplace.

This review found the Radiation Safety Program was in compliance with all federal, state, and local requirements. Personnel occupationally exposed to ionizing radiation were entered into appropriate medical surveillance programs and their exposures were tracked and documented (NAVMED 2011). Review of monitoring data indicated that no health effects were expected for personnel due to ionizing radiation exposure.

The control of radon exposure is monitored and controlled through the implementation of the Navy's Radon Assessment and Mitigation Program (NAVRAMP), therefore the NAVRAMP was also reviewed for the PHR. For radon, the NAVRAMP identifies the level of indoor radon in existing and new buildings, undertakes mitigation measures in existing buildings, and incorporates preventive measures in new buildings to prevent buildup of indoor radon levels above 4 picocuries per liter (pCi/L) in occupied buildings. The health effect of concern from long term exposure to radon is lung cancer. This review found the NAVRAMP Program to be in

compliance with Navy and Marine Corps requirements and no data gaps were identified (USNAVY 2014 and USMC 2013).

Based on the results of the Radiation Safety Program, NAVRAMP, radiation surveys, and measurements, it is not likely that any individual would receive any additional radiation dose above normal background radiation from the occupied areas at LBMH, MCAS Beaufort, or MCRD Parris Island.

The history of exposures to medical diagnostic and treatment procedures (x-rays, fluoroscopy, nuclear medicine, CAT scans) for the three validated cancer types is unknown; however, the trend toward using these technologies has been dramatically increasing in recent years. For example, in 2006, Americans were exposed to more than seven times as much ionizing radiation from medical procedures as was the case in the early 1980s (National Council on Radiation Protection and Measurements [NCRP] 2009). In 2006, medical exposure constituted nearly half of the total radiation exposure of the U.S. population from all sources.

While medical diagnostic procedures are currently the greatest man-made source of ionizing radiation exposure to the general population, this source accounts for less than the general background radiation on earth. Background radiation (which contributed half of the total exposure in 2006) comes from natural radiation in soil and rocks, radon gas which seeps into homes and other buildings, radiation from space, and radiation sources that are found naturally within the human body (NCRP 2009).

With regard to pediatric AML, ALL, and soft tissue sarcoma, a data gap or an unknown, would be the potential occurrence and/or amount of prenatal or in utero exposure to ionizing radiation which might have occurred as a result of medical/diagnostic/therapeutic testing. Other unknown potential risk factors include family history, race, other in utero exposures (e.g., alcohol), parental lifestyle (e.g., drugs), and exposure to viruses.

## Benzene

As identified in the Epidemiological Study (Section 2), benzene is one of the two potential environmental risk factors for one of the five types of pediatric cancers (AML). NMCPHC investigated whether or not LBMH residents were potentially exposed to benzene concentrations at work (MCAS Beaufort and MCRD Parris Island), at home (LBMH), and at LBMH schools.

The implementation of IH and occupational and environmental medicine (OEM) programs was reviewed to assess the evaluation of worker exposures and medical surveillance of hazards, to include benzene, in the workplace. Assessment of the work environment through IH sampling is routinely conducted for MCAS Beaufort and MCRD Parris Island and results indicate that all benzene concentrations are below the OSHA Permissible Exposure Level (PEL) and American

Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Value (TLV) for benzene. An employee's enrollment into a medical surveillance program is typically determined by IH sampling results and/or professional IH recommendations which are included in the activity IH survey report. The survey reports were reviewed and results indicated that work processes involving benzene were properly identified in IH surveys, exposure assessments (including sampling) were being conducted, and medical surveillance (including reproductive hazards) of workers was being accomplished in the OEM program. These programs were in compliance with Navy and Marine Corps requirements.

At home (LBMH), in addition to typical background concentrations of benzene, LBMH residents could potentially be exposed to benzene infiltrating to indoor air from subsurface soils and groundwater contaminated with home heating oil (benzene makes up approximately 0.1 to 1.0% of home heating oil). As part of a housing privatization program that began in 2004, the PPV partner and MCAS Beaufort removed USTs so they would not interfere with the construction of new homes in LBMH. Since initiating the removal program, MCAS Beaufort has identified and removed 1,252 USTs used to store home heating oil for 1,063 properties (Resolution Consultants 2017). Note: Some residences had more than one UST which is why the number of tanks is greater than the number of residential properties. UST removal and follow-on actions were/are conducted in coordination with the South Carolina Department of Health and Environmental Control (SC DHEC) to use procedures consistent with requirements for regulated tanks (e.g., gas station tanks).

The potential for subsurface contamination beneath residences at LBMH to pose a vapor intrusion (VI) risk has been assessed by sequential screening of soils, groundwater, soil gas and/or indoor air at affected properties. The VI investigation is continuing; however, a complete exposure pathway has not been demonstrated to-date for benzene in indoor air from VI.

In 2011, The US Army Corps of Engineers (USACE) retained Reynolds, Smith and Hills, Inc. (RS&H) to evaluate conditions at Galer Elementary School (Galer) and Bolden Elementary School (Bolden) in response to a letter of concern from teachers who requested testing. Concerns raised by teachers identified ailments and symptoms and raised questions as to whether or not environmental exposures in the schools could be resulting in the medical issues. In response to these concerns, the US Department of Defense Education Activity (DODEA) Domestic Dependent Elementary and Secondary Schools (DDESS) and USACE initiated an indoor air quality environmental evaluation at the schools.

Benzene was sampled in indoor air at Galer and Bolden. Benzene results for samples collected at Bolden were reported as "Not Detected." Benzene results for samples collected at Galer exceeded the United States Environmental Protection Agency's (US EPA) conservative target indoor air 1 x 10-6 risk screening level concentration (i.e., the risk of one additional occurrence of cancer, in one million people) but were below OSHA's regulatory level in three rooms. The

US EPA's target indoor air concentration used for comparison (0.31 ug/$m^3$) is based on residential exposure (24 hours a day, 7 days a week, 350 days a year for 30 years). A screening level for a student scenario at Galer would more realistically be 8 hours a day, 250 days a year (including summer school) for 3 years (Grades K – 2). If the target indoor air concentration was calculated based on this more realistic exposure frequency and duration, the resulting target 1 x 10-6 risk screening level concentration would be greater and the reported benzene indoor air sampling results would not exceed the screening level.

## LBMH VI from Underground Storage Tanks

LBMH is composed of 1,100 housing units and three schools. Housing units and schools at LBMH were historically heated by home heating oil stored in USTs. The only exception is the newer duplex homes (Freedom Sound) which never used heating oil tanks for heating purposes. Heating oil has not been used at LBMH since the mid-1980s. Most of the USTs were decommissioned in the mid-to-late 1980s. As was the accepted practice at the time, decommissioning USTs typically involved draining the tank and then filling it with dirt or sand, and then securing the cap/fill tube to prevent use of the tank in the future. The USTs were also typically left in place and covered with soil when they were removed from service.

In 1984, Congress directed the US EPA to develop regulations for UST systems. The US EPA issued federal regulations, effective December 1988, that delegate UST regulatory authority to approved state programs. Home heating oil tanks, where the oil contents are consumed on the premises where they are stored, are exempt from federal (e.g., US EPA) UST regulations (e.g., planning, compliance, permitting, enforcement, and remediation.[1] USTs used for home heating are exempt from state regulatory agencies in South Carolina, as well, and can remain in place (SC DHEC *Undated*). However, if a decision is made to remove a home heating oil tank and contamination (pollution) of soil is suspected based on visual observation, South Carolina Code of Laws (Title 48 Environmental Protection and Conservation) requires these findings to be reported and soil sampling be conducted (S.C. Code Ann. § 48).

Prior to 2004, tanks were removed by MCAS Beaufort when they were encountered during utility work. In 2004, the PPV partner that manages LBMH started a project to demolish and rebuild homes and removed tanks at these locations so they would not interfere with the demolition/construction work. In 2006, the PPV partner started a home renovation project and removed tanks that would interfere with the renovation work. Due to indications during historical tank removals that some tanks had leaked, although not required, MCAS Beaufort began the process of removing the remaining tanks as an environmental stewardship project in 2007.

[1] https://www.epa.gov/ust/revising-underground-storage-tank-regulations-revisions-existing-requirements-and-new last updated 24 July 2017

Soil sampling was conducted when each tank was removed. Because there are no regulations governing removal procedures, MCAS Beaufort coordinated with SC DHEC to develop removal procedures that were consistent with procedural requirements for regulated tanks. The determination to sample additional media (e.g., groundwater, soil gas, and/or indoor air) was based on sampling results obtained during the sequential screening process and SC DHEC review and input. Additional media were selected for sampling and analysis based on a comparison of site concentrations of constituents, in various media, to screening criteria in place at the time of reporting. For example, if petroleum products were detected in soil samples above SC DHEC screening levels for soil, a temporary groundwater monitoring well was installed to obtain groundwater samples and if groundwater sample results from the temporary monitoring well were above SC DHEC screening levels, a permanent groundwater monitoring well was installed and sampled. Groundwater is not used as a drinking water source for LBMH; therefore, exposure to contaminants in groundwater via drinking water is not a complete exposure pathway (See Section 3 – Public Health Evaluations – Drinking Water).

Four separate VI investigations have been conducted. In 2013, the first VI investigation at LBMH was performed at 388 Acorn Drive after discovery of free product (home heating oil) in the source monitoring well for this property. Since then, the VI investigations at LBMH have been an ongoing/evolving process and the potential for VI to occur is being assessed by sequential screening of soil, groundwater, soil gas and/or indoor air at affected properties.

In 2015, VI investigations were performed with an evaluation of the potential risk associated with construction of new homes on top of former UST locations in planned demolition and construction areas (designated as Demo Area 1 and Demo Area 2).

In 2016, a scope of work (SOW) was developed to conduct VI investigations at 34 properties where it was discovered that an add-on structure (e.g., garage, porch, shed or home addition) had been historically constructed on top of the suspected former UST locations.

In 2017, a SOW was developed to investigate VI at 26 locations where groundwater concentrations exceeded either the site-specific, groundwater-to-vapor screening levels or where free product was present in groundwater.

To date, VI investigations have been performed at 13 of the 14 properties where free product is present. The analytical results for all 13 of those properties are less than the VI Screening Levels (VISLs) for all COCs. However, 11 of those 13 properties are pending the MCAS Beaufort partnering team's review and decision as to whether to conduct further sampling or classify as NFA. The partnering team includes SC DHEC, MCAS Beaufort, Naval Facilities Engineering Command (NAVFAC) and NAVFAC contract staff. Additional VI investigations will be planned and completed based on the results of the additional groundwater assessments.

The investigation to address potential health concerns related to home heating oil USTs is ongoing. The SC DHEC has been, and continues to be involved in the review and approval of data provided on the approximately 1,100 LBMH residences with historical use of heating oil used in former USTs. While the VI investigation is continuing, the results of UST tank removal and subsequent investigations (soil, groundwater and VI) to-date, and oversight by the SC DHEC for each step of the process, indicate that exposure to indoor air concentrations of the constituents of home heating oil (e.g., benzene), is not a pathway of concern for residents at the properties in LBMH.

## MCAS Beaufort

Two hundred and sixty-nine (269) reports and other documents from 1985 to 2015 were reviewed including documents from Navy consultants and the SC DHEC. Documents reviewed included site assessments/characterizations, sampling reports, corrective measures studies (CMSs), remedial investigations/feasibility studies (RI/FSs), remedial action reports, work plans, monitoring reports, meeting minutes, and letters (see Appendix B). NMCPHC reviewed available documents to identify and collect information pertinent to the history and characteristics of each site on MCAS Beaufort and other general information about current activities and site use. The documents provided pertinent information for 141 sites, of which 130 were determined to have local impacts, zero were determined to have regional impacts and 11 had insufficient information to classify as local or regional (i.e., data gaps). Based on the document review, the NMCPHC concludes that there are no apparent public health hazards as a result of contamination from past disposal and handling practices at 130 of the 141 sites that were determined to have potential local impact. The 11 sites with data gaps warrant further evaluation to better identify any specific public health hazards.

Although many operations and other buildings are currently located near sites, most sites do not currently have contaminants accessible to people. Some sites had documented contaminant releases to groundwater; however, groundwater is not used as a drinking water source at MCAS Beaufort.

Based on the documents reviewed, the NMCPHC concludes that there are no apparent public health hazards as a result of contamination from past disposal and handling practices at 130 sites that were determined to have local impacts limited to direct contact or accessible contaminants. Sites classified as having local impacts were identified as potentially affecting a small number of people from possible exposures on-site or immediately proximate to sites. The status or recommended actions in place for these sites include environmental monitoring, NFAs, state UST program oversight, or have already undergone cleanup or mitigation. Several of these sites have been recommended for further action including sampling of soil and groundwater. It is assumed that any land use described in site documents reviewed for this assessment would remain the same in the future. Any changes in land use could affect the

potential for human exposures. Additionally, any further sampling or other assessment of sites with data gaps could change the sites' categorization (i.e., local or regional).

## MCRD Parris Island

Approximately 1,000, reports and other documents from 1979 to 2015 were reviewed from Navy consultants, the US EPA, and the ATSDR. This review included site assessments, characterizations, five year review reports, records of decision (RODs), CMSs, RI/FSs, work plans, monitoring reports, meeting minutes, and letters (see Appendix B). NMCPHC reviewed available documents to identify and collect information pertinent to the history and characteristics of each site on MCRD Parris Island and other general information about current activities and site use. The documents provided pertinent information for 58 sites, of which 45 were determined to have local impacts, seven determined to have regional impacts and six had insufficient information to classify as local or regional (i.e., data gaps). Based on the document review, the NMCPHC concludes that there are no apparent public health hazards as a result of contamination from past disposal and handling practices at 45 of the 58 sites that were determined to have potential local impact. The seven sites determined to have the potential for regional health impact and six sites with data gaps warrant further evaluation to better identify any specific public health hazards.

Four documents from 2004 to 2012 were reviewed for Site 45, a former dry cleaning facility. A human health risk assessment concluded that site soils do not pose unacceptable risks to current maintenance workers, commercial workers, adult visitors, or potential future residents (i.e., the risks calculated were within US EPA target risk levels).[2] However, risks for potential future construction workers exposed to site soils were considered unacceptable (using US EPA target risk levels). VI from groundwater and/or soil gas in Building 293 (Depot Law Center) and the new dry-cleaning facility were evaluated. VI is a potential concern for Building 293, and soil gas and additional groundwater data will be collected at this building during the future remedial design phase of the CERCLA process. Risks for the new dry cleaning facility, based on the Johnson and Ettinger predicted air concentrations using maximum soil gas concentrations indicated risk associated with VI is negligible. As per the RI Addendum (Tetra Tech 2012b), "further surface water and sediment sampling is required to determine if there are potential ecological impacts at the site." The collection of additional storm sewer samples and sediment

[2] The RI/Resource Conservation and Recovery Act [RCRA] Facility Investigation (RFI) reviewed by NMCPHC was consistent with US EPA guidance on risk based management decisions (i.e., acceptable or unacceptable based on cancer and noncancer target risk levels). The US EPA typically defines an acceptable risk or target risk level for cancer as a range between one in 1,000,000 ($1x10^{-6}$) to one in 10,000 ($1x10^{-4}$). Risks below $1x10^{-6}$ are generally considered to be "negligible" and risks greater than $1x10^{-4}$ are generally considered to be "unacceptable." Noncancer risks are defined with a hazard index (HI) which indicates the likelihood of a noncancerous health effect to occur. An HI less than one is generally considered to be "acceptable" and indicates that no adverse health effects are expected to occur.

samples (as a part of the Site 14 Site Inspection) is expected to be completed in time to be considered in the Site 45 Proposed Remedial Action Plan/Record of Decision (PRAP/ROD; Tetra Tech 2012b). Consequently, NMCPHC acknowledges the uncertainty that constituent concentrations in deeper sediment could be of concern to ecological receptors, and in turn human receptors through fish consumption.

Based on the document review, the NMCPHC concludes that there are no apparent public health hazards as a result of contamination from past disposal and handling practices at 45 of the 58 sites that were determined to have potential local impact. Sites classified as having local impacts were identified as potentially affecting a small number of people from possible exposures on-site or immediately proximate to sites. The status or recommended actions in place for these sites include environmental monitoring, NFAs, state UST program oversight, or have already undergone cleanup or mitigation. Seven sites were determined to have the potential for regional health impact, and six sites with data gaps warrant further evaluation to better identify any specific public health hazards.

## PHR Conclusions:

NMCPHC concludes that:

- At this time, no apparent environmental public health hazards have been identified as a result of contamination from past waste disposal and handling practices (e.g., Environmental Restoration Programs) at MCAS Beaufort or MCRD Parris that could contribute to the pediatric cancers in the LBMH population based on risk factors for those cancers.
- IH sampling and evaluation for occupational exposures has not indicated exposures above occupational regulatory limits for benzene.
- Based on the results of the Radiation Safety Program and NAVRAMP evaluations, and radiation surveys and measurements, it is not likely that an individual would receive any additional radiation dose above normal background radiation from the occupied areas at LBMH, MCAS Beaufort, or MCRD Parris Island.
- No apparent public health hazard has been identified for LBMH residents from former heating oil tanks based on the extensive monitoring history within LBMH (including schools), the evaluation of potential exposures to residents from different media, former remediation efforts at individual residences, and technical plans which were coordinated with SC DHEC. The VI investigation is ongoing and SC DHEC continues to be involved with each step in the investigation.
- Based on the types and number of cancers and the evaluation of their recognized risk factors, it is unlikely that an environmental or occupational exposure is associated with the pediatric cancers at LBMH.

## Recommended Risk Management Actions

See Section 6 (PHR Conclusions and Recommendations) of this report for a complete list and discussion of risk management recommendations.

- Continue to partner with SC DHEC for each step in the remaining UST investigations (groundwater and VI) process to ensure VI is not a pathway of concern for residents at the properties in LBMH.
- As information becomes available from the remaining investigations (groundwater and VI), ensure that information is made available to LBMH residents and is posted on the MCAS Beaufort Laurel Bay Health Study Website (http://www.beaufort.marines.mil/Resources/Laurel-Bay-Health-Study/), and that individual house profiles are available to residents that describes the history of the UST(s) removal and subsequent investigations (soil, groundwater, VI) as applicable.
- Identified environmental sites on MCAS Beaufort and MCRD Parris Island with data gaps should continue to be addressed under their applicable regulatory framework (e.g., UST, RCRA, CERCLA).
- For existing PPV contracts, both NAVFAC environmental and Bureau of Medicine and Surgery (BUMED) public health SMEs should be made aware of the environmental and public health content of the existing different 16 PPV contracts (e.g., Section 12 Environmental Protection and Exhibits [Asbestos, Lead Based Paint, Chlordane]) so that they can respond appropriately to requests for service either from residents or the military housing liaison. Once provided the details of the remaining 16 PPV ground lease contracts, NMCPHC will begin to develop PPV guidance for public health practitioners so they can provide the appropriate and contractually relevant support to residents and military housing liaisons. The development of similar PPV guidance for NAVFAC environmental SMEs is recommended.

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# List of Acronyms

| Acronym | Definition |
|---|---|
| ACGIH | American Conference of Governmental Industrial Hygienists |
| ACM | Asbestos Containing Material |
| AFHSB | Armed Forces Health Surveillance Branch |
| AFHSC | Armed Forces Health Surveillance Center |
| AHERA | Asbestos Hazard Emergency Response Act |
| AHLTA | Armed Forces Health Longitudinal Technology Application |
| AIHA | American Industrial Hygiene Association |
| ALL | Acute Lymphoblastic Leukemia |
| AMCC | Atlantic Marine Corps Communities |
| AML | Acute Myeloid Leukemia |
| AOC | Area of Concern |
| AST | Aboveground Storage Tank |
| ATSDR | Agency for Toxic Substances and Disease Registry |
| AVGAS | Aviation Gas |
| BFPD | Backflow Prevention Device |
| BGS | Below Ground Surface |
| BJWSA | Beaufort-Jasper Water and Sewer Authority |
| Bolden | Bolden Elementary School |
| BOQ | Bachelor Officers' Quarters |
| BTEX | Benzene, Toluene, Ethylbenzene, and Xylenes |
| BUMED | Bureau of Medicine and Surgery |
| CAT | Computerized Axial Tomography |
| CDC | Centers for Disease Control and Prevention |
| CERCLA | Comprehensive Environmental Response, Compensation, and Liability Act |
| CFR | Code of Federal Regulations |
| CHCS | Composite Health Care System |
| CMS | Corrective Measures Study |
| CNIC | Commander Naval Installation Command |
| CO | Carbon Monoxide |
| $CO^2$ | Carbon Dioxide |
| COC | Constituent of Concern |
| COPC | Constituent of Potential Concern |
| CS | Confirmatory Sampling |
| CSM | Conceptual Site Model |

| Acronym | Definition |
|---|---|
| DCE | Dichloroethene |
| DDESS | Domestic Dependent Elementary and Secondary School |
| DDVP | Dichlorvos |
| DMDC | Defense Manpower Data Center |
| DNA | Deoxyribonucleic Acid |
| DNAPL | Dense Non-Aqueous Phase Liquid |
| DoD | Department of Defense |
| DODEA | DoD Education Activity |
| DOEHRS-IH | Defense Occupational and Environmental Health Readiness System – IH |
| DoN | Department of Navy |
| DRMO | Defense Reutilization and Marketing Office |
| DSS | Department of Safety Standards |
| ECE | Environmental Compliance Evaluation |
| ED | Exposure Duration |
| EDC | Epi Data Center |
| EOD | Explosive Ordnance Disposal |
| ER Program | United States Navy Environmental Restoration Program |
| ESA | Environmental Site Assessment |
| FH | Family Housing |
| FFS | Focused Feasibility Study |
| Galer | Galer Elementary School |
| GOCO | Government Owned, Contractor Operated |
| GW | Groundwater |
| HHRA | Human Health Risk Assessment |
| HI | Hazard Index |
| HUD | Housing and Urban Development |
| HVAC | Heating Ventilation and Air Conditioning |
| IARC | International Agency for Research on Cancer |
| IAS | Initial Assessment Study |
| ICD-9-CM | International Classification of Disease, 9th Revision-Clinical Modification |
| ICD-10-CM | International Classification of Disease, 10th Revision-Clinical Modification |
| IG | Inspector General |
| IGWA | Initial Groundwater Assessments |
| IH | Industrial Hygiene |
| IHFOM | Industrial Hygiene Field Operations Manual |
| ICO | Installation Commanding Officer |

| Acronym | Definition |
|---|---|
| ILCR | Incremental Lifetime Cancer Risk |
| IM | Interim Measure |
| iNFADS | Internet Naval Facilities Assets Data Store |
| IPM | Integrated Pest Management |
| IPMC | Integrated Pest Management Center |
| IPMP | Installation Pest Management Plan |
| iNFADS | Internet Naval Facilities Asset Data Store |
| IRP | Installation Restoration Program |
| IRSM | Installation Radiation Safety Manager |
| LBMH | Laurel Bay Military Housing |
| LBP | Lead-Based Paint |
| LIPA | Lead in Drinking Water in Priority Areas |
| LNAPL | Light Non-Aqueous Phase Liquid |
| LLRW | Low-Level Radioactive Waste |
| LTM | Long-term Monitoring |
| MCAS | Marine Corps Air Station |
| MC | Munitions Constituent |
| MCO | Marine Corps Order |
| MCL | Maximum Contaminant Level |
| MCRD | Marine Corps Recruitment Depot |
| MCX | Marine Corps Exchange |
| MDAS | Material Documented as Safe |
| MEC | Munitions and Explosives of Concern |
| MEDIG | Navy Medicine Inspector General |
| MEDOSH | Medical Occupational Safety and Health |
| MEK | Methyl Ethyl Ketone |
| MHPI | Military Housing Privatization Initiative |
| MHO | Military Housing Office |
| MHS | DoD Military Health System |
| MPE | Multi-Phase Extraction |
| MPPEH | Material Potentially Presenting an Explosive Hazard |
| MTBE | Methyl Tert-Butyl Ether |
| MTF | Military Treatment Facilities |
| MW | Monitoring Well |
| MWR | Morale, Welfare, and Recreation |
| NACIP | Navy Assessment and Control of Installation Pollutants |

| Acronym | Definition |
|---|---|
| NAVFAC | Naval Facilities Engineering Command |
| NAVFACLANT | Naval Facilities Engineering Command Atlantic |
| NAVOSH Program | US Navy Safety and Occupational Health Program |
| NAVRAMP | U.S. Navy's Radon Assessment and Mitigation Program |
| NBC | Nuclear, Biological, Chemical |
| NEHC | Navy Environmental Health Center |
| NEPMU | Navy Environmental and Preventive Medicine Unit |
| NFA | No Further Action |
| NFI | No Further Investigation |
| NH | Naval Hospital |
| NIRIS | Navy Installation Restoration Information Solution |
| NMCPHC | Navy and Marine Corps Public Health Center |
| NME | Navy Medicine East |
| NPL | National Priorities List |
| NOPRS | NAVFAC Online Pesticide Reporting System |
| NPAO | Non-Process Area Outfall |
| NPDES | National Pollutant Discharge Elimination System |
| NREAO | Natural Resources and Environmental Affairs Office |
| OB | Open Burning |
| OD | Open Detonation |
| OEH | Occupational and Environmental Health |
| OEM | Occupational & Environmental Medicine |
| OH | Officer Housing |
| OHC | Occupational Health Clinic |
| OMC | Office of Military Commissions |
| OSH | Occupational Safety and Health |
| OSHA | Occupational Safety and Health Administration |
| OWS | Oil/Water Separator |
| PA | Preliminary Assessment |
| PAH | Polycyclic Aromatic Hydrocarbon |
| PAO | Process Area Outfall |
| PCB | Polychlorinated Biphenyl |
| PCE | Tetrachloroethylene |
| pCi/L | Picocuries per Liter |
| PCM | Primary Care Manager |
| PEL | Permissible Exposure Level |

| Acronym | Definition |
|---|---|
| PEP | Program Evaluation Plan |
| PHA | Personal Health Assessment |
| PHR | Public Health Review |
| ppb | Parts Per Billion |
| PPV | Public Private Venture |
| PRAP | Proposed Remedial Action Plan |
| PW | Public Works |
| PWS | Public Water System |
| RAO | Remedial Action Objective |
| RBSL | Risk-Based Screening Level |
| RCRA | Resource Conservation and Recovery Act |
| REC | Recognized Environmental Condition |
| REVA | Range Environmental Vulnerability Assessment |
| RFA | RCRA Facility Assessment |
| RH | Relative Humidity |
| RI/FS | Remedial Investigation/Feasibility Study |
| RIVS | Remedial Investigation Verification Step |
| RME | Reasonable Maximum Exposure |
| ROD | Record of Decision |
| RPA | Radiation Protection Assistant |
| RS&H | Reynolds, Smith, and Hills, Inc. |
| RSL | Risk-based Screening Level |
| RSM | Radiation Safety Manager |
| RUC | Reporting Unit Code |
| SAA | Satellite Accumulation Area |
| SAP | Sampling and Analysis Plan |
| SC DHEC | South Carolina Department of Health and Environmental Control |
| SECNAV | Secretary of the Navy |
| SI | Site Investigation |
| SME | Subject Matter Expert |
| SOHME | Safety and Occupational Health Medical Evaluation |
| SOW | Scope of Work |
| SSIC | Standard Subject Identification Code |
| SSL | Soil Screening Level |
| STSC | Superfund Technical Support Center |
| SVOC | Semi-Volatile Organic Compound |

| Acronym | Definition |
|---|---|
| SWMU | Solid Waste Management Unit |
| TCE | Trichloroethylene |
| TEDE | Total Effective Dose Equivalent |
| TLD | Thermoluminescent Dosimetric Devices |
| TLV | Threshold Limit Value |
| TPH-DRO | Total Petroleum Hydrocarbons – Diesel Range Organics |
| TRICARE | DoD Health Care Program |
| Tri-Command | MCAS Beaufort, MCRD Parris Island, and NH Beaufort |
| TSCA | Toxic Substances Control Act |
| TVOC | Total Volatile Organic Compound |
| TWA | Time-Weighted Average |
| UH | Unaccompanied Housing |
| U.S. | United States |
| USACE | United States Army Corps of Engineers |
| USCSWG` | United States Statistics Working Group |
| US EPA | United States Environmental Protection Agency |
| USMC | United States Marine Corps |
| UST | Underground Storage Tank |
| UV | Ultraviolet |
| UXO | Unexploded Ordnance |
| VC | Vinyl Chloride |
| VI | Vapor Intrusion |
| VISL | Vapor Intrusion Screening Level |
| VOC | Volatile Organic Compound |
| WWTP | Wastewater Treatment Plant |

# Section 1: Introduction

In June of 2015, in response to residents' concerns, the United States Marine Corps (USMC) requested that the Navy and Marine Corps Public Health Center (NMCPHC) investigate the incidence of pediatric cancers in current and former residents of Laurel Bay Military Housing (LBMH) in Beaufort, South Carolina, which residents believe may be associated with environmental exposures (see Figure 1). In response to this request, NMCPHC initiated a Public Health Review (PHR).

## Purpose

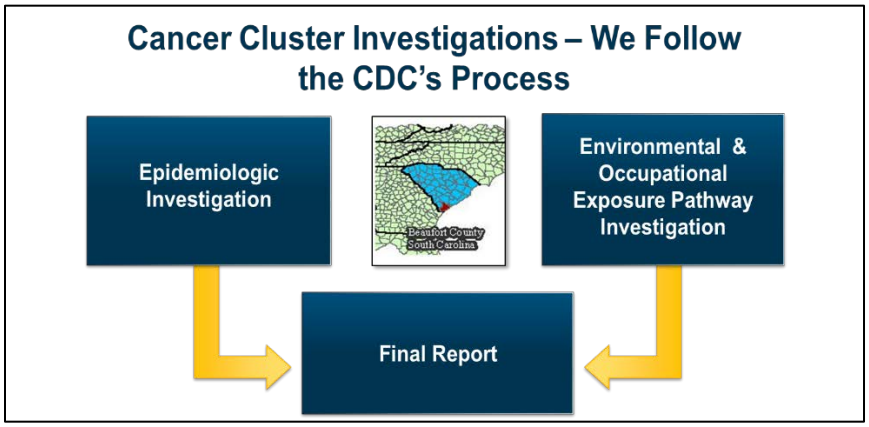
The purpose of this PHR report is to respond to current and former LBMH residents' concerns as expressed directly to Marine Corps Air Station (MCAS) Beaufort or posted on the Facebook page *Concerned Military Family United by Pediatric Cancer BEAUFORT SC* regarding pediatric cancers. This report summarizes the actions taken between June 2015 and September 2017 to address the residents' concerns.

## PHR Framework

NMCPHC followed the U.S. Centers for Disease Control and Prevention's (CDC's) process for performing PHRs that are associated with evaluating potential cancer risks in a population (CDC 2013a). This process is comprised of two steps: (1) an epidemiological investigation and (2) an environmental and occupational exposure pathway investigation. The results of these two investigations were integrated and presented in this final PHR report. The epidemiological investigation for this PHR focused on children; the environmental and occupational investigation for this PHR focused on potential complete exposure pathways (air, water, soil, soil gas) to constituents (e.g., chemicals) of concern (COCs) which are also applicable to adults.

For the epidemiologic investigation, subject matter experts (SMEs) in epidemiology investigated pediatric cancers in beneficiary children who lived or were conceived in the Beaufort area from 01 January 2002 to 31 December 2016 to determine if the observed cancer rates exceeded what would be expected in this population.

For the environmental and occupational exposure pathway evaluation, SMEs in industrial hygiene (IH), drinking water, environmental restoration, human health risk assessment, ionizing radiation, radon assessment and mitigation, occupational and environmental medicine, toxicology and epidemiology reviewed over a thousand environmental and occupational (e.g., work place) documents and medical records data for LBMH, MCAS Beaufort, and Marine Corps Recruit Depot (MCRD) Parris Island to evaluate the potential relationship, if any, between environmental exposures to chemicals and pediatric cancers in the LBMH population. COCs were identified based on the results of the following evaluations:




- Public health evaluations of drinking water, radiation safety, radon, pest control, IH, and occupational and environmental medicine program information;
- Environmental evaluations to identify releases of chemicals (e.g., from underground storage tanks [USTs], past waste disposal or waste handling practices, solid waste management units or general areas of concern); and
- Military Housing and Public Private Venture (PPV) contract evaluations to determine if housing may be associated with suspected or unknown environmental exposures (e.g., vapor intrusion [VI]).

A PHR relies upon:

- **Environmental data** – Concentrations of chemicals and microorganisms (e.g., bacteria) in media (e.g., soil, soil gas, water, air, and food)
- **Exposure data** – How people could come into contact with chemicals and microorganisms
- **Toxicity data** – What adverse health effects might be expected due to chemical exposure
- **Epidemiological health outcome data** – Information on community-wide rates of illness, disease, and death
- **Community health concerns** – United States Navy and Marine Corps personnel reports on disease and illness

PHR investigations are complex, take time, and typically comprise multiple iterative steps, with each step building on the previous step. A very conservative, health-protective, and comprehensive approach was taken to investigate the potential health concerns at LBMH. The Navy and USMC have taken action where necessary in response to information obtained during the PHR as opposed to waiting for the PHR to be completed.

The following actions were conducted as part of the PHR to address concerns regarding pediatric cancers:

- Performing an epidemiological review of medical databases to identify and confirm the diagnosis of pediatric cancer and the specific type of cancer
- Reviewing medical literature to identify known environmental risk factors for each confirmed cancer type
- Gathering and reviewing available historical occupational and environmental records
- Conducting on-site reconnaissance
- Assessing the need for collecting additional environmental data to fill identified data gaps for areas with incomplete or insufficient data for characterizing environmental concerns or potential complete exposure pathways

In response to resident's concerns, MCAS Beaufort developed a Laurel Bay Health Study website (http://www.beaufort.marines.mil/Resources/Laurel-Bay-Health-Study/). The following information is posted on the website:

- Public Updates
- Technical Information
- Fact Sheets
- Frequently Asked Questions
- Posters
- Information from Previous Open House Forums
- Upcoming Environmental Sampling
- Briefing Materials

## Overview of LBMH, MCAS Beaufort, MCRD Parris Island, Site 45, and Naval Hospital Beaufort Housing

Data from five locations in Beaufort, South Carolina were evaluated in the PHR: LBMH, MCAS Beaufort, and MCRD Parris Island (see Figure 2). In addition, Naval Hospital (NH) Beaufort and Housing and Site 45 (located within MCRD Parris Island) were also included in the evaluation. A brief description of each area is presented in this section.

## LBMH

LBMH is located 3.5 miles due west of MCAS Beaufort and primarily houses military personnel with families who are stationed at MCAS Beaufort, MCRD Parris Island, and NH Beaufort. LBMH includes 1,300 single-family military housing units and covers approximately 1,100 acres (see Figure 3). Three grade schools are also located within the LBMH boundary: Elliott Elementary, Charles F Bolden Elementary, and Robert E Galer Elementary. LBMH is bordered by forested uplands to the north, uplands to the south and east, and salt marshes and the Broad River to the west.



*Picture 1: LBMH Home*

## MCAS Beaufort

MCAS Beaufort is located approximately 25 miles west of the Atlantic Ocean and four miles from downtown Beaufort, South Carolina (see Figure 2). MCAS Beaufort is approximately 5,800 acres and is used primarily to house 700 marines and sailors and includes operational facilities (see Figure 4). The mission of MCAS Beaufort is to support operations, commands, and missions for the 2nd Marine Aircraft Wing, attached II Marine Expeditionary Force units, MCRD Parris Island, and the Eastern Recruiting Region. The 700 marines and sailors residing on MCAS Beaufort prepare approximately 3,400 marine personnel, squadrons, and tenant units for deployment at any given time to locations around the world.



*Picture 2: Marine Fighter Attack Squadron 115's Hangar Prior to Departing on a Western Pacific Deployment*

## MCRD Parris Island




*Picture 3: Drill Instructors Retiring the Guidons*

MCRD Parris Island is located within Port Royal, South Carolina, south of MCAS Beaufort (see Figure 2). MCRD Parris is approximately 2,894 acres of dry land and 3,816 acres of salt marshes, tidal ponds, and streams (see Figure 5). The area includes a child development center and temporary lodging facilities and Bachelor Officers Quarters. Approximately 19,000 recruits are trained at MCRD Parris Island each year. The area around Parris Island is used for commercial and recreational fishing; the area also serves as habitat for threatened and endangered migratory species of wildlife, including the southern bald eagle, wood stork, Eskimo curlew and short-nosed sturgeon.

### *Site 45*

Site 45 (Morale, Welfare, and Recreation [MWR] Dry Cleaning Facility) was a former dry cleaning facility located on MCRD Parris Island between Panama Street to the north, Kyushu Street to the south, and Samoa Street to the east (see Figure 6). This site was investigated during the PHR to evaluate potential environmental impacts of tetrachloroethylene (PCE) from former dry-cleaning operations. In 1988, an underground storage system was removed that had stored hydrocarbon cleaning solvents, and four aboveground storage tanks were installed along the northern side of the building. In 1994, one of the aboveground storage tanks was overfilled with PCE which flowed into the concrete catch basin designed to contain any tank-filling overflow. In 2001 the building and associated structures were demolished and the site remains a vacant lot covered with mowed grass.




*Picture 4: Site 45 Aerial View*

### *NH Beaufort Housing*

The NH Beaufort Housing area is located on the Beaufort River in Port Royal, South Carolina, along the southern coast of South Carolina in Beaufort County (see Figure 2). The housing at NH Beaufort is primarily for active duty personnel and dependents. NH Beaufort Housing residents work at MCAS Beaufort, MCRD Parris Island and NH Beaufort. NH Beaufort consists of the hospital and two Branch Health Clinics: one clinic is located at MCRD Parris Island and one clinic is located at MCAS Beaufort. The housing is located within the grounds of NH Beaufort area and consists of single-story, privatized family housing units and Bachelor Enlisted Quarters (see Figure 7).



*Picture 5: NH Beaufort Housing*

## Report Organization

The remainder of this report is organized as follows:

- Section 2: Epidemiological Investigation
- Section 3: Public Health Evaluations
- Section 4: Environmental Programs
- Section 5: Military Housing Privatization Environmental and Public Health Issues
- Section 6: PHR Conclusions and Recommendations
- Section 7: References

# Section 2: Epidemiological Investigation

## Epidemiologic Investigation of Pediatric Cancers

At the request of the Marine Corps Installations Command and the Medical Officer of the Marine Corps, the NMCPHC investigated alleged pediatric cancer cases among current and former residents of LBMH located near MCAS Beaufort. Some residents believe the pediatric cancers may be associated with suspected or unknown environmental exposures. The NMCPHC EpiData Center (EDC) was requested to identify and validate all pediatric cancers among beneficiary children who lived in the Beaufort area from 01 January 2002 to 31 December 2016 to determine if the observed cancer rates exceeded what would be expected in this population.

## Understanding the Cancer Process

According to the Centers for Disease Control and Prevention (CDC), cancer is the second leading cause of death in the United States, with one in four deaths attributable to some form of cancer. Approximately one in two men and one in three women will have some form of cancer in their lifetime. Cancer is common; therefore, cases might appear to occur with alarming frequency within a community even when the number of cases is within the expected rate for the population. Multiple factors affect the likelihood of developing cancer, including age, genetic factors, and lifestyle behaviors such as diet and smoking. A statistically significant excess of cancer cases can occur within a given population without a discernible cause and might be a chance occurrence (see Appendix C).

There are four factors considered when conducting cancer investigations:

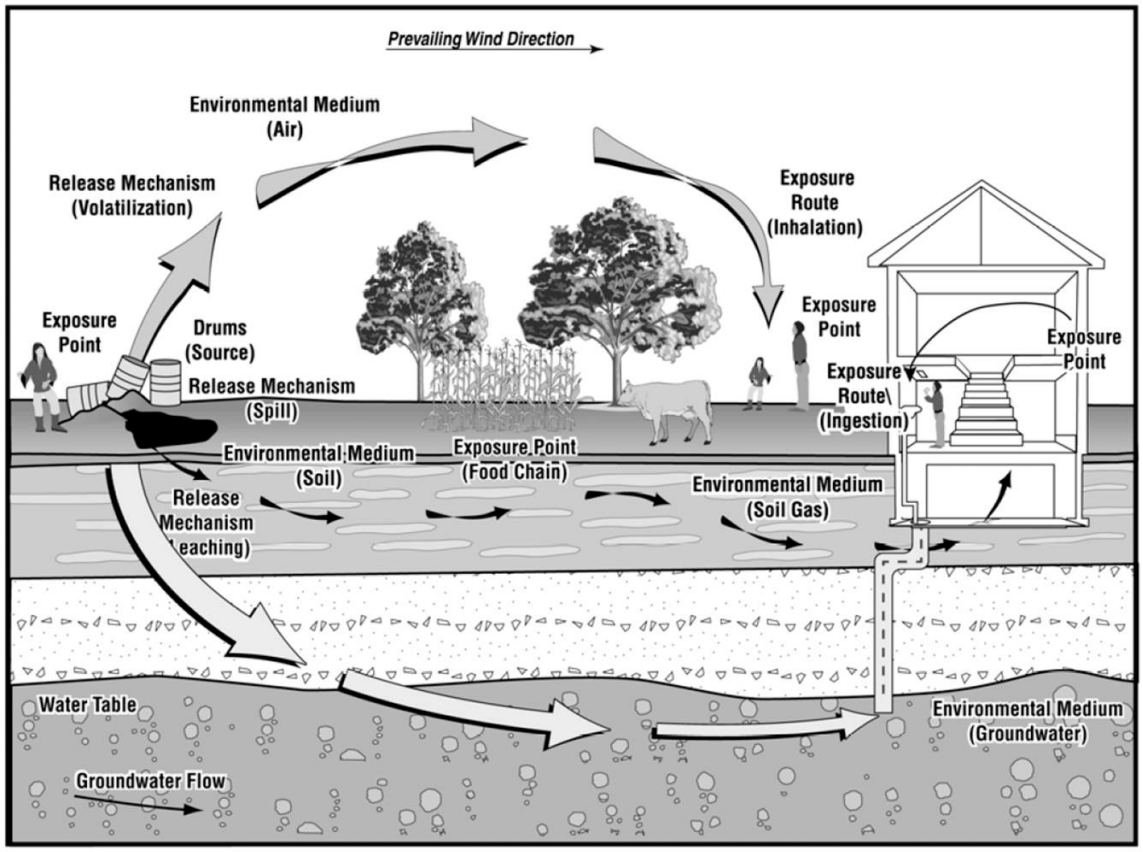
1. **Genetics**: A person with a family history of cancer is at an increased risk of developing cancer (American Cancer Society 2017a).
2. **Age at Diagnosis**: The risk of cancer increases with increasing age (National Cancer Institute 2017f). The incidence of some cancers is specifically related to the age of the person (National Cancer Institute 2017f). For example, the incidence of acute lymphoblastic leukemia (ALL) peaks at about age 3 and then decreases rapidly (American Cancer Society 2017d).
3. **Exposure to External Agents**: There are some occupational and environmental exposures that are associated with an increased risk of cancer (National Cancer Institute 2017a). For example, repeated exposure to sunlight sufficient to cause sunburns is associated with an increased risk of melanoma.
4. **Lifestyle Behavior**: Certain behaviors increase the risk of cancer, including smoking, alcohol consumption, and sedentary lifestyle (National Cancer Institute 2017g).

All cancers involve changes in how a gene is expressed (National Cancer Institute 2017h). The changes can be inherited, caused by an external factor like ionizing radiation, or from an

uncorrected genetic error during cell division. Examples of external agents that can cause changes to a gene include environmental exposures (i.e., sunlight/ultraviolet [UV] light, and air and groundwater pollution), X-rays, secondhand smoke in the home, prenatal alcohol consumption, and medication use. A person's age is a surrogate or substitute measure for the fact that the body accumulates the effects of damaging exposure over time since most cancers take an extended period of time to develop. In the case of pediatric cancer, the child's exposure to external agents may have occurred in the womb. Age is such a powerful determinant of cancer that observed cancer rates must be adjusted to account for age so rates can be compared within and between populations (National Cancer Institute 2017g).

Cancer exposure factors are described as the toxicity or ability of the agent to cause damage, the intensity of exposure, and the dose of total exposure. Using sunlight as an example, some UV radiation components of sunlight are known as skin cancer risk factors. UV radiation can directly damage deoxyribonucleic acid (DNA) or indirectly impact the expression of genes that prevent tumors. The risk of skin cancer increases with the number of sunburns (e.g., intensity and frequency) or the amount of time a person had unprotected exposure to the sun, otherwise known as the dose (American Cancer Society 2017b).

Exposures can change the body's ability to manage conditions that may be related to cancer. Most chemicals that enter the body from external sources are metabolized in the liver. The metabolic pathways that detoxify some chemicals in the liver are the same metabolic pathways that detoxify alcohol and medications in the liver. If liver function is impaired due to alcohol or medication use, then the metabolism of external chemicals may be blocked or only partially completed, leading to longer circulation of the chemicals in the body or the production of more toxic metabolites (Guengerich 2000).




*Source: 2005 Agency for Toxic Substances and Disease Registry's Public Health Assessment Guidance Manual*

For an epidemiology study to be meaningful, a complete exposure pathway from the exposure to the individual must be demonstrated and there must be a sufficient number of cases to study. However, a complete exposure pathway does not necessarily mean that a public health hazard exists. Rather, specific exposure conditions, such as the route of exposure and the magnitude, frequency, and duration of exposure, need to be examined more closely to evaluate possible health implications.

### 5 Elements of an Exposure Pathway

*Source* – How the material gets in the environment.

*Media* – How a material moves from its source (e.g., soil, water or air)

*Exposure Point* – Where people contact the media.

*Exposure Route* – How the material enters the body (e.g., eating, drinking, breathing).

*Receptor Population* – People who are exposed or potentially exposed.

A pathway of exposure is considered completed when all five elements are present. A completed pathway connects the source of the material to people.

If one element is missing the pathway is incomplete and there is no exposure and no health effects.

## Incidence of Pediatric Cancers

Pediatric cancer, although less common than adult cancer, is the second leading cause of death in children ages 5-14 (American Cancer Society 2013). The 2013 incidence rate of pediatric cancer, which is the most recent year of available data from the CDC, was 16.8 cases per 100,000 children over a calendar year (CDC 2016). The type of cancer and proportion of cases that develops in children ages 0-14 years are (American Cancer Society 2013):

- ALL (26%)
- Brain and central nervous system (21%)
- Neuroblastoma (7%)
- Non-Hodgkin lymphoma (6%)
- Wilms tumor (5%)
- AML (5%)
- Bone tumors (4%)
- Hodgkin lymphoma (4%)
- Rhabdomyosarcoma (3%)
- Retinoblastoma (3%)
- Other types (16%)

The probability that a child will develop a malignant cancer before age 15 is about 1 in 408 children (i.e., if a group of 408 children were followed from birth to 15 years of age, on average, one cancer case would be observed). Therefore, in a cohort of more than 10,000 to 15,000 children who lived in a study area over a 14 year study period, about 24-37 cancer cases would be observed. In addition, the most prevalent pediatric cancer type is acute lymphoblastic leukemia (ALL) which peaks from age 2-4 and remains higher than other cancers until 9 or 10 years of age (American Cancer Society 2013). Therefore, in an area with a relatively large number of families with young children concentrated around a military base, we would expect to see more pediatric cancer cases because there are more young children living in the area. Because of this, cancer cases might appear to occur with higher frequency within a community even when the number of cases is actually within or below the expected rate for the population, adding to the perception of an excess of cancer cases in a community.

## Latency

The latency period is defined as the time from cancer initiation to clinical detection (American Journal of Epidemiology 1981). In simpler terms, cancer development is a series of steps that occur over time starting with the initiation of the cancer process, leading to subclinical markers (i.e., not yet readily observable signs or symptoms), and ending in a clinical diagnosis. These steps are divided into two phases, although the time at which one phase transitions to the other is usually unknown. The first phase is the induction period. The induction period is

defined as the time from the first exposure to an agent to the initiation of the cancer process. The second phase is the latency period.

Cancer screening is a means of detecting disease early in asymptomatic people. Screenings may result in earlier cancer detection and potentially offer more time for treatment, but does not necessarily improve the chance of a cure or increase life expectancy. Furthermore, some cancers that are detected during screening are individually resolved and early treatment may not be beneficial. Unfortunately, information is not well understood about which cancers are going to progress or resolve, or why the cancer progresses or resolves. To simplify the discussion, this report will refer to the period of time from first exposure to diagnosis as latency.

Previous studies have been used to define disease latency periods by basing the latency period on known occupational exposures or accidents that have occurred at the same time to significantly high levels of chemicals or other agents (e.g., The World Trade Center collapse). Conversely, the disease latency period related to environmental pollutant exposure is typically unknown due to the relatively low levels of exposure, the large number of exposed people, the length of time each individual was exposed, and the different routes of exposure and metabolic pathways (CDC 2013b). For the purpose of this report, the latency period will be assumed to be the same as observed in occupational studies unless otherwise noted.

## Cancer Promoters

Cancer does not progress in the same way for every individual. The development and progression of cancers are multifactorial (i.e., genetic, behavioral, and environmental). A cancer promoter is an agent that can shorten the latency period, but it is not part of the cancer process (National Cancer Institute 2017d). For example, drinking alcohol may be a cancer promoter for breast cancer. While there has not been a definitive link between alcohol consumption as a component cause of breast cancer, a significant increased risk of breast cancer was associated with recent drinking (within five years of diagnosis) in several studies. In this case, alcohol consumption was not implicated as being the cause of cancer, but rather playing a role in promoting the cancerous growth.

## Hypersensitivity and Immunity

Cancer latency periods and exposure risk levels for cancer are calculated based on a population of people, and not the individual. The population includes people who are hypersensitive and people who are immune to the exposures that initiate cancer (Modern Epidemiology 2008). For example, some people can smoke three or four packs of cigarettes per day for 40 years and not get lung cancer, while some people can be exposed to extremely low levels of a chemical and cancer will be initiated (National Cancer Institute 1996). Knowing an individual's genetic makeup and the family history allows for better understanding of the cancer risk, but much is still unknown about individual susceptibility to carcinogens. A recent article estimated that

about 66% of all cancers have an unknown cause, while 29% are attributed to environmental exposures and 5% to inherited genes (Science 2017).

## Methods

### Study Population

To identify the study population, a list of the postal zip codes for of active duty marines and sailors who lived and worked within approximately 30 miles of LBMH and MCRD Parris Island was created (see Figure 1). The zip codes used to identify the service members are provided in Appendix D. Data from the active duty Defense Manpower Data Center (DMDC) database were obtained for 01 January 2002 to 31 December 2016 using the identified zip codes to capture personal identifiers for all possible service members living in the study area. The study population scope was expanded to include active duty personnel from squadrons that deployed through MCAS Beaufort with zip codes outside the study area using the duty location codes in the DMDC database. The study start date was January 2002 because this is the first month the EDC began archiving medical and personnel records data. The study end date was December 2016 because this allowed sufficient time for medical claims data to be submitted and entered into the medical data systems. Latency was not used as a factor in this analysis because the latency of most pediatric cancers is unknown.

Using the sponsor identifiers found in the active duty DMDC file, outpatient medical encounter data (Standard Ambulatory Data Record/Comprehensive Ambulatory Professional Encounter Record) and inpatient discharge records (Standard Inpatient Data Record) from 01 January 2002 to 31 December 2016 were abstracted. Due to the need for specialized care, many childhood cancers are treated in non-military hospitals and the cost of care was reimbursed through TRICARE, the Department of Defense (DoD) health care program. These records, referred to as purchased care claims, were obtained from the Medical Data Repository for all inpatient

These records, referred to as purchased care claims, were obtained from the Medical Data Repository for all inpatient (TRICARE encounter data-institutionalized) and outpatient (TRICARE encounter data-non-institutionalized) medical encounters from 01 January 2002 to 31 December 2016. For potential cases that met the case definition, the patient's birthdate and the date of initial cancer diagnosis were compared to the first month the sponsor was stationed in the study area.

### Case Definition

For this study, a case of pediatric cancer was defined as a DoD beneficiary child 15 years of age or younger with a malignant cancer diagnosis in any medical record that was consistent with the diagnosis and treatment of cancer. To obtain an initial list of potential cases, the Armed Forces Health Surveillance Branch (AFHSB) cancer case definition (i.e., three or more outpatient encounters within 90 days or at least one inpatient discharge coded as a malignancy to be a

cancer case) was used. The AFHSB case definition is for health surveillance and was not intended to serve as a case validation; however, the EDC wanted to cast a wide net to avoid missing any cases. Also, medical providers sometimes code an encounter as a potential cancer case because the provider is unsure at the time of the visit. These records remain in the medical data systems unless the provider corrects the record. The International Classification of Disease, 9th Revision-Clinical Modification (ICD-9-CM) codes ranging from 140.0-239.9 and 10th Revision-Clinical Modification (ICD-10-CM) C and D codes (C00-C96 and D00-D48) were used to identify potential cancer malignancies in the study population. To validate cases with inconsistent diagnosis codes, medical provider and applicable laboratory and treatment notes for each potential case were reviewed in the electronic medical records of the Armed Forces Health Longitudinal Technology Application (AHLTA). Patients with records indicating a final diagnosis of benign cancer or other non-cancer condition were not validated as cases.

### Inclusion Criteria

The study cohort consisted of all children (0-15 years of age) who were:

- Eligible beneficiaries of the Military Health System,
- Born after 01 January 2002, and
- The child of a sponsor who was assigned to the study area anytime between 01 January 2002 and 31 December 2016.

A case was included in the study:

- If the child met the case definition and the diagnosis date was after the date the sponsor reported to the study area during the study period.
- If a child was born 10 months or less after the sponsor left the study area and was a validated case. A 10-month time period was applied to each potential case birthdate to include children who were conceived while the sponsor was stationed in the study area.

### Exclusion Criteria

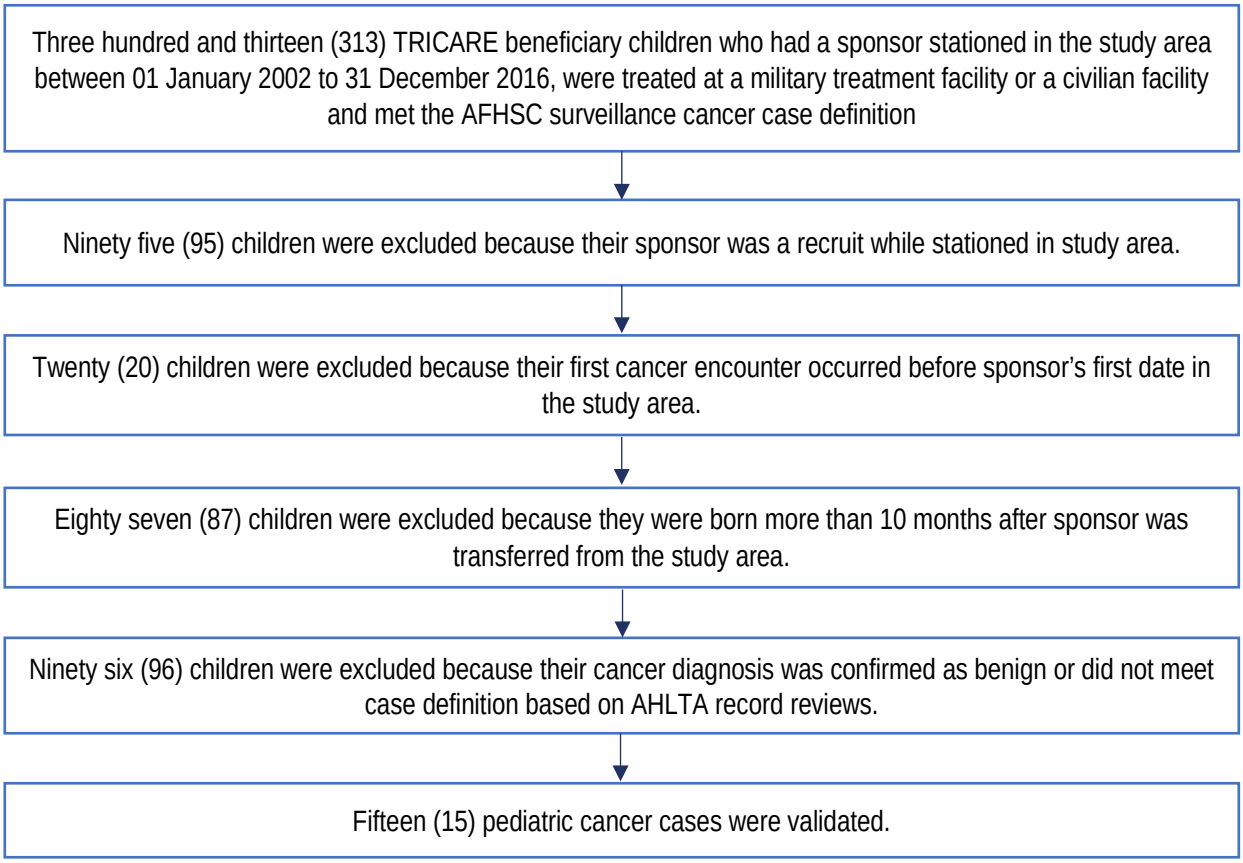
- A child was excluded from the study if they were born before 01 January 2002 because medical data for this child was not available to confirm a primary cancer diagnosis prior to the study period.
- A child was excluded from the study if they received a cancer diagnosis before the first record of the sponsor stationed in the study area.
- A child was excluded from the study if their sponsor was only at MCRD Parris Island for three to four months, had a boot camp training Reporting Unit Code (RUC) for the entire time, and had a rank equal to private or private first class.

### Incidence Rate Calculation

To calculate the incidence rate for each type of cancer, a minimum of 16 cases is required (National Cancer Institute 2003). Incidence rates have two components that allow observed rates to be compared to population rates: (1) the number of validated cases, and (2) the total time each person in the study population is at risk of becoming a case after arriving in the study area (referred to as person-time). For example, if a child was born while the sponsor was stationed at MCRD Parris Island, the time from the birth date until the sponsor left active duty or up to the study end date, whichever came first, was counted as person-time at risk. If a child was born before the sponsor was stationed at the study area, then the total person-time would be from the date of arrival at the study area until the sponsor left active duty or up to the study end date, whichever came first. Incidence rates are usually expressed as the number of cases per 100,000 person-years. If there are at least 16 cases of one type of cancer, the incidence rates will be age-adjusted and compared to the population cancer incidence rates published by the SC DHEC or the National Cancer Institute, depending on the availability of rates for specific cancers. If at least 16 cases for each cancer type are not validated, then incidence rates cannot be calculated. If incidence rates cannot be calculated, a description of each type of validated cancer diagnosed among the study population, associated risk factors, and latency will be provided.

## Results

A total of 313 children were initially included in the analysis because the AFHSB cancer surveillance case definition was met and the children had a sponsor stationed at or currently living within 30 miles of the study area (see case validation flow diagram on the following page). Ninety-five potential cases were excluded because the service members were only at MCRD Parris Island for three to four months and the sponsors had a boot camp training RUC during the entire time. Twenty (20) potential cases were excluded because the date of their first cancer diagnosis occurred before the sponsors were assigned to the study area. Eighty seven (87) potential cases were excluded because they were conceived or born at least 10 months after the sponsors were reassigned to a command outside the study area or left active service. The sponsor's rank was equal to private or private first class. The remaining 111 potential cases were reviewed in AHLTA to confirm the accuracy of the malignant ICD-9-CM or ICD-10-CM cancer codes. Of the 111 cases reviewed, 96 were excluded because the diagnosis was confirmed as either benign or did not meet the case definition. Fifteen (15) cancer cases were validated in AHLTA. The 15 validated cancer cases included ALL, AML, neuroblastoma, Wilms tumor, and soft tissue sarcoma. Due to health privacy regulations, the distribution of cases cannot be discussed.




*Flowchart 1: Case Validation Flow Diagram*

## Discussion

Five different types of cancer were identified among 15 cases in the study population. While cancer is rare in a pediatric population, the types of cancer observed in this study are the most commonly seen in a pediatric population. Cancer incidence rates, for the purpose of comparison with general population and state cancer incidence rates, could not be calculated due to the low number of cancers validated by the study. Because the development of cancer is multifactorial, it is not scientifically valid to group all cancers together as a single health outcome. The following is a discussion of the types of cancer observed in the study and is provided for information purposes only. If a parent or guardian has any questions or concerns, he or she should discuss them with an oncologist or medical provider.

### Acute Lymphoblastic Leukemia

ALL is the most common form of childhood cancer. ALL is a blood cancer that affects the bone marrow, or more specifically, the white blood cells called lymphocytes. Development of ALL is a multi-step process involving several genomic alterations. These genomic alterations can take place in utero, infancy, or childhood and lead to abnormal growth of lymphocytes (National

Cancer Institute 2017b). Once these immature lymphocytes proliferate, ALL can invade the blood, spread to other organs and progress very quickly. If untreated, ALL can be fatal within a few months of initiation.

***Risk factors:*** Age (younger than 15 years of age and older than 50 years); race (White); genetic disorders (Down syndrome, ataxia telangiectasia, Li-Fraumeni syndrome, Klinefelter syndrome, Fanconi anemia, Wiskott-Aldrich syndrome, and Bloom syndrome); high doses of ionizing radiation; and viruses (human T-cell leukemia virus-1, Epstein-Barr virus [Cancer.Net Editorial Board 2016]).

***Latency***: Because the etiology of ALL is not completely understood, the latency period is variable. Some models indicate that the latency period is about two years and includes exposures that occurred in utero which may explain the peak in ALL incidence at around two years of age (National Cancer Institute 1997). The latency period for ionizing radiation exposure is about five months (CDC 2013b).

### Acute Myelogenous Leukemia

Childhood AML is a cancer of the blood and bone marrow. AML is also called acute myelogenous leukemia, acute myeloblastic leukemia, acute granulocytic leukemia, and acute nonlymphocytic leukemia.

***Risk Factors***: Genetic disorders (Down syndrome, Fanconi anemia, familial monosomy, ataxia telangiectasia, Shwachman-Diamond syndrome, and Bloom syndrome); exposure to ionizing radiation or alcohol in utero; exposure to benzene; sibling with leukemia; race (Hispanic); family history of myelodysplastic syndromes; and personal history of aplastic anemia (National Cancer Institute 2017c; Pediatric Blood Cancer 2013).

***Latency***: Few literature sources discuss latency for this cancer. There appears to be multiple pathways for developing AML, thus providing different latency periods. For exposure to high levels of ionizing radiation in childhood, the latency period can be around six months to several years. For cases where the child is less than two years of age, AML likely has a prenatal origin (CDC 2013; British Journal of Cancer 1999).

### Neuroblastoma

Neuroblastoma is a cancer in which malignant cells form in certain types of nerve tissue. Neuroblastoma most often begins in the adrenal glands, which are on top of the kidneys. It can also form in nerve tissue in the neck, chest, abdomen, or spine. Neuroblastoma most often occurs in children younger than five years of age; 37% of cases are diagnosed as infants. Sometimes it forms before birth and is found during a routine pregnancy ultrasound. In children aged six months or younger, the disease sometimes goes away without treatment (National Cancer Institute 2017e).

***Risk Factors***: The only known risk factors are germline mutations and there are no known environmental exposure risk factors (National Cancer Institute 2017e).

***Latency***: Neuroblastoma is an embryonal malignancy and does not have a measureable latency period.

### Soft Tissue Sarcoma

Soft tissue sarcoma is a cancer that develops in the tissues that support and connect the body. It begins in immature cells that normally form muscle and develops in striated muscles, which are the muscles that people can control. The cancer may occur anywhere in the body, including in the head and neck, urinary or reproductive organs, and arms or legs. Rhabdomyosarcoma is the most common soft tissue sarcoma diagnosed in children (Cancer.Net Editorial Board 2017a; MedScape 2015).

***Risk Factors***: Inherited conditions (Li-Fraumeni syndrome, Beckwith-Wiedemann syndrome, Neurofibromatosis type 1, Costello syndrome, Noonan syndrome); parental use of marijuana and cocaine; prenatal exposure to X-rays; and previous exposure to alkylating agents used to treat pediatric cancers (Cancer.Net Editorial Board 2017b).

***Latency***: Soft tissue sarcoma is an embryonal malignancy and does not have a latency period.

### Wilms Tumor

Wilms tumor (nephroblastoma), an embryonal malignancy of the kidney, is the most common childhood renal tumor. Wilms tumor usually presents as an abdominal mass in an otherwise apparently healthy child. Wilms tumor has the potential for both local and systemic spread. Approximately five to 10 percent of children with Wilms tumor have bilateral or multicentric tumors (GeneReviews® 2003).

***Risk factors***: Age (three to four years of age); race (African Americans have a slightly elevated risk); gender (girls have a slightly higher risk); and family history of cancer. There are no known environmental exposures associated with Wilms tumors (American Cancer Society 2017d).

***Latency***: Wilms tumor is an embryonal malignancy and does not have a measureable latency period (GeneReviews® 2003).

## Limitations

The primary limitations for this study were inaccurate coding of cases and accurate ascertainment of sponsor location. This study depended heavily on the duty assignment location of the sponsor to identify the location of beneficiaries. Clinical coding of cancer is subject to the diligence of the medical provider to enter the proper code into the health record. Because the method found all cancer diagnoses first and then applied the case definition, the chance that a case was missed due to inconsistent coding was reduced. Every effort was made

to observe case information in both administrative and clinical records. By including the prenatal period as a potential exposure period, additional cases were included in the study.

### Personnel Rosters

The DMDC provides monthly snapshots of each active duty, reserve, and deployed Navy and Marine Corps service members' personnel records. Data are provided to DMDC by the service, and analyses are dependent on the quality and completeness of these data. Any changes in service member status after the monthly data are extracted will not be captured until the following month.

### Encounter Data

Encounter data maintained at the EDC are routinely generated within the Composite Health Care System (CHCS) at fixed military treatment facilities (MTFs). Encounter data consist of ambulatory clinical encounters and inpatient discharges. Purchased care records are based on claims data submitted to TRICARE. Due to data source changes, Military Health Systems (MHS) ambulatory data before 01 January 2012 have four diagnosis fields, and data after this date have 10. The number of cases for a particular condition will likely appear to increase after 01 January 2012 even if the actual number of individuals with the condition did not. This change will affect case counts over years and may make comparisons more difficult to interpret. Inpatient records are created at discharge or transfer and have 20 diagnosis fields.

Diagnoses in medical encounters depend on correct ICD-9-CM and ICD-10-CM coding practices. Data for medical surveillance are considered provisional and medical case counts may change if the record is updated after the report is generated. Additionally, because records are submitted into the system at different times, there may be patients who had an inpatient or outpatient encounters that were not captured in the current data.

# Section 3: Public Health Evaluations

Public health evaluations were conducted for the PHR to determine the effectiveness of the drinking water, lead in drinking water in priority areas (LIPA), radon, installation radiation safety, pest control management, occupational and environmental medicine, and IH programs at LBMH, MCAS Beaufort, and MCRD Parris Island. Subject matter experts (SMEs) in drinking water, environmental restoration, radiation health, radon assessment, occupational and environmental medicine, toxicology, epidemiology, and IH conducted public health evaluations for the PHR. The SMEs reviewed documents provided by Navy Medicine East (NME), NH Beaufort, LBMH, MCAS Beaufort, and MCRD Parris Island to determine the effectiveness of the program in their area of expertise, identify data gaps, and provide recommendations based on the findings. The purpose of this section is to provide a summary of each evaluation. The following information is provided in this section for each evaluation:

- A list of the reviewed documents;
- A summary of the findings;
- Existing data gaps identified during the evaluation; and
- Recommendations based on evaluations.

## Drinking Water Evaluation

The purpose of the Drinking Water Program at MCAS Beaufort and MCRD Parris installations is to deliver drinking water in compliance with the United States Environmental Protection Agency (US EPA) Safe Drinking Water Act (1974 - 42 U.S.C. 300(f) et seq.) to all installation personnel. The Drinking Water Program policy and associated requirements are contained in Marine Corps Order (MCO) P5090.2A Change 3 of 23 August 2013, Environmental Compliance and Protection Manual, Chapter 16 (Drinking Water Systems and Water Conservation). Marine Corps water systems must be in compliance with all applicable federal, state, and local drinking water laws, regulations, and related DoN and DoD policies.

### Documents Reviewed

- 2005 Annual Water Quality Report (Beaufort-Jasper Water and Sewer Authority [BJWSA] 2005)
- 2006 Annual Water Quality Report (BJWSA 2006)
- 2007 Annual Water Quality Report (BJWSA 2007)
- 2008 Annual Water Quality Report (BJWSA 2008)
- 2009 Annual Water Quality Report (BJWSA 2009)
- 2010 Annual Water Quality Report (BJWSA 2010)
- 2011 Annual Water Quality Report (BJWSA 2011)

- 2012 Annual Water Quality Report (BJWSA 2012)
- 2013 Annual Water Quality Report (BJWSA 2013)
- 2014 Annual Water Quality Report (BJWSA 2014)
- 2015 Annual Water Quality Report (BJWSA 2015)
- 2016 Annual Water Quality Report (BJWSA 2016)

## Findings

BJWSA drinking water, treated and delivered by BJWSA, consistently meets or surpasses all water quality standards and inspections from both the US EPA and the SC DHEC. The BJWSA has treated and supplied the drinking water to LBMH, MCAS Beaufort, and MCRD Parris Island since 1965. BJWSA has owned, operated, and maintained the LBMH, MCAS Beaufort, and MCRD Parris Island water and wastewater systems since 2008.[3]

The BJWSA's website provides information regarding LBMH, MCAS Beaufort, and MCRD Parris Island's water supply. The following information was presented on BJWSA's website:

> "As part of a merger, utilities on the military installations have undergone significant maintenance and upgrades. In addition, due to more restrictive Beaufort River discharge requirements, the military wastewater plants at the Air Station and Parris Island have been eliminated, with wastewater flows diverted to our state-of-the-art Port Royal Island Water Reclamation Facility.
>
> Eight pump stations were constructed at Marine Corps Air Station Beaufort and Marine Corps Recruit Depot Parris Island. Several pump stations were eliminated and replaced with gravity sewer pipes, and pipelines were connected to the Port Royal Island Water Reclamation Facility. A two and a half million gallon equalization tank was added on Parris Island. The pipeline from Parris Island has been installed under Archer's Creek, using horizontal directional drilling to ensure minimal impact on the creek and surrounding marsh area. The consolidation project and upgrades to utilities have been completed."



Figure 1: Port Royal Island Water Reclamation Facility

[3] http://www.bjwsa.org/military.

The BJWSA's drinking water source is the Savannah River, not groundwater. According to the BJWSA's 2012 Water Quality Report, "The Savannah River supplies water for the Chelsea Water Treatment Plant and the Purrysburg Water Treatment Plant. The Chelsea Water Treatment Plant provides drinking water to residences and businesses in northern Beaufort County and supplements the Purrysburg Water Treatment Plant when necessary. The Purrysburg Water Treatment Plant supplies drinking water to southern Beaufort and Jasper counties. These treatment plants have the capacity to provide up to 39 million gallons of water per day. BJWSA also uses water from the upper Floridan Aquifer, a large, underground bed of rock that holds and provides groundwater to streams and wells. The Floridan Aquifer extends through Florida, South Georgia, and parts of Alabama and South Carolina." In the Levy-Limehouse-Bellinger area, the water has been converted from wells to treated water from the Purrysburg Water Treatment Plant. BJWSA maintains three Floridan Aquifer wells in Bluffton, which add to the water supply during times of high water demand.

BJWSA follows US EPA and SC DHEC protocols for testing the water quality for LBMH, MCAS Beaufort, and MCRD Parris Island. BJWSA collects water samples from the Savannah River, the water system, and home tap water. A certified, independent laboratory and the BJWSA-certified laboratory perform extensive tests on the water samples. BJWSA regularly reports test results to SC DHEC. In addition, SC DHEC performs sanitary surveys on a regular basis to check water quality. Water quality reports (Consumer Confidence Reports) are available on the BJWSA website at http://www.bjwsa.org/quality.

SC DHEC produces the Savannah River Basin Source Water Assessment Report to help identify necessary pollution prevention efforts and ensure the future safety of the community's drinking water. Information regarding the Savannah River Basin Source Water Assessment Report and the report itself are available for review at the BJWSA administration office or on the SC DHEC websites at www.scdhec.gov/HomeAndEnvironment/Water/SourceWaterProtection/ and at http://www.scdhec.gov/HomeAndEnvironment/Docs/savannah.pdf . The Savannah River contains naturally-occurring minerals and organic substances. The US EPA and SC DHEC maintain water quality standards to ensure a healthy water supply. The BJWSA meets these regulations, and also routinely meets higher standards set by the American Water Works Association. For treatment, BJWSA uses chloramines (approved by US EPA and SC DHEC) to ensure the water is free from substances and organisms that may be harmful to health. Chloramines provide better protection than chlorine because chloramines last longer in the system. Some individuals may be more vulnerable to contaminants in drinking water than the general population and can be particularly at risk for infection including immuno-compromised individuals (i.e., individuals undergoing chemotherapy cancer treatment, individuals who have undergone organ transplants, and individuals with HIV/AIDS or other immune system disorders), some elderly people, and infants. Immuno-compromised individuals can seek advice from their health care provider.

Guidelines to reduce the risk of infection from contaminants are available from the Safe Drinking Water Hotline at (800) 426-4791. Individuals living on a military base who need to report a water or sewer problem can contact:

- MCAS Laurel Bay: (843) 228-7527
- MCRD Parris Island: (843) 228-3145
- NH Beaufort Housing:
  - (843) 228-5430 during daytime hours
  - (843) 228-5600 during night and weekend hours

### Existing Data Gaps

No data gaps were identified during the drinking water review.

### Recommendations

There are no recommendations for drinking water.

## LIPA Evaluation

In addition to complying with all applicable federal, state, and local drinking water laws and regulations, and related DoN and DoD policies, Marine Corps installations must also comply with requirements to sample for lead in priority areas. This requirement is described in Marine Corps Installations Command Policy Letter 2-14 5090 G-F of Feb 24 2014 (Sampling and Testing for Lead in Drinking Water in Priority Areas). Installations are required to follow US EPA guidelines when testing and sampling drinking water from water fountains, faucets, and other outlets used primarily by children. Priority areas are defined as:

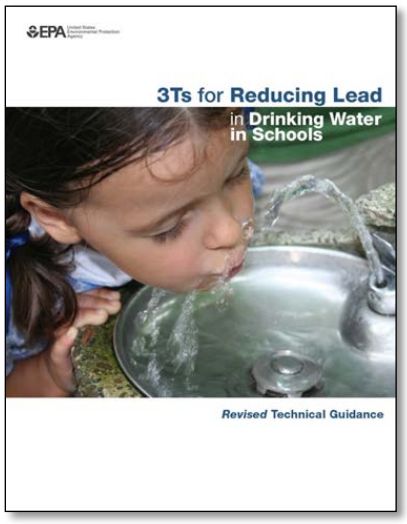
- Primary and secondary schools outlets;
- Child Development Centers;
- School age centers; and
- Youth and teen centers.

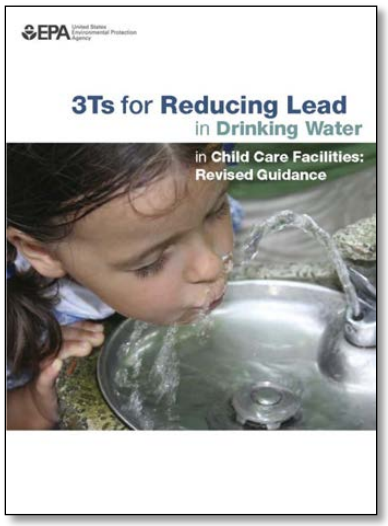
Priority areas do not include on-base or off-base residences used for childcare purposes (i.e., Family Child Care Homes), out-patient medical centers, or schools that are not owned or managed by the DoD.

All installations are required to implement a three-step program for sampling and testing drinking water in priority areas in accordance with the Marine Corps Installations Command Policy pursuant to the following US EPA guidance:

- 3T's for Reducing Lead in Drinking Water in Schools Revised Technical Guidance (US EPA 2006), and

- 3T's for Reducing Lead in Drinking Water in Child Care Facilities: Revised Technical




Guidance (US EPA 2005).

Sampling and testing under the Marine Corps' program should to be conducted in addition to (not in place of) the sampling that is conducted to determine whether or not a water supply system meets system-wide regulations under the Lead and Copper Rule, which is covered by the Safe Drinking Water Act (42 USC 300f—300j).

The Marine Corps' three-step Sampling and Testing for Lead in Drinking Water in Priority Areas should be conducted as follows:

### Step 1 – Baseline

Step 1 was to establish a Baseline by sampling and testing of water outlets in priority areas that are known to be used regularly for drinking and cooking. Examples include:

- Drinking fountains (bubbler and water cooler style);
- Sinks (especially those known or visibly used for water consumption, e.g., coffee maker or cups are nearby);
- Bathroom faucets;
- Hose attachments that may be used to fill water jugs (e.g., for sports team practice);
- Hot water outlets;
- Ice makers; and
- Bottled water dispensers.

If initial screening results exceed US EPA's recommended lead screening level of 20 parts per billion (ppb), installations shall immediately take the outlet(s) out of service or mark the outlet(s) with appropriate signs (e.g., non-potable). Installations shall implement the second

step of the US EPA's Two-Step Sampling Process. If sampling continues to exceed 20 ppb, installations shall institute permanent corrective actions. Step 1 shall be completed for all priority areas by 31 December 2014.

### Step 2 – New or Modified Facilities

Step 2 includes installations sampling and testing all water outlets in priority areas that are known to be used regularly for drinking and cooking when Marine Corps-owned water treatment processes are added or modified in any way that has the potential to increase lead concentrations (e.g., system includes older plumbing lines and plumbing/solder is disturbed, replaced, or removed). As part of the installation's annual internal environmental compliance audit, the environmental office shall query each priority area to determine if any plumbing modifications have been made and if sampling needs to be completed. This step shall also include initial baseline testing of all outlets that are expected to be used regularly for drinking and cooking in newly—constructed priority areas prior to building occupancy; however, after January 2014 if the contractor can adequately demonstrate that all materials used in plumbing conform to section 1417 of the Safe Drinking Water Act requiring less than 0.25% lead, then the requirement to test new construction is waived.

### Step 3 – Retesting

Step 3 includes installations shall re-test priority areas every five years from the established baseline, or more frequently if required by regulatory agencies.

### Recordkeeping

LIPA records must be retained per Secretary of the Navy (SECNAV) M-5210.1 (Records Management Manual), Standard Subject Identification Code (SSIC) 5090.5. A copy of all test results shall be made available for all schools, day care centers, and medical facilities where testing has been conducted. A notice of availability of the testing results shall be sent to the parents or legal guardians of children attending the affected school.

## Documents Reviewed

Lead in Drinking Water Sampling Report for MCAS Beaufort, July 2014

- 2014 MCAS Beaufort 3Ts Water Testing Results
  - Laurel Bay Child Development Center Building 1632
  - Laurel Bay Youth/Teen Center Building 1623
  - MCAS Beaufort CDC Building 1142
  - Bolden Elementary School
  - Galer Elementary School
  - Elliot Elementary School
- 2014 MCRD Parris Island 3Ts Water Testing Results
  - MCRD Parris Island Child Development Center Building 504

- MCRD Youth Center Building 501

### Findings

Although there is no formal agreement between MCAS Beaufort and the DoD Education Activity (DoDEA) schools at LBMH, they were included in the contract in which all testing was conducted and the final report prepared. DoDEA worked with MCAS Beaufort as a partner throughout the entire project from sampling, notifying parents of results, and providing bottled water to students and faculty, and fixture removal or replacement.

The results of the Lead in Drinking Water in Priority Areas evaluation indicated that the LIPA Programs for MCAS Beaufort and MCRD Parris Island appear to be in compliance with Marine Corps Installations Command Policy Letter 2-14 5090 G-F of Feb 24 2014 (Sampling and Testing for Lead in Drinking Water in Priority Areas). For MCAS Beaufort and MCRD Parris Island, although not specifically mentioned in the required internal Environmental Compliance Evaluation (ECE) Audit Final Reports for 2015 and 2016, the LIPA Program was evaluated after the baseline year (2014) and is in compliance based on May 26, 2017 and June 1, 2017 emails from Mr. Bill Drawdy (Natural Resources and Environmental Affairs Office [REAO] MCAS Beaufort) to Dr. Paul Gillooly (NMCPHC) and a June 1, 2017 email from Mr. Tim Harrington (NREAO MCRD Parris Island) to Dr. Paul Gillooly (NMCPHC).

### Existing Data Gaps

No data gaps were identified during the LIPA Program review.

### Recommendations

Continue to retest priority areas every five years from the established baseline, or more frequently, if required by regulatory agencies.

## Navy Radon Assessment and Mitigation Program Evaluation

The purpose of the U.S. Navy's Radon Assessment and Mitigation Program (NAVRAMP) is to ensure compliance with the requirements of the Toxic Substances Control Act (TSCA) as administered by the US EPA. Specifically, the US EPA-approved NAVRAMP identifies the level of indoor radon in existing and new buildings, undertakes mitigation measures in existing buildings, and incorporates preventive measures in new buildings to prevent buildup of indoor radon levels above 4 picocuries per liter (pCi/L) in Navy-occupied buildings. Policy and requirements for this program are contained in the Navy's Environmental Readiness Program Manual (DoN 2011). All Marine Corps installations must implement the NAVRAMP testing program to identify levels of indoor radon in accordance with MCO P5090.2A in the Environmental Compliance and Protection Manual.

Specific requirements include:

- Identifying activities where indoor concentrations of radon in occupied buildings exceeds the US EPA-recommended action level of 4 pCi/L;
- Maintaining a central data management system containing all validated monitoring results of Navy buildings (i.e., housing and non-housing, Navy-owned, or Navy-leased) tested for radon under NAVRAMP;
- Mitigating the indoor radon levels in buildings to below the US EPA-recommended action level of 4 pCi/L;
- Performing periodic inspections and preventive maintenance as required on mitigation systems and periodic retesting of buildings with mitigation systems (at least every 2 years) to ensure subject systems are operating properly to reduce the building's radon levels below 4 pCi/L; and
- Ensuring building designs include appropriate radon preventive measures where necessary such as sub-slab systems in new buildings to prevent buildup of indoor radon levels above 4 pCi/L, considering applicable regulatory requirements, historical radon monitoring data, and geological conditions at the location.

NAVRAMP implementation consists of testing, mitigation, and prevention. The mitigation and prevention requirements do not apply to non-Navy-owned buildings. A review of available documentation from NAVRAMP was performed and the results are presented in this section.

### Documents Reviewed

- 2002 Tri Command Finding of Suitability for MCAS Laurel Bay Family Housing
- 2011 Command Safety Program Assessment for MCAS Beaufort
- 2012 Radon Sampling at Air Station DEERS/AFGE Local Building 10752015 Internet Naval Facilities Assets Data Store (iNFADS)
- 2013 Data Call For Radon Test Results for MCAS Family Housing
- 2015 ECE Final Report for MCAS Beaufort
- 2015 Summary of Radon Surveys MCAS Beaufort
- 2015 Summary of Radon Surveys MCRD Parris Island
- 2016 Radon Sampling at Air Station GSE Maintenance Complex, Building 3030
- 2017 ECE Final Report for MCRD Parris Island

### Findings

A review of radon sampling conducted at MCAS Beaufort and MCRD Parris Island indicates that testing has occurred from 2002 thru 2014. A single contractor, Stelling Engineering, has provided sufficient sampling support and any recommended remediation actions to take over this period. They have also performed subsequent sampling where required.

In 2002, there was one building (MCAS Beaufort, Building 1075) that had sample results greater than the US EPA recommended action level of 4pCi/L. This was recognized and remediation efforts were performed on the building with subsequent samples collected in both 2004 and 2012. The results of both of these samples post remediation were below the 4 pCi/L recommended action level.

### Existing Data Gaps

No data gaps were identified during the NAVRAMP review.

### Recommendations

Continue performing the periodic inspections and preventive maintenance as required on existing building mitigation systems and periodic retesting of buildings with mitigation systems (at least every 2 years) per the Environmental Readiness Program Manual (DoN 2011) to ensure subject systems are operating properly to reduce the building's radon levels below 4 pCi/L.

## Installation Radiation Safety Program Evaluation

The purpose of the Installation Radiation Safety Program is to ensure compliance with federal, state and local policy to minimize:

- The risk of injury to personnel and the general public;
- Contamination of personnel and facilities; and
- The loss of control of sources of ionizing radiation.

Specific requirements include:

- Develop and implement the Installation Radiation Safety Order, and publish and distribute applicable installation messages, bulletins, or notices as required.
- Ensure an adequate number of Radiation Safety Managers (RSMs), Assistant Installation Radiation Safety Managers (IRSMs), and Radiation Protection Assistants (RPAs) to administer the Radiation Safety Program at the installation.
- Maintain and submit reports of radioactive commodities or sources.
- Perform annual leak tests in accordance with the procedures in the applicable supply instruction.
- Dispose of Low-Level Radioactive Waste (LLRW) through the Navy LLRW Program.
- Ensure proper handling and control of radioactive materials including receipt, storage, shipping, and disposal operations at installation activities and tenant commands.
- Provide lists of inventories and storage locations of radioactive materials/commodities to installation fire department and emergency response personnel. In addition, provide regular periodic training to these organizations on emergency response procedures involving radiation sources.

- Establish local procedures and maintain close liaison with the Defense Reutilization and Marketing Office (DRMO) and other installation organizations to prevent the unauthorized transfer or delivery of any radioactive materials to the DRMO.
- Conduct and document semi-annual reviews of the adequacy of the content, and implementation of the Radiation Safety Program.

Implementation of the Installation Radiation Safety Program at LBMH, MCAS Beaufort, and MCRD Parris Island was reviewed for compliance. A review of available documentation was performed and the results are presented in this section.

### Documents Reviewed

- Installation Radiation Safety Program Standard Operating Procedure (ASO 5104.1 of 4 Nov 14)
- Installation Radiation Safety Program letters of designation for Radiation Safety Manager
- ECE Report for MCRD Parris Island, 27 Jan 2017
- ECE Final Report MCAS Beaufort, 19 Nov 2015
- Command Safety Program Assessment MCAS Beaufort, 7 Jan 2014
- Command Safety Program Assessment MCAS Beaufort, 24 May 2011

### Findings

A review of the Installation Radiation Safety Program demonstrated compliance with all federal, state, and local requirements.

### Existing Data Gaps

No data gaps were identified during the Installation Radiation Safety Program review.

### Recommendations

Continue maintaining the Installation Radiation Safety Program as directed by federal, state and local policy.

## Pest Control Management Evaluation

MCAS Beaufort and MCRD Parris Island pest control operations are governed by DODINST 4150.07 with additional guidance provided by OPNAVINST 6250.4C and MCO P5090.2A. These policies ensure that DoD installations are in compliance with all federal laws and regulations governing the management of pest control operations and pesticide utilization. Government Owned, Contractor Operated (GOCO) sites and facilities such as the LBMH area are required to comply with the required policies, and state and local regulations.

All DoD installations are required to implement Integrated Pest Management (IPM) practices into all pest control operations. IPM is defined by DODINST 4150.07 as "a sustainable approach to managing pests by combining biological, cultural, physical, and chemical tools in a way that minimizes economic, health, and environmental risks."

Installation Pest Management Plans (IPMPs) are required to be developed for each installation. The IPMP is then implemented and managed by an appointed Integrated Pest Management Coordinator (IPMC) who oversees the operations of installation and contracted pest management professionals. GOCO operations are required to follow IPM practices and develop their own IPMPs in coordination with the installation IPMC.

All personnel involved in pest management activities onboard DoD installations, to include GOCO locations, are required to be certified pesticide applicators pursuant to DoD, federal, and/or state pesticide applicator requirements and regulations. All pesticide applications occurring onboard the installation, to include GOCO locations, are required to be documented in the NAVFAC Online Pesticide Reporting System (NOPRS).

### Documents Reviewed

- DoD Pest Management Program - DODINST 4150.07 (DoD 2008)
- Environmental Readiness Program Manual - OPNAV M-5090.1 (DoN 2014))
- Pest Management Program - OPNAVINST 6250.4C (DoN 2012)
- Environmental Compliance and Protection Manual - MCO P5090.2A (DoN 2013)
- MCAS Beaufort Integrated Pest Management Plan, Nov 2015
- Pesticide Application Records for MCAS Beaufort (NAVFAC 2002-2017a)
- Pest Management Program Reviews of MCAS Beaufort (NAVFAC 2002, 2004, 2006, 2008, 2011, and 2014)
- MCRD Parris Island Integrated Pest Management Plan (2011)
- Pest Management Program Reviews of MCRD Parris Island (NAVFAC 2003, 2004, 2009, 2012, and 2015)
- Pesticide Application Records for MCRD Parris Island (NAVFAC 2002-2017b)
- Partners Plan for Pest Control (Atlantic Marine Corps Communities, LLC 2007)
- USAF Aerial Spray Post Mission Reports and Sample Flight Plans

### Findings

Pest control activities, to include pesticide application, were reviewed for compliance with the following findings below:

#### *LBMH*

A separate IPMP was provided for LBMH and is well written and appears to meet all requirements (Atlantic Marine Corps Communities, LLC 2007). The IPMP is managed by Atlantic

Marine Corps Communities, LLC and coordinated with the MCAS Beaufort IPMC. Pesticide applications conducted as part of the IPMP must be reported to the MCAS Beaufort IPMC and documented in NOPRS.

### *MCAS Beaufort*

The IPMP for MCAS Beaufort meets all program implementation and management requirements. On-site pest management program reviews were conducted by NAVFAC in 2002, 2004, 2006, 2008, 2011, and 2014 and no significant issues were identified that would indicate an ongoing lack of compliance or significant concern with IPMP implementation.

A total of 7,705 records were identified in NOPRS for MCAS Beaufort pest management activities from 01 October 2002 to 05 April 2017. Record entries include all pest management activities to include mechanical control and pesticide (herbicide and insecticide) applications. Of those, 2.6% (203) were listed as occurring in family housing. Of those, all 203 applications occurred inside or around 19 buildings. Identification of the buildings did not state that they were exclusively in the Laurel Bay community. All pesticide applications were made by contractors working for Pestmaster Services (Beaufort, SC). The majority (91%) of insecticide applications were pyrethroids with 94% of those containing the active ingredient cyfluthrin. Pyrethroids are one of the safest classes of insecticides and cyfluthrin specifically has no known carcinogenic, teratogenic, or mutagenic concerns. Additionally, all applications were documented at or below US EPA label rates. The remaining products were all commercially available cockroach control products with minimal exposure risk and no carcinogenicity concerns.

### *MCRD Parris Island*

The IPMP for MCRD Parris Island meets all program requirements. On-site pest management program reviews were conducted by NAVFAC in 2003, 2004, 2009, 2012, and 2015 and no significant issues were identified that would indicate an ongoing lack of compliance or significant concerns with implementation of the IPMP. A total of 1,990 pest control records were reported in NOPRS from 01 October 2002 to 05 April 2017. Of these only 0.3% (5) were recorded as occurring in housing, presumably onboard MCRD Parris Island. The identified active ingredient was bifenthrin, another pyrethroid with a similar risk profile as cyfluthrin. Additionally, the US Air Force conducted aerial insecticide spray operations onboard MCRD Parris Island on 5 occasions between 2015 and 2016. These applications targeting midge and mosquito populations in the salt marshes surrounding the installation utilize naled which is an organophosphate. Naled is a class 2B carcinogen with the following statement: (No evidence of carcinogenicity in laboratory animals with Naled Technical. However, EPA under its 1999 proposed Guidelines for Carcinogen Risk Assessment has classified DDVP, an impurity in naled, as having "suggestive evidence of carcinogenicity, but not sufficient to assess human carcinogenic potential." IARC listed DDVP (Dichlorvos) as being possibly carcinogenic to humans (Group 2B). However, the application rate utilized during these operations releases dilute naled

at 0.88 oz/acre from 300 ft Above Ground Limit with a 1,000 ft swath width. Within these parameters and based on a review of the historic flight plans, there is minimal to no risk of spray drift reaching the Laurel Bay housing area and individual exposure risks directly in the flight path would have been orders of magnitude below EPA exposure thresholds.

### Existing Data Gaps

No data gaps were identified with regard to pest control operations onboard LBMH, MCAS Beaufort, and MCRD Parris Island. All programs appear to be in compliance with all federal, state, and local regulations ensuring pest control operations present minimal risk to installation and housing personnel.

### Recommendations

Continue to coordinate pest control program evaluations with NAVFAC, maintain pesticide applicator certifications, and follow established IPMPs.

## Occupational & Environmental Medicine Evaluation

Occupational & Environmental Medicine (OEM) is a branch of public health and preventive medicine focused on promoting the health of workers by the prevention and treatment of work-related injuries and illnesses, optimizing return to work, making disability determinations, and implementing effective workplace wellness programs. OEM may also be consulted on the prevention and treatment of illnesses that may result from environmental exposures. This includes working with Industrial Hygiene (IH) and Safety Programs to develop comprehensive strategies to identify hazards of concern, the populations affected, and the appropriate screening and occupational medical surveillance. OEM is responsible for providing that screening and occupational medical surveillance, as well as any treatment for workers, if required. Specific OEM program requirements are provided in the Navy's Safety and Occupational Health Program Manual (OPAVINST 5100.23G CH-1 of 21 Jul 2011), Chapter 8 (Occupational Health).

### Documents Reviewed

- 2009 Medical Inspector General Inspection Report of Naval Hospital Beaufort
- 2012 Medical Inspector General Inspection Report of Naval Hospital Beaufort
- 2015 Medical Inspector General Inspection Report of Naval Hospital Beaufort
- 2006 Medical Occupational Safety and Health (MEDOSH) Program Review Report
- 2009 Safety and Occupational Health Medical Evaluation (SOHME)
- 2012 Safety and Occupational Health Medical Evaluation (SOHME)
- 2014 Safety and Occupational Health Medical Evaluation (SOHME)
- 2006 to 2016 Occupational exposure records for ionizing radiation

- Telephone conversations and emails with Dr. Ray Christopher, Head of Occupational Medicine at NH Beaufort
- Telephone discussions with current (June 2017) Navy Medicine East SOHME Inspection Team

## Findings

Inspections and evaluations of the Occupational and Environmental Medicine programs administered by Naval Hospital (NH) Beaufort from 2006 to 2014 received either a satisfactory or commendable rating from the Navy Inspector General (IG) Inspection Team and Navy Medicine East Safety and Occupational Health Inspection Team.

One previous SOHME from 2012 indicated that active duty may not have been adequately screened, during their annual Personal Health Assessment (PHA) evaluations, for enrollment in specific occupational medical surveillance programs. According to current NME SOHME inspection team, this finding has been rectified and all service members are adequately screened and forwarded to the Occupational Health Clinic (OHC) for appropriate enrollment in occupational medical surveillance. Staffing shortages in the OHC have also been resolved so all service members and active duty requiring medical surveillance can be expeditiously evaluated.

Based on the epidemiological review of confirmed pediatric cancer cases and potential relation to either ionizing radiation or volatile organic compounds (VOCs; e.g., Benzene), our review focused on employee or active duty enrollment in the radiation worker program or in benzene medical surveillance, where reproductive effects from these exposures might be identified. Dr. Christopher reports no medical concerns from personnel (either active duty or civilian) in the radiation worker or benzene medical surveillance programs the past two years. The Occupational Health Nurse Clinic Manager for the past 18 years, Ms. Michelle White, reports she is not aware of any workers who have presented with concerns regarding benzene or radiation exposures during her employment.

Occupational exposure records for ionizing radiation were reviewed from calendar year 2006 to 2016 (11 years). This included all annual Exposure to Ionizing Radiation Reports (NAVMED 6470/1) and Situational Reports. The number of individuals monitored ranged from 27 in 2014 to 37 in 2010, 2011 and 2016. The Occupational Codes for those monitored with Thermoluminescent Dosimetric Devices (TLDs) included: 30 (medical diagnostic radiology), 33 (medical radiation oncology), 40 (industrial gamma rays), 41 (industrial x-rays) and 90 (other). All occupational exposures to ionizing radiation are identified by IH and all exposed workers are placed in medical surveillance with TLDs to monitor ionizing radiation exposure. The only identified exposures were to electromagnetic (photon) radiation, which includes gamma rays and x-rays.

The individual annual Total Effective Dose Equivalent (TEDE) for exposures ranged from 00.000 to 00.149 rem, with the annual occupational exposure limit of 05.000 rem (10 CFR Part 20, Standards for Protection Against Radiation, Subpart C – Occupational Dose Limits). The highest annual individual exposure of 00.149 rem represents 3% of the annual occupational exposure limit. The average of all annual TEDEs monitored for the Beaufort Tri-Command over the 11 year period is 00.006 rem, which is less than the Navy-wide average of 00.012 rem. No exposures occurred above the established annual limit and no exposure related Situational Medical Examinations were required during this period. Given the monitoring data over the last 11 years, there is no expectation of any health effects in these workers due to ionizing radiation exposure. There are no completed exposure pathways for ionizing radiation exposure to family members or in the military housing areas. Photon radiation (x-rays and gamma rays) is not carried home by the worker and there are no sources of ionizing radiation in the military housing areas beyond normal background levels found across the United States.

Particular attention was focused on the process to identify and manage exposures to reproductive hazards at MCAS Beaufort and MCRD Parris Island. Dr. Christopher reports that Reproductive and Developmental Hazards assessments are performed in accordance with Navy's Safety and Occupational Health Program Manual (OPAVINST 5100.23G CH-1 of 21 Jul 2011), Navy Guidelines Concerning Pregnancy and Parenthood (OPNAVINST 6100.1C), and the Navy Technical Manual on Reproductive and Developmental Hazards (NMCPHC-TM-OEM 6260.01C).

- All reproductive hazards are identified in the IH survey for each individual work center at MCAS Beaufort, MCRD Parris Island, and Naval Hospital/Naval Support Facility (Tri-Command).
- Supervisors are instructed to emphasize reproductive hazards when conducting required hazardous materials training for employees.
- Employees are instructed to notify their supervisors if they become pregnant.
- Supervisors ensure that the Exposures of Reproductive and Developmental Concern Statements are completed by both the supervisor and the worker.
- Those workers, civilian and military, are referred to NH Beaufort OHC for a formal Reproductive Hazard consultation.
- The Occupational Health providers review the IH Survey and Exposures of Reproductive and Developmental Concern Statements. The worker's current clinical status, including any current complications with the pregnancy, is discussed along with the worker's current job duties and concerns. After all questions are addressed and all known reproductive hazards are evaluated, appropriate work restrictions are placed for the duration of pregnancy. Work restrictions are clearly documented.

- The worker is encouraged to return or contact the OHC for any ongoing concerns or new issues as they arise. The OHC is very responsive to these requests and these workers are given priority for appointments once requested.

Another route of entry to Occupational Health may be directly from the worker's Primary Care Manager (PCM) or another health care practitioner. Male workers are also able to access the OHC with reproductive hazard concerns through this mechanism.

Dr. Christopher reports that the OHC is not aware of any pregnant personnel that were missed for evaluation by this program. Work restrictions are clearly documented and all supervisor concerns or clarifications are addressed as needed for work restrictions ordered by the OH provider. The OHC has performed 18 reproductive hazard evaluations this fiscal year (since 1 Oct 2016) to date, and 25 the past fiscal year. There have been no chemical or radiological reproductive and developmental issues noted in these evaluations the past two years. Dr. Christopher has not received any specific requests for reproductive and development hazard assessments for family members living in Laurel Bay housing, or received concerns from service members living there.

### Existing Data Gaps

No Navy OEM programmatic data gaps were identified during the OEM evaluation; however, it must be recognized that civilians may choose to see non-Navy (i.e., private sector) providers for medical care, including medical care for occupational-related conditions. The Navy, including Dr. Christopher, would have no knowledge of or access to records of such care, unless a worker informed the Navy.

### Recommendations

The OHC should continue to evaluate workers with concerns about work exposures in general and reproductive hazards specifically. The evaluation of workplaces for hazards, including reproductive hazards, and the evaluation of workers with reproductive concerns should continue to function in accordance with the guidance mentioned above.

If any LBMH resident has concerns about possible reproductive or developmental hazards associated with the housing complex, they may call the NH Beaufort OHC to arrange an appointment (843-228-5508). When contacting the clinic, please ask to speak with the Clinic Occupational Health Nurse. Tri-command civilian or active duty workers who have concerns about potential workplace hazards should notify their supervisor who can refer the worker to the OHC for evaluation.

Naval Hospital Beaufort health care providers should be familiar with, and continue to refer to, Provider Guidance for pediatric and adult cancers developed by NMCPHC specifically for health concerns regarding Laurel Bay Military Housing (see Appendix E).

## Industrial Hygiene

IH is the science of anticipating, recognizing, evaluating, and controlling workplace conditions that may cause workers' injury or illness. Industrial hygienists use environmental monitoring and analytical methods to detect the extent of worker exposure and employ engineering, work practice controls, and other methods to control potential health hazards. Industrial hygiene surveys are conducted to accurately assess worker exposures to chemical, physical and biological agents in the workplace and provide recommendations for their reduction or elimination. Periodic workplace evaluations are made to assure the effectiveness of the implemented controls and determine the need for continued medical surveillance.

Available IH documentation for MCAS Beaufort and MCRD Parris Island was reviewed and the results are presented in this section. Industrial Hygiene Program requirements are contained in OPAVINST 5100.23G (Navy Safety and Occupational Health Program Manual [CH-1 of 21 Jul 2011], Chapter 8 – Occupational Health), and DODI 6055.05 (Occupational and Environmental Health [OEH] of November 11, 2008).

### Documents Reviewed

- 2009 Medical Inspector General Inspection Report of Naval Hospital Beaufort
- 2012 Medical Inspector General Inspection Report of Naval Hospital Beaufort
- 2015 Medical Inspector General Inspection Report of Naval Hospital Beaufort
- 2006 Medical Safety and Occupational Health Safety (MEDOSH) Report Safety – Hazard Abatement Program Plan
- 2009 Safety and Occupational Health Medical Evaluation (SOHME)
- 2012 Safety and Occupational Health Medical Evaluation (SOHME)
- 2014 Safety and Occupational Health Medical Evaluation (SOHME)
- Telephone conversations and emails with LCDR Sequin, Head of Occupational Medicine at NH Beaufort
- Telephone conversations and emails with LCDR Dean, Head of Industrial Hygiene at NH Beaufort
- Telephone discussions with Suzanne Gregor, Navy Medicine East Industrial Hygiene Program Manager
- 1998 Combat Service Support Detachment 23 Survey
- 2004 Periodic Industrial Hygiene Survey of VFA 82
- 2005 Periodic Industrial Hygiene Survey of VMFA (AW) 332
- 2010 Periodic Industrial Hygiene Survey of Naval Air Technical Data and Engineering Service Command
- 2010 Periodic Industrial Hygiene Survey of VFA 86

- 2012 Baseline Industrial Hygiene Survey of Naval Air Warfare Center Weapons Division Detachment
- 2012 Baseline Industrial Hygiene Survey of Tactical Training Range Detachment
- 2013 Baseline Industrial Hygiene Survey of Headquarters and Service Battalion Non-Industrial Work Centers Parris Island (PI)
- 2013 Baseline Industrial Hygiene Survey of Resident Officer in Charge of Construction
- 2015 Periodic Industrial Hygiene Survey of Facilities and Maintenance Division machine/plumbing/sheet metal shop PI
- 2015 Periodic Industrial Hygiene Survey of Facilities Engineering and acquisition Division PI
- 2015 Periodic Industrial Hygiene Survey of Facilities Engineering and Acquisition Division Beaufort
- 2015 Periodic Industrial Hygiene Survey of VMFA 224
- 2015 Periodic Industrial Hygiene Survey of VMFA 122
- 2015 Periodic Industrial Hygiene Survey of VMFA 115
- 2015 Periodic Industrial Hygiene Survey of VMFA 533
- 2015 Periodic Industrial Hygiene Survey of Naval Criminal Investigative Service Resident Agency PI
- 2015 Periodic Industrial Hygiene Survey of Recruit Training Regiment PI
- 2015 Periodic Industrial Hygiene Survey of Weapons and Field Training Battalion PI
- 2016 Periodic Industrial Hygiene Survey of Defense Commissary Agency
- 2016 Periodic Industrial Hygiene Survey of Combat Logistics Company 23
- 2016 Periodic Industrial Hygiene Survey of Fleet Readiness Center East Detachment
- 2016 Periodic Industrial Hygiene Survey of Marine Air Control Squadron Two
- 2016 Periodic Industrial Hygiene Survey of Marine Aviation Logistics Squadron 31 (Category 1 and 3 shops)
- 2016 Periodic Industrial Hygiene Survey of Marine Aircraft Group 31
- 2016 Periodic Industrial Hygiene Survey of Aircraft Rescue and Firefighting, Pistol Range and Structural Fire and Rescue Division
- 2016 Periodic Industrial Hygiene Survey of Tactical Training Range Detachment
- 2016 Periodic Industrial Hygiene Survey of VMFA 251
- 2016 Periodic Industrial Hygiene Survey of VMFA 312
- 2016 Periodic Industrial Hygiene Survey of Marine Fighter Attack Training Squadron 501
- 2016 Periodic Industrial Hygiene Survey of 6th Marine Corps District

- 2016 Periodic Industrial Hygiene Survey of Facilities and Maintenance Department (Category 1 and 2 shops)
- 2016 Periodic Industrial Hygiene Survey of Religious Ministries
- 2016 Periodic Industrial Hygiene Survey of Marine Wing Support Squadron 273
- 2017 Epidemiologic Investigation of Pediatric Cancers Associated with Marine Corps Air Station Beaufort, SC and Marine Corps Recruit Depot, Parris Island, SC by NMCPHC
- Safety Data Sheet, Exxon Mobile JP-5 NATO F-44 19 Nov 2015
- Safety Data Sheet, ECO-SURE Industrial Enamel Aerosol Paint, 11 Jun 2014
- https://www.epa.gov/gasoline-standards/gasoline-mobile-source-air-toxics
- https://monographs.iarc.fr/ENG/Monographs/vol45/mono45-10.pdf
- Defense Occupational and Environmental Health Registry System – Industrial Hygiene (DOEHRS-IH) personnel exposure sampling results 2008-2017
- 2006 Medical Occupational Safety and Health Program Review of Naval Hospital Beaufort
- 2009 Medical Inspector General Inspection Report of Naval Hospital Beaufort
- 2012 Medical Inspector General Inspection Report of Naval Hospital Beaufort
- 2015 Medical Inspector General Inspection Report of Naval Hospital Beaufort
- 2009 Navy Medicine East Safety and Occupational Health Medical Evaluation of Naval Hospital Beaufort
- 2012 Navy Medicine East Safety and Occupational Health Medical Evaluation of Naval Hospital Beaufort
- 2014 Navy Medicine East Safety and Occupational Health Medical Evaluation of Naval Hospital Beaufort
- Exposure Monitoring Plan Completion Rates, Industrial Hygiene Program Office,
- Beaufort, SC

## Findings

Inspections and evaluations of the IH program administered by NH Beaufort from 2006 to 2014 received either a satisfactory or commendable rating from the Navy Inspector General (IG) Inspection Team and Navy Medicine East Safety and Occupational Health Inspection Team. Previously identified staffing shortages in the IH Program have been resolved so the conduct of IH surveys and exposure assessments can be expeditiously completed. As required by OPNAVINST 5100.23G and DODI 6055.05, each workplace is to receive an initial occupational exposure assessment (baseline IH survey), and receive periodic re-assessments (periodic IH Survey). Per OPNAVINST 5100.23G and the Industrial Hygiene Field Operations Manual (IHFOM - May 2017, NEHC Technical Manual, NEHC- TM6290.91-2) , periodic IH surveys are to be conducted annually, biennially, or every four years depending on the hazard category of the

work center (e.g., Category I, II, or III). In each survey, the IH is to identify and include all known carcinogens and reproductive hazards. Employee enrollment into medical surveillance programs is determined by IH sampling results and/or professional IH recommendations that are contained in the activity IH survey report.

Upon review of the Naval Hospital Beaufort IH surveys, a number of carcinogens and reproductive hazards were identified with processes in the workplace. However, benzene was the only potential environmental risk factor that matched one of the types of cancer (i.e., Acute Myelogenous Leukemia) identified in the NMCPHC Epidemiological Investigation (see Section 2) of pediatric cancers associated with LBMH, MCAS Beaufort, and MCRD Parris Island. Benzene is classified as a known human carcinogen (e.g., AML) by OSHA and the US EPA. Benzene is also classified as a Reproductive/Developmental Hazard by the Navy (Technical Manual NMCPHC-TM-OEM 6260.01C April 2010, Reproductive and Developmental Hazards: A Guide for Occupational Health Professionals).

Benzene was listed as a potential hazard for shops and processes that included aircraft, flight line operations (fueling/defueling), fuel cell maintenance, fuel lab–fuel testing, aircraft corrosion control (sanding/spray painting), emergency rescue and recovery operations, and vehicle maintenance. Sampling results of personnel performing flight line aircraft fueling and defueling operations (VMFAT 501, MWSD-31, MCAS Fuels Station), fuel lab, aircraft corrosion control and vehicle maintenance indicate employee exposures were “acceptable” and below the OSHA 8-hour time-weighted average (TWA) Permissible Exposure Level (PEL), and ACGIH Threshold Limit Value (TLV). Records of these results were posted to each employee's occupational health record in accordance with DODINST 6055.05 and NAVMC Directive 5100.8 (Marine Corps Occupational Safety and Health (OSH) Program Manual – 15 May 2006).

### Existing Data Gaps

No Navy IH programmatic data gaps were identified based upon review of documents, discussions with the NH Beaufort Head IH, and discussion with Navy Medicine East SOHME Inspection Team members.

### Recommendations

Navy Medicine East Industrial Hygiene Program Manager should continue to coordinate with NH Beaufort IH services to:

- Continue to perform exposure monitoring and sampling where indicated to up-date exposure assessments in the workplace.
- Assess exposure results and document rationale for exposure judgement.
- Continue to evaluate workplaces for hazards, including reproductive hazards, and continue to function in accordance with the guidance mentioned above.

# Section 4: Environmental Programs

## Environmental Restoration Program

The United States Navy's Environmental Restoration Program (ER Program) began in the early 1980's after DoD adopted revisions of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA as a model for environmental cleanups by military components). The ER Program is organized into three programs:

1. Installation Restoration Program (IRP) which addresses releases of hazardous substances, pollutants, or contaminants that pose toxicological risks to human health or the environment,
2. Munitions Response Program which addresses environmental health and safety hazards from unexploded ordnance (UXO), discarded military munitions, and munitions constituents (excluding operational ranges), and
3. Building Demolition/Debris Removal Program which addresses removal of unsafe buildings or structures.

The purpose of the IRP is to identify, investigate, and cleanup or control releases of hazardous substances, pollutants, and contaminants from waste disposal operations at Navy commands. Policies and requirements for this program are documented in the Navy's Environmental Readiness Program Manual, Chapter 42 - Environmental Restoration (OPNAV M-5090.1D 2014). A review of available documentation from the ER Program, Drinking Water Program, SC DHEC, NAVRAMP, Indoor Air Quality reports, and Lead-Based Paint and Asbestos reports was performed and the findings are presented in the following sections.

As part of the PHR, a review of all available documents pertaining to each site within the following four areas was performed:

- LBMH
- MCRD Parris Island[4]
- MCAS Beaufort
- Naval Hospital Beaufort Housing

The purpose of this PHR is to respond to the pediatric cancer concerns as expressed to MCAS Beaufort by stakeholders through meetings and as provided on the website "Concerned Military Family United By Pediatric Cancer Beaufort SC."

[4] Including Site 45, which is located on MCRD Parris Island.

NMCPHC reviewed environmental documents from sites that represent past and/or present potentially-contaminated or regulated areas of concern (AOCs), solid waste management units (SWMUs), USTs, or general areas of concern at LBMH, MCAS Beaufort, MCRD Parris Island and NH Beaufort Housing. The documents associated with each area that were reviewed for this report were provided by MCRD Parris Island, MCAS Beaufort, the Naval Installation Restoration Information Solution (NIRIS) web-based system and/or the NAVFAC. This section presents an overview of each area, key documents reviewed, the approach used to evaluate the documents and categorize the potential impact of sites, and the findings based on information identified in the documents. NMCPHC conducted an on-site reconnaissance at LBMH, MCAS Beaufort, MCRD Parris Island and NH Beaufort Housing in March 2017.

## Method for Evaluating Sites

Due to the volume of studies and reports generated over time at MCRD Parris Island and MCAS Beaufort, a process was developed to categorize[5] sites based on the extent to which people could be expected to come in contact with contaminants at each of the sites. This process relied on qualitatively assessing potential human exposures based on compiled and reviewed site information. NMCPHC conducted an on-site reconnaissance at LBMH, MCAS Beaufort, and MCRD Parris Island in March 2017. Sites were placed into one of three categories which were defined as:

1. **Local impact** – This category was assigned to sites with potential exposures for a limited number of people who have access to the sites or to the immediate area next to the sites where the contaminants are contained. Exposures are expected to only occur as a result of direct contact with on-site contamination. Sites identified as no further action (NFA) were automatically placed in this category.
2. **Regional impact** – This category was assigned to sites with potential exposures to people as a result of off-site migration of contamination. This category includes potential exposures for people who do not have direct access to the site, as well as those that do. For the purpose of this assessment, sites considered regional impacts are more likely to be a potential hazard to public health as they could affect a larger number of people.
3. **Data gaps** – This category was assigned to sites with incomplete or insufficient data for evaluating the impact (local or regional) of site contamination, potential pathways of exposures or possible off-site migration.

[5] LBMH and NH Beaufort Housing were not evaluated using this categorization approach because these locations did not have multiple sites (e.g., CERCLA Sites, RCRA Sites) identified in these areas. USTs containing home heating oil and other typical household COPCs (e.g., LBP, radon) were evaluated in these areas.

Any site identified as NFA in a document was assumed to present a low impact for human health and was placed into the local impact category. The rationale for this determination was that sites identified as NFA were assumed to have been evaluated and determined to be cleaned up or to be associated with minimal contamination. Additionally, sites determined to have data gaps were assumed to present a low risk to human health and were assigned to the local impact category. The rationale for this determination was that a documented release would have most likely triggered an evaluation and/or subsequent report from the installation or oversight agency (e.g., SC DHEC and US EPA). All other sites (i.e., those not placed in the local impact category) were evaluated for proximity to residents, the likelihood of off-site migration of contamination, and possible exposure pathways to determine classification as a local or regional impact.

A table was created to present the findings for each of the areas evaluated at MCAS Beaufort and MCRD Parris Island (see Table 1 and Table 2). Each of the areas contain individual sites (see Figures 3 through 7). The individual site name, site description, current status or recommended actions, impact classification, COCs or COPCs, and the primary source documents used in the evaluation are presented in Table 1 and Table 2.

## Laurel Bay Military Housing



### Background Information

LBMH is located 3.5 miles due west of MCAS Beaufort, 11.5 miles from MCRD Parris Island, and primarily houses military personnel with families stationed at MCAS Beaufort, MCRD Parris Island, and NH Beaufort. LBMH includes approximately 1,300 single-family military housing units and covers approximately 1,100 acres. The housing area is bordered on the west by salt marshes and the Broad River, and to the north, east and south by uplands. Forested areas lie along the northern and northeastern borders. LBMH serves as one of the primary housing areas for nearby MCAS Beaufort.

The Military Housing Office (MHO) assists service members and families to find family housing. On-base housing at MCAS Beaufort is PPV housing. The Tri-Command area is managed by Atlantic Marine Corps Communities (AMCC) and serves LBMH, MCAS Beaufort, MCRD Parris Island, and Naval Hospital Beaufort Housing. The partnership between MCAS Beaufort and AMCC Tri-Command provides housing for active-duty service members, families, active-duty bachelors (i.e., roommates and geographic bachelors), DoD civilians and military retirees assigned to MCAS Beaufort, MCRD Parris Island, and the NH Beaufort. In addition to the LBMH, the DODEA operates three schools in this area including Charles F. Bolden Elementary/Middle School (Bolden; grades 3 – 8), Elliott Elementary School (grades Pre K – 2), and Robert E. Galer Elementary School (Galer; grades Pre K – 2). School information can be found at: http://www.dodea.edu/Americas/southeast/laurelBay/laurelBayCommunity.cfm.

USTs were used in the past at 1,100 LBMH housing units to store home heating oil that was used to heat the homes. The USTs were removed from service in the mid-1980s in favor of natural gas/geothermal heating systems and UST removal has occurred since 2000. The USTs leaked at some residences, releasing petroleum-related constituents into the soil and groundwater. As petroleum constituents are potentially of concern for VI, VI investigations at LBMH have occurred since approximately 2013. Other investigation efforts at LBMH have focused on historical pesticide applications, indoor air quality in homes and schools, groundwater quality, and hazardous building materials. There are no RCRA or CERCLA (Superfund) sites in LBMH although three off-base, private Superfund sites are located within a three mile radius of LBMH. The Superfund sites include Independent Nail Co.[6], Kalama Specialty Chemicals,[7] and Wamchem, Inc.[8] The Superfund program website was reviewed and US EPA has determined that the three sites are protective of human health and the environment. Each site has been enrolled in a five-year long-term monitoring plan and currently does not pose a threat to LBMH.

## Documents Reviewed

A total of 275 documents were reviewed for LBMH. The dates of the documents ranged from 1992 to 2017 and included documents from Navy contractors, South Carolina Department of Health and Environmental Control (SC DHEC), NAVFAC, United States Marine Corps (USMC), and DoD. The documents included Environmental Site Assessments (ESAs), sampling and well installation work plans, technical memos, UST assessments, closure and NFA reports, groundwater monitoring reports, indoor air quality evaluations, risk assessments, and correspondence with SC DHEC. Nineteen of the 275 documents reviewed were key documents associated with the LBMH ER review and include:

[6] http://cumulis.US EPA.gov/supercpad/cursites/dsp_ssppSiteData1.cfm?id=0403262#What
[7] http://cumulis.US EPA.gov/supercpad/cursites/dsp_ssppSiteData1.cfm?id=0403343#Status
[8] http://cumulis.US EPA.gov/supercpad/cursites/dsp_ssppSiteData1.cfm?id=0403275#What

- Final Phase 1 Environmental Site Assessment Laurel Bay MCAS Beaufort SC (URS Corporation 2002)
- South Carolina Department of Health And Environmental Control Laurel Bay Housing Unit Underground Storage Tank Closure Report Letters (Combined) MCAS Beaufort SC (SC DHEC 2009)
- Laurel Bay Schools Phase 1/Phase 2 Indoor Air Quality Environmental Evaluation Galer and Bolden Elementary Schools Beaufort MCAS, Beaufort, SC (Reynolds, Smith, and Hills, Inc. 2010).
- Report of Findings for Laurel Bay Military Housing Investigation of Potential Impacts to Groundwater from Former underground Heating Oil Storage Tanks MCAS Beaufort SC (Tetra Tech 2010b)
- Indoor Air Quality Assessment, Building Envelope Evaluation and HVAC Evaluation Report, 533 Laurel Bay Boulevard, MCAS Beaufort, SC (Terracon Consultants 2012a)
- DRAFT Indoor Air Quality Assessment, Building Envelope Evaluation and HVAC Evaluation Report, 550 Dahlia Drive, MCAS Beaufort, SC (Terracon Consultants 2012b)
- DRAFT Indoor Air Quality Assessment, Building Envelope Evaluation and HVAC Evaluation Report, 761 Althea Street, MCAS Beaufort, SC (Terracon Consultants 2012c)
- DRAFT Indoor Air Quality Assessment, Building Envelope Evaluation and HVAC Evaluation Report, 839 Azalea Drive, MCAS Beaufort, SC (Terracon Consultants 2012d)
- DRAFT Indoor Air Quality Assessment, Building Envelope Evaluation and HVAC Evaluation Report, 1019 Foxglove Street, MCAS Beaufort, SC (Terracon Consultants 2012e)
- DRAFT Indoor Air Quality Assessment, Building Envelope Evaluation and HVAC Evaluation Report, 920 Barracuda Drive, MCAS Beaufort, SC (Terracon Consultants 2012f)
- Elliott Elementary School 2013 AHERA Asbestos Management Plan (Alpha Facilities Solutions, LLC 2013)
- Preliminary Vapor Intrusion Evaluation Based on July/August 2013 Groundwater Results, Technical Memorandum (Resolution Consultants 2014a)
- DRAFT Final Quality Assurance Project Plan Addendum for Long Term Monitoring at Underground Storage Tank 6 MCAS Beaufort SC, Draft Acting as Final (Resolution Consultants 2014b)
- Transmittal Form and attached Final Uniform Federal Policy Sampling and Analysis Plan for Soil Media Laurel Bay Military housing Area MCAS Beaufort SC (Resolution Consultants 2014c)
- Soil Gas Sampling Results – October 2014 Laurel Bay Military Housing, MCAS Beaufort, Technical Memorandum (Resolution Consultants 2015a)

- Soil Gas Sampling Results 388 Acorn Drive, Technical Memorandum (Resolution Consultants 2015b)
- Limited Site Investigation Laurel Bay 42 Dove and Cardinal Lanes Beaufort, Beaufort County, SC (Terracon Consultants 2015b)
- Final Screening-Level, Human-Health, Risk Assessment, Letter Report of Chlorinated pesticides in Soil for Laurel Bay Military Housing, Marine Corps Air Station Beaufort, Beaufort, SC (Terracon Consultants 2015a)
- Memorandum, Summary Multi-Media Investigations Laurel Bay Military Housing, MCAS Beaufort (Resolution Consultants 2017)

## Findings

In the 1980s, the LBMH homes were converted to natural gas and, as was accepted practice, the USTs were decommissioned (e.g., the residual contents of the tanks were removed and the tanks were filled with sand). Prior to 2004, tanks were removed by MCAS Beaufort when they were encountered during utility work. In 2004, the PPV partner that manages the LBMH area started a project to demolish and rebuild 10 homes. The PPV and MCAS Beaufort removed tanks at these locations so they would not interfere with the demolition/construction work. In 2006, the PPV started a home renovation project and removed tanks that would interfere with the renovation work. These historical tank removals indicated that some of the tanks had leaked, therefore; in 2007, USMC began the process of removing the remaining tanks as an environmental stewardship project.

Because there are no regulations governing home heating oil UST removal procedures, MCAS Beaufort coordinated with SC DHEC to develop removal procedures that were consistent with procedural requirements for regulated tanks (e.g., gas station tanks).[9] Consequently, a step-wise, multi-media investigation/removal process was developed and is presented on Flowchart 2 and Figure 9 along with the status of the residential properties evaluated at each step.

Soil sampling was conducted after the tanks were removed. The determination to sample additional media (e.g., groundwater, soil gas) was based on the results of soil sampling and SC

[9] In 1984, Congress directed the US EPA to develop regulations for USTs. The US EPA issued federal regulations, effective December 1988, which delegated UST regulatory authority to approved state programs. Home heating oil tanks, where the oil contents are consumed on the premises where they are stored, are exempt from federal (e.g., US EPA) UST regulations (e.g., planning, compliance, permitting, enforcement, and remediation [https://www.epa.gov/ust/revising-underground-storage-tank-regulations-revisions-existing-requirements-and-new, last updated 24 July 2017]). USTs used for home heating are exempt from state regulatory agencies in South Carolina, as well, and can remain in place (SC DHEC Undated). However, if a decision is made to remove a home heating oil tank and contamination (pollution) of soil is suspected based on visual observation, South Carolina Code of Laws (Title 48 Environmental Protection and Conservation) requires these findings to be reported and soil sampling be conducted (S.C. Code Ann. § 48).

DHEC's review and approval. All tank removals, and follow-on actions (e.g., groundwater and soil gas sampling), have been conducted with SC DHEC guidance, oversight, and approval.

### *Soil and Groundwater*

There were 1,100 homes in LBMH that historically used home heating oil. To date, MCAS Beaufort has identified and removed 1,252 known tanks at LBMH. Soil samples were collected from each of 1,252 UST removal locations (only 1,063 properties were sampled for soil because USTs were not found at 37 properties) and analyzed for the petroleum-related COCs identified by SC DHEC. Soil sampling results were compared to SC DHEC screening levels and a report was provided to SC DHEC to determine if further action was necessary (e.g., ground water monitoring) or if NFA was necessary at each residence. Four hundred and twenty-seven (427) properties had soil concentrations that exceeded SC DHEC criteria and, therefore, SC DHEC required a subsequent groundwater investigation. NFA was required at 636 properties because the soil concentrations did not exceed SC DEHC criteria (see Flowchart 2 and Figure 9). Investigations performed at the 37 additional residential properties indicated that the former tanks at these locations have also been removed.

Groundwater is not used as a drinking water source for LBMH; therefore, exposure to contaminants in groundwater via drinking water is not a complete exposure pathway. Drinking water for LBMH is treated and delivered by BJWSA. It consistently meets or surpasses all water quality standards and inspections from both the US EPA and the SC DHEC. The BJWSA has treated and supplied the drinking water to LBMH, MCAS Beaufort, and MCRD Parris Island since 1965. BJWSA has owned, operated, and maintained the LBMH, MCAS Beaufort, and MCRD Parris Island water and wastewater systems since 2008.

At this time, initial groundwater assessments (IGWAs) have been completed at the 427 residential properties with soil concentrations that exceeded SC DHEC criteria. Of the 427 properties where IGWAs have been completed, 96 were determined to require additional investigation by SC DHEC (see Flowchart 2 and Figure 9). NFA was required by SC DHEC at 331 properties because the groundwater concentrations did not exceed SC DHEC criteria (see Flowchart 2 and Figure 9). In addition, soil sampling (and potentially IGWAs) is currently being planned for the 37 properties where MCAS Beaufort does not have documentation of the UST removal. Therefore, the number of properties requiring further action from this step may increase (i.e., more than 96 properties may require additional investigation).

In accordance with the process approved by SC DHEC, additional groundwater investigations begin with the installation of a single permanent monitoring well to confirm the results of the IGWA. To date, permanent monitoring wells have been installed at 67 of the 96 LBMH properties. Of the 67 properties where groundwater monitoring has been completed, 27 were determined to require additional investigation via soil gas/indoor air sampling (see Flowchart 2 and Figure 9). NFA was required at 23 of the properties because the groundwater

concentrations did not exceed SC DHEC criteria. Twenty nine (29) of the 96 properties requiring additional groundwater investigation are pending installation of permanent monitoring wells. After the monitoring wells have been installed and sampled, these locations will be evaluated using SCHDHEC criteria to determine if further action is necessary. Seventeen (17) of the 96 properties are waiting for an NFA determination by SC DHEC.

### *Soil Gas/VI Summary*

At home (LBMH), in addition to typical background concentrations of VOCs (including benzene), LBMH residents could potentially be exposed to VOCs infiltrating to indoor air from subsurface soils and groundwater contaminated with home heating oil (benzene typically comprises 0.1 to 1.0% of home heating oil).

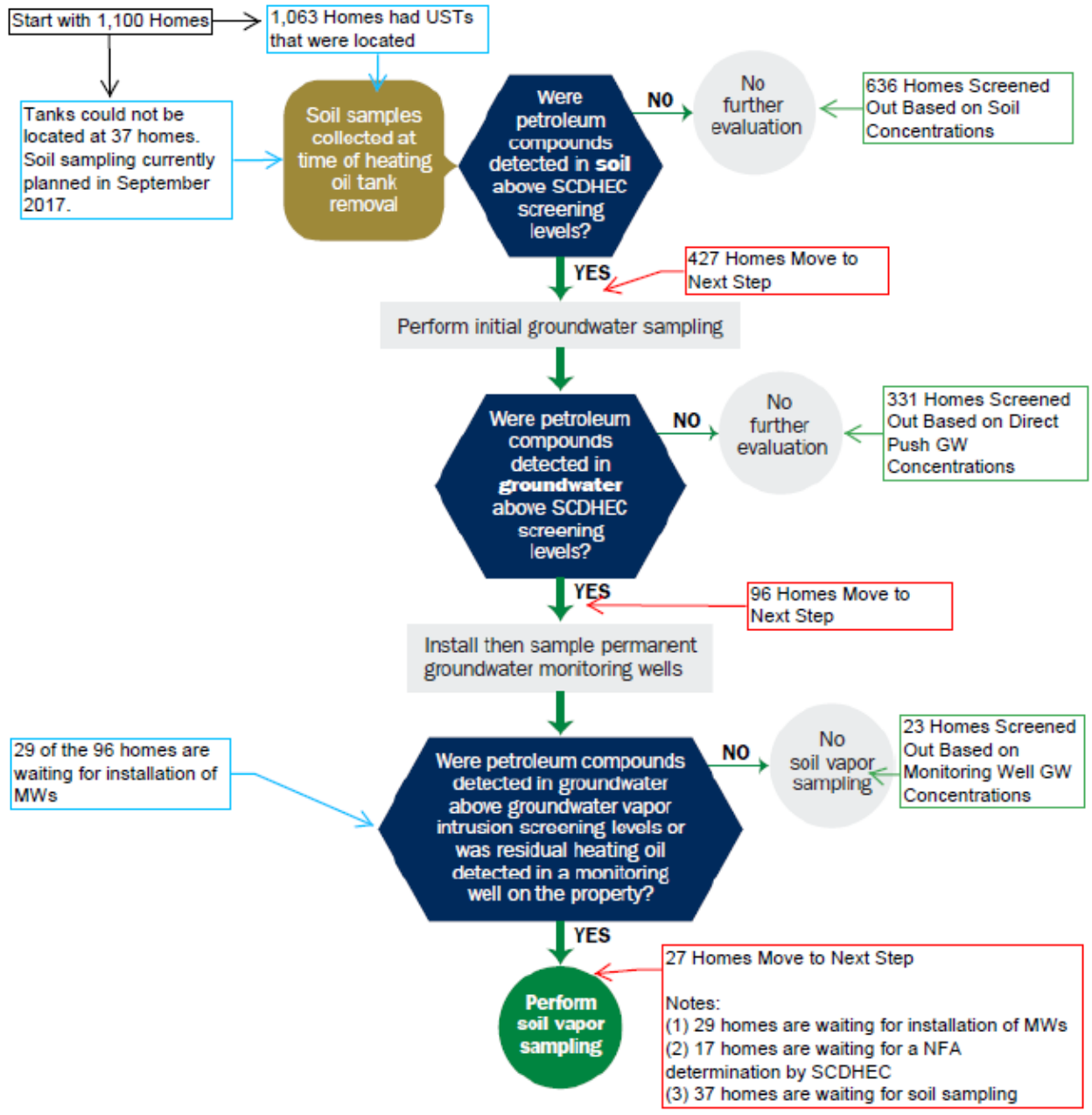
Four, separate VI investigations have been conducted at LBMH since 2013 (Resolution Consultants 2017). The VI investigations at LBMH have been an ongoing/evolving process and the potential for VI to occur is being assessed by sequential screening of soil, groundwater, soil gas and/or indoor air at affected properties. The four, separate VI investigations are summarized below:

1. In 2013, the first VI investigation at LBMH was performed at 388 Acorn Drive after discovery of free product (home heating oil) in the source monitoring well for this property.
2. In 2015, VI investigations began with an evaluation of the potential risk associated with construction of new homes on top of 48 former UST locations in planned demolition and construction areas.
3. In 2016, a scope of work (SOW) was developed to conduct VI investigations at 34 properties where it was discovered that an add-on structure (garage, porch, shed or home addition) had been historically constructed on top of the suspected former UST locations.
4. In 2017, a SOW was developed to investigate VI at 26 locations where groundwater concentrations exceeded either the site-specific, groundwater-to-vapor screening levels or where free product was present in groundwater.

To date, VI investigations have been performed at 13 of 14 properties where free product was observed. The analytical results for all 13 of those properties are less than the VI Screening Levels (VISLs) for all COCs. However, 11 of those 13 properties are pending the MCAS Beaufort partnering team's review and decision as to whether to conduct further sampling or classify as NFA. The partnering team includes SC DHEC, MCAS Beaufort, NAVFAC and NAVFAC contract staff. Additional VI investigations will be planned and completed based on the results of the additional groundwater assessments.

The investigation to address potential health concerns related to home heating oil USTs is ongoing. The SC DHEC has been, and continues to be involved in the review and approval of

data provided on the approximately 1,100 LBMH residences with historical use of heating oil used in former USTs. While the VI investigation is continuing, the results of UST tank removal and subsequent investigations (soil, groundwater and VI) to-date, and oversight by the SC DHEC for each step of the process, indicate that exposure to indoor air concentrations of the constituents of home heating oil (e.g., benzene), is not a pathway of concern for residents at the properties in LBMH.




*Flowchart 2: Multimedia Selection Process for LBMH*

### *Pesticides*

In 2014, sections of the LBMH were demolished in preparation for new construction. Terracon Consultants evaluated soil for chlorinated pesticides in 2014. Soil samples were analyzed for chlordane; heptachlor; 4,4'-DDT; 4,4'-DDD; and 4,4'-DDE. Chlorinated pesticides were historically applied to manage pests in the LBMH area. Eight of 42 former building pads and four Open Areas not targeted for development were sampled. Three hundred and sixty soil borings were collected from 30 randomly selected locations in the target areas at different interval depths. Heptachlor and chlordane were identified as the only pesticides detected above the Regional Screening level (RSL) at the former building pads. Chlordane was found more widespread than heptachlor. An exceedance of the RSL for heptachlor or chlordane did not occur at every sample location in the building pads. The Open Areas were not impacted by any of the pesticides.

A standard US EPA 30-year residential exposure scenario was used to calculate the risk from pesticide exposure. The cumulative cancer risk (based on chlordane and heptachlor) for a 30-year residential exposure was $9 \times 10^{-6}$ and for a 3-year residential exposure (average tour) was $9 \times 10^{-7}$. Terracon Consultants did not calculate a 6-year residential exposure but generally concluded that a six year residency would not be of concern based on the 3-year residential exposure risk. Consequently, additional pesticide sampling or assessment of risks from former pesticide application is not necessary (Terracon Consultants 2015a). The SC DHEC concluded that the risk analysis used a conservative method to calculate risk level and the level of risk is appropriate for unrestricted use of the site. For additional information regarding pesticides, see Section 3 – Public Health Review Evaluation – Pest Control Management.

### *Indoor Air*

Indoor air quality, the building envelope, and the heating, ventilation, and air condition systems (HVAC) were evaluated for six residences by Terracon Consultants in 2012. The evaluation occurred in accordance with guidelines established by the American Industrial Hygiene Association (AIHA) and the US EPA. The project included: visual assessment; measurements of temperature; relative humidity (RH), carbon dioxide ($CO^2$), and carbon monoxide (CO); surface moisture measurements and thermal imaging; surface swab sampling for mold spores; air sampling for mold spores; radon testing;[10] VOC screening; VOC and mold VOC testing; formaldehyde testing; evaluation of the condition of the HVAC system and existing controls; and a building envelope evaluation.

Radon testing was conducted in each of the six residences and all sample results were below the EPA recommended action level of 4.0 pCi/L. Based on this information, these sites are considered to have low potential for elevated indoor concentrations of radon gas.

[10] Radon will be addressed more thoroughly in a later section of the PHR Evaluation.

Mold was evaluated and detected in all six residences. The cause of mold in the residences was poor home upkeep (damaged roofs, broken seals, and water damage), regional humidity, and sporadic use of the HVAC system. The mold total VOC (TVOC) concentrations ranged from marginal to acceptable for indoor air. A regulatory standard specifying the maximum allowable concentration of mold spores in homes has not been established. The presence of mold in LBMH is not unique and is consistent with mold growth in environmentally humid areas. Mold can be safely addressed by cleaning the HVAC system, using high quality air filters that capture mold spores, and maintaining proper building maintenance and indoor hygiene.

Indoor air quality results were also affected by the lifestyle choices of the resident. For example, the interior of 1019 Foxglove Street was recently painted and cleaned. Due to the recent painting, the property had elevated TVOC concentrations (Terracon Consultants 2012e). The properties at 920 Barracuda Street and 533 Laurel Bay Boulevard were both evaluated while the resident was in the process of moving and heavy foot traffic and the packaging of boxes may have affected the results (Terracon Consultants 2012a). The three other residences were in differing states of cleanliness with poor to moderate indoor maintenance/hygiene. The properties at 761 Althea Street, 839 Azalea Drive, and 550 Dahlia Drive were occupied by smokers or contained air fresheners or incense. Residences occupied by smokers or that contained incense had higher levels of TVOCs caused by VOCs associated with personal care products, tobacco smoke and air freshening devices (Terracon Consultants 2012c). VOC concentrations at each of the properties could be adequately addressed through changes to the HVAC system. Introducing a different quantity of outside air to the interior would dilute VOC concentrations and alleviate the majority of indoor air quality concerns associated with VOCs (Terracon Consultants 2012d).

> Terracon concluded: *It is Terracon's opinion that the housekeeping practices in the home* [i.e., 533 Laurel Bay Boulevard, 550 Dahlia Drive, 761 Althea Street, 839 Azalea Drive, and 920 Barracuda Drive] *and the maintenance of the subject home play a dual role in the impact of the overall indoor air quality. Therefore, if the home is kept clean, the occupants do not smoke in the home, the occupants do not use air freshening devices in the home, the HVAC system is used properly, and the HVAC system is clean and proper filters are used, then this home should be able to be occupied in a safe and healthy manner without major actions to be taken.*

1019 Foxglove did not receive a conclusion most likely because the residence was unoccupied at the time of the review. The evaluation of the HVAC system is similar to the other residences resulting in mold being caused by dust and dirt, intermittent HVAC system use, regional humidity, and water damage to the property drywall (Terracon Consultants 2012e).

Residents of AMCC housing neighborhoods are provided the following documents for mold education, awareness, prevention and reporting procedures:

- AMCC Mold 101 – A Guide for Prevention, Identification and Procedure for Mold In Your Atlantic Marine Corps Communities Home
- Mold and Mildew Addendum February 2013

### *Other Miscellaneous Areas of Interest in LBMH*

In 2011, The US Army Corps of Engineers (USACE) retained Reynolds, Smith and Hills, Inc. (RS&H) to evaluate conditions at Galer and Bolden in response to a letter of concern from teachers who requested testing. Concerns raised by teachers identified ailments and symptoms and raised questions as to whether or not environmental exposures in the schools could be resulting in the medical issues. In response to these concerns, the DODEA Domestic Dependent Elementary and Secondary Schools (DDESS) and USACE initiated an indoor air quality environmental evaluation at the schools.

At the Galer and Bolden Elementary Schools, groundwater, potable water, and indoor air quality was assessed. Groundwater and potable water analyses did not indicate a VI source of VOCs to indoor air at the schools. Indoor air quality was evaluated for the presence of asbestos, molds and bacteria, VOCs, semi-volatile organic compounds (SVOC), polychlorinated biphenyls (PCBs) and pesticides, and environmental parameters (e.g., radon, $CO^2$, temperature, and humidity). The result of indoor air investigation suggested the need to address mold related issues, but did not indicate a VI problem at either school even though a number of VOCs were identified in indoor air.

Benzene was sampled in indoor air at Galer and Bolden. Benzene results for samples collected at Bolden were reported as not detected. Benzene results for samples collected at Galer exceeded the US EPA's conservative target indoor air 1 x 10-6 risk screening level concentration (i.e., the risk of one additional occurrence of cancer, in one million people) but were below OSHA's regulatory level in three rooms. The US EPA's target indoor air concentration used for comparison (0.31 ug/$m^3$) is based on residential exposure (24 hours a day, 7 days a week, 350 days a year for 30 years). A screening level for a student scenario at Galer would more realistically be 8 hours a day, 250 days a year (including summer school) for 3 years (Grades K – 2). If the target indoor air concentration was calculated based on this more realistic exposure frequency and duration, the resulting target 1 x 10-6 risk screening level concentration would be greater and the reported benzene indoor air sampling results would not exceed the screening level.

Elliott Elementary school had a separate sampling plan. Potable water was sampled but groundwater and asbestos samples were not collected. Potable water results were in line with the results from Galer and Bolden (RS&H 2010). Asbestos was not sampled due to the school being constructed in 2004. 40 CFR Part 763.99 determines that a school constructed after 1988 may request a waiver from sampling for Asbestos. Elliott Elementary requested a waiver from asbestos inspections with the US EPA in a letter from Joseph Guiendon to Mark Fite dated

February 14, 2007. Elliott Elementary provided a letter stating that no asbestos containing materials or lead-based paints (LBPs)/solvents were used in the construction of the building and that the building was free of the above products. Even though a waiver was requested, an asbestos sampling plan still exists for Elliott Elementary. The school was later sampled in 2013. No asbestos containing materials were identified for the facility (Alpha, LLC. 2013).

Laurel Bay Exchange Service Station: The Laurel Bay Exchange Service Station is located in the eastern section of LBMH. Gasoline leaked from a UST at the property in the 1980s. The shallow aquifer beneath the property was contaminated. The tank and surrounding sediments were excavated in 1993. Periodic groundwater sampling has been conducted at the service station since April 1993 and the results demonstrate decreasing contaminant concentrations. Groundwater at the property flows south towards a less populated area of the LBMH. Historical reports indicate that the Laurel Bay Exchange Service Station did not have an effect on surrounding properties. The Revised Corrective Action Plan in 2010 recommended monitored natural attenuation sampling as the remedial action for the property. Ten volatile organic chemicals were removed from the sampling program in 2013. Consequently, the service station is not a public health hazard to the LBMH based upon the historical level of contamination and previous cleanup activities, the direction of groundwater flow, and recent modifications to the sampling plan after 2013 (Resolution Consultants 2014b).

Potential Historical (1960s) Uncontrolled Dumping Area: During the interview process of the Phase 1 ESA, the potential for a historical dumping area was identified during interviews with public works personnel and a former resident from the 1960s. The parties proposed the existence of an area used for dumping north of Bolden contained in a 150-acre undeveloped parcel of land. None of the individuals interviewed could identify the exact location of the dumping area, or even verify that the dumping area was actually located in the subject area. The area north of Bolden was searched but trash or mounds that indicated potential dumping areas were unable to be identified. The Phase 1 ESA suggested a remote sensing evaluation to be completed using an electromagnetic terrain conductivity meter (RS&H 2010). Groundwater investigations and site reconnaissance activities at the 150-acre undeveloped parcel in 2002 and 2003 indicated that one area of concern was a natural depression and the second area of concern revealed a solid waste site for disposal of inert debris. The SC DHEC issued an opinion that the groundwater investigations and site reconnaissance activities are sufficient to conclude that no further groundwater investigation is warranted and that groundwater concentrations in the suspected dumping area are indicative of background conditions.

## *Asbestos, Lead, and Mold*

### Asbestos

Prior to 2015, asbestos was not sampled in any of the homes because the Phase I ESA performed by URS in 2002 concluded, “Due to the good condition of the ACMS within Laurel

Bay and the presence of the Asbestos Management Plan, no additional assessment is warranted for this community (URS 2002)."[11] The ground lease agreement between DoN and AMCC, specifically Exhibit K (Asbestos Management Plan [AMP]), does require AMCC to implement an AMP that is compliant with "Environmental Laws" (DoN 2003). Note that the ground lease itself is more specific and requires the PPV Partner to comply with "all Environmental laws" to "include, but not limited to, those federal, state, and local laws, ordinances, rules, regulations, and other requirements".

The AMP (Exhibit K) covers demolition, abatement, worker protection, personal protective equipment, prohibited activities, certification and regulations, safe work practices, waste disposal, maintenance, exposure assessment and monitoring, initial exposure assessments, negative exposure assessments, medical surveillance, recordkeeping, competent person requirements, regulated areas, and housekeeping.

In 2015, in anticipation for phased demolition of housing, Terracon Consultants under contract to AMCC, conducted 128 asbestos house surveys which included visual assessments, physical assessments, sample collection and sample analysis. The surveys were performed by SC DHEC licensed asbestos inspectors using protocols required by EPA 40 CFR 763 (Asbestos Hazard Emergency Response Act – AHERA) and SC DHEC Regulation 61-86.1 (Standards of Performance for Asbestos Projects).

Day to day compliance with the AMP is a responsibility of AMCC. There is no DoN direct oversight done or required by the ground lease agreement.

### Lead-Based Paint

Similar to asbestos, the ground lease agreement between DoN and AMCC, specifically Exhibit L (LBP Management Plan), does require AMCC to implement a LBP Management Plan (DoN 2003). Where demolition or renovation is likely to disturb LBP, the Lessee "shall encapsulate, abate or remove the LBP to the extent required by and in accordance with Environmental Laws and OSHA". Note that the ground lease itself is more specific and requires the PPV Partner to comply with "all Environmental laws" to "include, but not limited to, those federal, state, and local laws, ordinances, rules, regulations, and other requirements".

The LBP Management Plan (Exhibit L) covers notice of LBP in buildings, certification of workers, personal protective equipment and worker health, clearance sampling, prohibited activities, clean-up, waste disposal, and maintenance.

AMCC's environmental contractor, URS Corporation, conducted LBP sampling to the exterior of houses at select locations (124 locations at LBMH) and found some areas that were above the

[11] Asbestos was sampled in one of the six homes where the IAQ assessments were performed. An asbestos sample was collected from 839 Azalea drive at the request of the Lend Lease staff for disposal purposes only because a portion of the "popcorn-finished" ceiling in a bedroom had fallen into the room.

U.S. Department of Housing and Urban Development (HUD) Guidelines (> 1.0 mg/cm$^2$) for paint.

Abatement methods included encapsulation, enclosure, removal and demolition. One hundred eighteen residences had exterior LBP encapsulated. Of the residences that had LBP encapsulated, twenty three residences additionally had LBP enclosed. Encapsulation and enclosure occurred in 2008. During the encapsulation and enclosure process LBP was enclosed on the fascia, screen porches, carports and front window units with either metal or vinyl wrap. Six of the residences had LBP removed. Five of the residences that had LBP removed were demolished between 2003 and 2004. Note, there is no requirement to sample all homes for LBP in the ground lease. However, prior to demolition or renovation, the Lessee is required to test for LBP and if found, encapsulate, abate or remove the LBP to the extent required by environmental laws.

In compliance with federal law, as part of the check in process, residents are provided the Tri-Command Family Housing – LBP Disclosure Form "Disclosure of Information on Lead-Based Paint and/or Lead-Based Paint Hazards".

Day to day compliance with the LBP Management Plan is a responsibility of AMCC. There is no DoN direct oversight done or required by the ground lease agreement.

### Summary

The LBMH is composed of 1,300 housing units and three schools. There are no RCRA or Superfund sites in the LBMH area. Three off-base, private CERCLA sites are within a three mile radius of LBMH. The US EPA has determined that these sites do not threaten people living or working near the sites.[12] In addition, a former fuel station was identified immediately east of LBMH. Fuel from USTs at the station leaked into the soil/groundwater. The property was investigated and remediated in 1993. The investigation concluded that there was no impact to the residences proximate to the former fuel station (Resolution Consultants 2014b).

Eleven hundred (1,100) of the housing units were historically heated by home heating oil stored in USTs. In the early 2000's it was discovered that some of these tanks had leaked. Because home heating oil USTs are not regulated, MCAS Beaufort coordinated with SC DHEC to develop tank removal procedures consistent with procedural requirements for regulated tanks (e.g., gas station tanks). Consequently, a step-wise multi-media investigation/removal process was developed. Soil sampling was conducted after tanks were removed and a determination to sample additional media (e.g., groundwater, soil gas) or a determination for NFA was based on the results of soil sampling and SC DHEC guidance, oversight and approval. Groundwater is not

[12] http://cumulis.US EPA.gov/supercpad/cursites/dsp_ssppSiteData1.cfm?id=0403262#What; http://cumulis.US EPA.gov/supercpad/cursites/dsp_ssppSiteData1.cfm?id=0403343#Status; http://cumulis.US EPA.gov/supercpad/cursites/dsp_ssppSiteData1.cfm?id=0403275#What

used as a source for drinking water at LBMH. VI investigations to date have determined that VI is not a significant exposure pathway for residents at LBMH. SC DHEC has provided oversight and has concurred, to-date, with the VI investigation/results.

Building materials were sampled for mold and asbestos and it was determined homes could be safely occupied with proper residential housekeeping and maintenance. Soil samples indicate very low levels of pesticide application and SC DHEC concluded that the level of risk is appropriate for unrestricted use of the site.

Due to the extensive monitoring history within LBMH, the evaluation of risks to residents from different media, former remediation efforts at individual residences, and technical plans to accommodate additional sampling needs from future soils encountered that may be contaminated, there appears to be little risks to residents in the LBMH from former heating oil tanks, mold, pesticides, or asbestos.

## MCAS Beaufort



### Background Information

MCAS Beaufort is located approximately 25 miles west of the Atlantic Ocean near Beaufort, South Carolina, 70 miles southwest of Charleston, South Carolina, and 4 miles from downtown

Beaufort. MCAS Beaufort consists of 6,900 acres, of which 5,800 acres are located east of Highway 21 and include operational facilities and the remaining 1,100 acres are located four miles west of the MCAS Beaufort main gate and include LBMH. The mission of MCAS Beaufort is to support operations, commands, and missions for the 2nd Marine Aircraft Wing, attached II Marine Expeditionary Force units, MCRD Parris Island, and the Eastern Recruiting Region. The 700 Marines and Sailors residing on MCAS Beaufort prepare approximately 3,400 Marine personnel, squadrons, and tenant units for deployment at any given time to locations around the world.

MCAS Beaufort originally began as a Civil Aeronautics Authority airport in 1941 and was commissioned as Naval Air Station Beaufort in 1943. The Marine Corps began using the air station to support the Marine Corps Air Station Cherry Point, North Carolina in 1953 and acquired additional land in 1955 to use the base as a Master Jet Station. The base was designated a Marine Corps Air Station in 1960 and currently includes two runways for flight operations, administrative buildings, aircraft hangars, military quarters, mess halls, and maintenance, training and community facilities (Tetra Tech 2011).

### Environmental Protection

As a federal facility, MCAS Beaufort must comply with all applicable federal, state, and local environmental laws and regulations, DoD and DoN instructions, and Marine Corps orders. Awareness and training play a key role in ensuring environmental protection and compliance with these regulations. The NREAO and the Department of Safety Standards (DSS) are located on MCAS Beaufort and provide mandatory Environmental Hazardous Waste and Safety training for personnel. The commandant of the Marine Corps requires all personnel to be familiar with the installation Commanding Officer's Environmental Policy which is located here: http://www.beaufort.marines.mil/Portals/53/Commanding%20Officer's%20Enviromental%20Policy%20Statement.pdf

### Documents Reviewed

Two hundred and sixty nine (269) reports and other documents from 1985 to 2015 were reviewed including documents from Navy contractors and the SC DHEC. The documents reviewed included site assessments, characterizations, sampling reports, corrective measures studies (CMS), remedial investigations and feasibility studies (RI/FS), remedial action reports, work plans, monitoring reports, meeting minutes, and letters (see Appendix B). To the extent practicable, NMCPHC reviewed the documents to identify and collect information pertinent to the site's history, characteristics, current activities, and use.

Information for sites located near existing or previously existing MCAS Beaufort buildings was reviewed to identify potential human exposure risks and specific populations at risk (e.g., residents, recreationists, commercial/industrial workers, and construction workers). MCAS Beaufort sites, community facilities, a child development center, and existing and demolished

housing (e.g., senior officer's quarters, bachelor's quarters, and temporary lodging facilities) are presented on Figure 4. The majority of the sites are concentrated in areas where people work at MCAS Beaufort including the airfield and operational facilities (see Figure 4). Family housing units were located east of the airfield, but were demolished and all family housing for MCAS Beaufort is currently located off-base at LBMH. There is a child development center located south of the runway on Geiger Boulevard that provides day-care. The closest site to the child development center (SWMU 72) is approximately 1,200 feet away. SWMU 72 is designated as NFA[13] and was identified as the base photo lab.

A total of 269 documents were reviewed for MCAS Beaufort. Approximately 70 of the 269 documents reviewed were key documents associated with the MCAS Beaufort ER review and included a total of 141 identified sites on MCAS Beaufort (see Table 1).

### Findings

Of the 141 sites reviewed, 130 were determined to have the potential for local impacts, zero were determined to have the potential for regional impacts, and 11 were determined to have data gaps that precluded categorization of local or regional potential impacts.

Sites are listed by site name with a description of each site, the impact classification, and a short description of current site status or recommended actions (see Table 1). Most of the 130 sites categorized as having local impacts had reported contaminant releases to soil and/or groundwater. Eighty-five (85) of these sites were identified as NFA or were recommended/requested NFA, indicating contamination had been cleaned up or otherwise controlled. Of the remaining 45 local sites that did not have an NFA:

- Twenty-two sites involved fuel storage and/or spills either from UST or as part of fueling operations (e.g., associated with a gas station, fueling activities, or a pipeline).
- Six sites included past or current training areas or ranges.
- Four sites were listed as past or current landfills.
- Three sites were associated with oil/water separator operations.
- The remaining 10 sites included various maintenance, storage or disposal areas.

See Table 1 for more detailed information about each site and the rationale for the determination as to whether a site had the potential for local or regional impacts.

The remaining 11 sites not designated as having the potential for local impact were determined to have insufficient information for determining potential human exposures and were put in the data gaps category (see Table 1). These sites include:

[13] A site designated as NFA poses little to no risk to human health (or the environment) and does not require additional cleanup actions based on the present use and knowledge of the site.

- Four former firing ranges
- Two former landfills
- One disposal area
- One hazardous waste storage facility
- One former sewage treatment plant
- One former wastewater treatment plant
- One sewer outfall (currently in use)

The types of data gaps associated with these sites include sampling and analysis plans that have not yet been conducted (or reported), sites currently in use and to be investigated when closed, no documentation on the site identified during the PHR, or further delineation of sampling results required to determine whether they have the potential to pose local or regional impacts to the base population. Additional information about each of these sites is presented in the following in-the text table titled MCAS Beaufort Sites Characterized as Local Risks. No sites were determined to represent regional impacts.

Although many operations and other buildings are currently located near sites, most sites do not currently have contaminants accessible to people. Some sites had documented contaminant release to groundwater; however, groundwater is not used as drinking water at MCAS Beaufort. Drinking water on MCAS Beaufort is treated and delivered by BJWSA. It consistently meets or surpasses all water quality standards and inspections from both the US EPA and the SC DHEC. The BJWSA has treated and supplied the drinking water to LBMH, MCAS Beaufort, and MCRD Parris Island since 1965. BJWSA has owned, operated, and maintained the LBMH, MCAS Beaufort, and MCRD Parris Island water and wastewater systems since 2008.

Fishing and hunting are popular recreational activities in the area surrounding MCAS Beaufort and are allowed on-base.

**MCAS Beaufort Sites Considered To Have Local Impacts**

| Site | Description | Status or Recommended Action[14] |
|---|---|---|
| A-B Pipeline | Release of JP-5 from pipeline | Groundwater monitoring |
| AOC A | Stained concrete pad | NFA |
| AOC B | Product storage area | NFA |
| AOC C | Mop washing area, taken out of service before 1988 | Soil sampling and CMS |
| AOC D | Container storage area and associated "Drip Pan" | NFA |
| AOC E | Product storage area | NFA |

[14] This description represents the recommended actions or status identified from the most recent report available for this review. However, it is possible for a site to be under additional investigation and/or undergoing cleanup that may not have been documented in a report available at the time of this review.

| Site | Description | Status or Recommended Action[14] |
|---|---|---|
| AOC F | Product storage area | NFA |
| AOC G | Battery repair shop | NFA |
| AOC H | Product storage area | NFA |
| AOC I | Automotive parts storage area at automotive hobby shop | NFA |
| AOC J | Marine Corps exchange service station | Groundwater monitoring |
| AOC K | EOD Range (OD Unit), including training area, currently in use | Corrective action required (deferred) |
| AOC L | Air conditioner filter cleaning facility | NFA |
| AOC M | Generator | NFA |
| AOC N | Product storage area | NFA |
| AOC O | Waste disposal area | NFA |
| AOC P | Suspect Disposal area | NFA |
| Moore Street (AOC Q) | Area with petroleum odors | NFA |
| BLDG 603 | JP-5 release | NFA |
| BLDG 1040 | Gas/diesel release | NFA |
| Boresight Range | Operated 1957-1992 (approx.), presently used as a gun jam clearing area | Inactive, but not closed |
| Building 448 | Diesel spill area | NFA |
| Crash Site | JP-5 release | NFA |
| Gas chamber | Building no longer exists (Building 2090 was identified as a CBRN Gas Chamber on base), reportedly used for chemical training; circa 1945 (approx.) | Unknown |
| Nuclear, biological, chemical (NBC) training area | Training areas for use of gas masks | Unknown |
| Release 5 - Station Fuels (UST 46 & 47) | Fuel transfer line leak (repaired) | Long-term GW monitoring |
| Release 7 | Aviation gas release | NFA |
| Small Arms/Indoor Pistol Range | Operated since 1959, currently in use | Best management practices |
| SWMU 3 | Borrow pit landfill (approx. 1957 – 1958) | CMS, groundwater monitoring, and other activities |
| SWMU 4 (also UXO 2) | Southeast point disposal area (approx. 1950's - 1960's) | NFA |
| SWMU 5 | Pesticide residue pit area (operated 1956-1972 and 1972-1979) | Groundwater monitoring |
| SWMU 6 | Inert landfill seepage trenches (operated 1966- | Corrective measures study completed 2012 |

| Site | Description | Status or Recommended Action[14] |
|---|---|---|
| | 1985) | |
| SWMU 7 – UST 13 | Day tanks, jet fuel | Groundwater monitoring and recovery of LNAPL |
| SWMU 8 | Kavieng street landfill (operation 1955-1957) | Maintain soil cover, ground-water monitoring, and land use controls |
| SWMU 9 | Former lube oil pit | NFA |
| SWMU 10 | Tank bottom sludges disposal area | NFA |
| SWMU 11 | Former ground support equipment maintenance area (approx. 1950's-1985) | NFA |
| SWMU 12 | Former eastern fire training pit, with waste storage drums (approx. 1950's-1960's and 1960's-1970's) | Corrective measures study work plan completed 2012 |
| SWMU 13 | Western fire training pits | NFA |
| SWMU 14 | Inert landfill (operated 1966-1981) | Corrective measures study work plan completed 2012 |
| SWMU 15 | PCB spill area (approx. 1960's- 1970's, for two years) | NFA |
| SWMU 17 | Funa Futi road disposal area | NFA |
| SWMU 18 | Current fire training pits | Corrective action required (deferred) |
| SWMU 19 | Satellite storage tank 999 (waste liquids) | NFA |
| SWMU 20 | Satellite storage tank 1000 (waste liquids) | NFA |
| SWMU 21 | Satellite Storage Tank 1002 (waste liquids) | NFA |
| SWMU 22 | Satellite storage tank 996 (waste liquids) | NFA |
| SWMU 23 | Satellite storage tank 997 (waste liquids) | NFA |
| SWMU 24 | Satellite storage tank 998 (waste liquids) | NFA |
| SWMU 25 | Satellite storage tank 995 (waste liquids) | NFA |
| SWMU 26 | Satellite storage tank 994 (waste liquids) | NFA |
| SWMU 27 | Satellite storage tank 993 (waste liquids) | NFA |
| SWMU 28 | Satellite storage tank 992 (waste liquids) | NFA |
| SWMU 29 | Satellite storage tank 1003 (waste liquids) | NFA |
| SWMU 30 | Satellite storage tank (waste liquids) | Corrective action required (deferred) |
| SWMU 31 | Temporary hazardous waste storage | NFA |
| SWMU 32 | Temporary hazardous waste storage | NFA |
| SWMU 33 | Temporary hazardous waste storage | NFA |
| SWMU 34 | Temporary hazardous waste storage | NFA |
| SWMU 35 | Temporary hazardous waste storage | NFA |
| SWMU 36 | Temporary hazardous waste storage | NFA |

| Site | Description | Status or Recommended Action[14] |
|---|---|---|
| SWMU 37 | Temporary hazardous waste storage | NFA |
| SWMU 38 | Temporary hazardous waste storage | NFA |
| SWMU 39 | Temporary hazardous waste storage | NFA |
| SWMU 40 | Temporary hazardous waste storage | NFA |
| SWMU 41 | Temporary hazardous waste storage | NFA |
| SWMU 42 | Temporary hazardous waste storage | NFA |
| SWMU 43 | Temporary hazardous waste storage | NFA |
| SWMU 44 | Temporary hazardous waste storage | NFA |
| SWMU 45 | Temporary hazardous waste storage | NFA |
| SWMU 46 | Temporary hazardous waste storage | NFA |
| SWMU 47 | Temporary hazardous waste storage | NFA |
| SWMU 48 | Temporary hazardous waste storage | NFA |
| SWMU 49 | Temporary hazardous waste storage | NFA |
| SWMU 50 | Temporary hazardous waste storage | NFA |
| SWMU 51 | Temporary hazardous waste storage | NFA |
| SWMU 52 | Temporary hazardous waste storage | NFA |
| SWMU 53 | Steel 55-gallon drum | NFA |
| SWMU 54 | Pressurized leak detection system | NFA |
| SWMU 55 | Scrap metal waste storage area | NFA |
| SWMU 56 | Contaminated fuel storage tank | NFA |
| SWMU 57 | Mag 31 product storage area | NFA |
| SWMU 58 | Dumpster | NFA |
| SWMU 59 | Safety-Kleen machines | NFA |
| SWMU 60 | Dirty rag containers | NFA |
| SWMU 61 | Floor drains and associated sewer system | NFA |
| SWMU 62 | Waste recovery drums | NFA |
| SWMU 63 | CFR Burn Pit Oil/Water Separator, accidental fuel release, currently in use | Corrective Action Required (deferred) - Site is in Use |
| SWMU 64 | Oil/water separator | Corrective Action Required (deferred) - Site is in Use |
| SWMU 65 | Oil/water separator | Corrective Action Required (deferred) - Site is in Use |
| SWMU 66 | Oil/water separator | NFA |
| SWMU 68 | East rapid refueling pits pipeline, JP-5 release | Groundwater sampling and product recovery |
| SWMU 69 | West pits transfer pipeline, JP-5 fuel | Groundwater monitoring |

| Site | Description | Status or Recommended Action[14] |
|---|---|---|
| SWMU 70 | Operating air compressor | NFA |
| SWMU 71 | Ammo popper | NFA |
| SWMU 72 | Base Photo lab | NFA |
| SWMU 73 | Base Dental clinic | NFA |
| SWMU 74 | Hazardous waste storage tank (#979) | NFA |
| SWMU 77 | Acid neutralization pit (batteries) | NFA |
| SWMU 78 | Oil/water separator at former jet engine test cell | NFA |
| SWMU 79 | Hangar 416 (formerly associated with SWMU 63 [CFR Burn Pit Oil/Water Separator]), currently in use | Corrective action required (deferred) |
| SWMU 80 | Wash Rack 953 (formerly associated with SWMU 63 [CFR Burn Pit Oil/Water Separator]), currently in use | Corrective action required (deferred) |
| SWMU 81 | Wash Rack 959 (formerly associated with SWMU 63 [CFR Burn Pit Oil/Water Separator]) | Corrective action required (deferred) |
| SWMU 82 | Hangar 414 (aviation gas release) (formerly associated with SWMU 63 [CFR Burn Pit Oil/Water Separator]) | Corrective action required (deferred) |
| SWMU 83 | Building 843 (formerly associated with SWMU 63 [CFR Burn Pit Oil/Water Separator]) | Corrective action required (deferred) |
| SWMU 84 Site 23 | Surface debris area | NFA |
| SWMU 85 | Automotive parts debris piles | NFA |
| SWMU 86 | Delaney property automotive repair facility | NFA |
| SWMU 88 | P454 petroleum contaminated area | Corrective action required |
| SWMU 89 (UXO 1) | Surface debris area, including drums | NFA recommended |
| SWMU 90 | Hydraulic lift in Building 857 | Corrective action required |
| UST 9 | Tank farm A, fueling pier, jet fuel | Groundwater monitoring and recovery of LNAPL |
| UST 11/UST 13 | Tank farm B | Groundwater monitoring and LNAPL recovery |
| UST 11 | Tank farm C, jet fuel | Groundwater monitoring |
| UST 15 | Hangar 414, leaking jet fuel storage tanks installed circa mid-1940's | Groundwater monitoring and sulfate enhanced bioremediation injections in 2016 |
| UST 554 | Heating oil tank, installed 1993 | Active |
| UST 600 | Diesel tank, installed 1993 | Active |
| UST 629A | Gasoline UST associated with Building 629 (AOC J) | See AOC J Site |
| UST 629B | Unleaded gas UST associated with Building 629 | See AOC J Site |

| Site | Description | Status or Recommended Action[14] |
|---|---|---|
| | (AOC J) | |
| UST 629C | Unleaded gas UST associated with Building 629 (AOC J) | See AOC J Site |
| UST 770 | Gasoline tanks installed 1993; associated with Release 5 - Station Fuels Site | See Station Fuels Site |
| UST 771 | Diesel tanks installed 1993; associated with Release 5 - Station Fuels Site | See Station Fuels Site |
| UST 872 | Jet fuel tanks; associated with jet engine test cell (building 604) | NFA |
| UST 873 | Jet fuel tanks; associated with jet engine test cell (building 604) | NFA |
| UST 903 | Jet fuel tank; associated with Release 5 - Station Fuels Site | See Stations Fuel Site |
| UST 1040A | Gasoline tank, installed 1983 | NFA |
| UST 1040B | Diesel fuel tank, installed 1983 | NFA |
| UST 1269 | JP-5 (jet fuel) tank, installed 2003 | Active |
| UST 1283A | Gas tank, installed 2003 | Active |
| UST 1283B | Gas tank, installed 2003 | Active |

## MCAS Beaufort Sites Considered To Have Data Gaps

| Site | Description | Status or Recommended Action[15] |
|---|---|---|
| Former Bore Sight Range | Used circa 1945 (approx.) | This range is located proximate to the airfield and cannot be addressed at this time. It will require corrective action when the airfield is closed. |
| Former Pistol Range | Used 1945-1948 (approx.) | This range is located proximate to the airfield and cannot be addressed at this time. It will require corrective action when the airfield is closed. |
| Former Skeet Ranges | Used 1945-1948 (approx.) | This range is located proximate to the airfield and cannot be addressed at this time. It will require corrective action when the airfield is closed. |
| Skeet Range | Site is inactive | Status pending |
| SWMU 1 (part of UXO 1) | Fenced hazard area (former landfill), operated 1960-1970s | Corrective measure implementation is ongoing |
| SWMU 2 (part of UXO 1) | Lafrene road landfill, operated 1958-1965 | Corrective measure implementation is ongoing |

[15] This description represents the recommended actions or status identified from the most recent report available for this review. However, it is possible for a site to be under additional investigation and/or undergoing cleanup that may not have been documented in a report available at the time of this review.

| Site | Description | Status or Recommended Action[15] |
|---|---|---|
| SWMU 16 | Storm sewer drainage outfall, currently in use | Corrective action required (deferred) |
| SWMU 67 | Sewage treatment plant, demolished in 2011 | RFI and risk assessment recommended |
| SWMU 75 | Hazardous waste container storage facility | Corrective action required (deferred) |
| SWMU 76 | Former incinerator disposal area, operated 1942-1946 (approx.) | Confirmatory sampling |
| SWMU 87 | Former 1940's era wastewater treatment plant | Corrective action required |

## Summary

Based on the documents reviewed summarizing the nature and extent of contamination and the health protective remedial responses that have been implemented or are planned for implementation, the NMCPHC concludes that there are no apparent public health hazards as a result of contamination from past disposal and handling practices at the 130 sites characterized as having potential local impacts. Sites classified as having local impacts were identified as potentially affecting a small number of people from possible exposures on-site or immediately proximate to sites. The status or recommended actions in place for these sites include environmental monitoring, NFAs, state UST program oversight, or have already undergone cleanup or mitigation.

The 11 sites that were determined to have data gaps require further information to characterize potential exposures to be able to classify them as the potential to have local or regional impacts. Several of these sites have been recommended for further action including sampling of soil and groundwater.

It is assumed that any land use described in site documents reviewed for this assessment would remain the same in the future. Any changes in land use could affect the potential for human exposures and thus could change the potential impact category results of this review. Additionally, any further sampling or other assessment of sites with data gaps could change the impact designation assigned for those sites.

## MCRD Parris Island




### Background Information

MCRD Parris Island is located within Port Royal, South Carolina. It is approximately 2,894 acres of dry land and 3,816 acres of salt marshes, tidal ponds, and streams. MCRD is located on Parris Island and also consists of several smaller islands approximately 4 miles south of the City of Beaufort, South Carolina. About 19,000 recruits are trained at Parris Island each year. The area around Parris Island is used for commercial and recreational fishing activities; the area also serves as habitat for threatened and endangered migratory species of wildlife including the southern bald eagle, wood stork, Eskimo curlew and short-nosed sturgeon.

Parris Island has been operating as a recruit and training facility for the United States Marine Corps since 1915 and contains administrative office buildings, training facilities, recruit and family housing, building and vehicle maintenance shops, and community facilities. Currently the residents of MCRD Parris Island include active duty military personnel (approximately 600) and dependents (approximately 700). There are approximately 1,200 active duty military and approximately 500 civilian employees who work but do not live on MCRD Parris Island. The average tour of duty for the majority of military personnel is three years, with medical and dental staff remaining at Parris Island for three to four years.

The Navy has been conducting Environmental Restoration Program (ER Program) activities since 1986 and completed an Initial Assessment Study (IAS) at that time. On behalf of the United

States Environmental Protection Agency (US EPA), ATKearney conducted a Resource Conservation and Recovery Act (RCRA) Facility Assessment (RFA) of Parris Island in 1990 to identify SWMUs and other sources of environmental contamination not necessarily involving wastes (AOCs) and evaluate the potential for release of hazardous waste or hazardous constituents from the respective units and areas. As a result of environmental contamination, MCRD Parris Island was listed on the US EPA's National Priorities List (NPL) in 1994.

Additional information collected for this review included the identification of site locations relative to other buildings and existing features on MCRD Parris Island. This information was collected to identify where potential for wide-spread human exposures and potential populations at risk exist (e.g., residents, recreationists, commercial/industrial worker, and construction worker). The identified sites, lodging facilities, bachelor officer's quarters, child development center, and other existing features for MCRD Parris Island are presented on Figure 5.

The majority of the sites are concentrated in areas where people work on MCRD Parris Island. Available information indicated that there are approximately 260 housing units including Unaccompanied Housing (UH), Officer Housing (OH), and Bachelor Officer's Quarters (BOQ). The UH and BOQ are located near the Beaufort River on the eastern perimeter of MCRD Parris Island. Enlisted housing is on the Broad River. The child development center is located on Wake Boulevard and is approximately 2,500 feet from the nearest site (Site 55 – Fiber Optic Vault). Location information was not available for some sites and therefore could not be identified on the figure. A list of sites for which the locations are unknown is presented in the legend notes on Figure 5.

### Documents Reviewed

Approximately 1,000 reports and other documents from 1979 to 2015 were reviewed from Navy contractors, the US EPA, and the Agency for Toxic Substances and Disease Registry (ATSDR). This review included site assessments, characterizations, five year review reports, records of decision (RODs), corrective measure studies (CMSs), remedial investigations and feasibility studies, work plans, monitoring reports, meeting minutes, and letters. To the extent practicable, the NMCPHC reviewed documents to identify and collect information pertinent to the history and characteristics of each site on MCRD Parris Island and other general information about current activities and site use (see Table 2). Of the approximately 1,000 documents reviewed, the main documents that provided the pertinent information applicable to the 58 sites located on MCRD Parris Island include:

- Initial Assessment Study of Marine Corps Recruit Depot, Parris Island, South Carolina (Dames & Moore 1986)
- Interim RCRA Facility Assessment of United States Marine Corps (USMC), Recruit Depot, Parris Island, South Carolina (ATKearney 1990)

- Remedial Investigation Verification Step Report with Transmittal Letter (McClelland Engineers 1990)
- Public Health Assessment for MCRD Parris Island (ATSDR 1996)
- Five Year Review Report MCRD Parris Island SC (NAVFAC 2005)
- Record of Decision for Site 1 Incinerator Landfill and Site 41 Former Incinerator MCRD Parris Island SC (Tetra Tech 2006a)
- Record of Decision for Site 2 Borrow Pit Landfill and Site 15 Dirt Roads MCRD Parris Island SC (Tetra Tech 2006b)
- Five Year Review Report MCRD Parris Island SC (NAVFAC 2010)
- Site Inspection/Confirmatory Sampling Report for Site 4, Site 5, Site 7, Site 9, Site 13, Site 16, Site 27, and Site 35 MCRD Parris Island SC (Tetra Tech 2010c)
- Preliminary Assessment and Site Inspection Report for Site 14 Storm Water Outfalls MCRD Parris Island SC (Tetra Tech 2012a)
- Meredith Amick, Letter to Dan Owens and Tim Harrington Regarding Tetra Tech Preliminary Assessment and Site Investigation Report for Site 14 Storm Water Outfalls MCRD Parris Island SC (SC DHEC 2014)
- Feasibility Study Report for Site 9 Former Paint Waste Storage Area, Site 16 Pesticide Rinsate Area, Site 27 Motor Transportation Facility and Site 55 Fiber Optic Vault MCRD Parris Island SC (Tetra Tech 2014)
- Draft Five-Year Review for Operable Units 1, 3, and 5 (Resolution Consultants 2015a)

## Findings

Of the 58 sites reviewed, 45 sites were determined to have potential local impacts, seven sites were determined to have potential regional impacts, and six sites were determined to have data gaps that precluded categorization of potential impacts. In the table below, sites are listed by impact category with a short description of each site identified at MCRD Parris Island. A more detailed summary of site information including contaminants of concern, current status or recommended actions, and impact category rationale is presented on Table 2. The site locations are presented on Figure 5.

**Sites Considered To Have Potential Local Impacts**

| Site | Description | Status or Recommended Action |
|---|---|---|
| Site 1 | SWMU 1 – Incinerator Landfill | LTM ongoing |
| Site 2 | SWMU 2 – Borrow Pit Landfill | NFA |
| Site 3 | SWMU 3 – Causeway Landfill | LTM ongoing |
| Site 4 | SWMU 4 – Dredge Spoils Fire Training (Investigated with Site 13C and UXO 2) | Active Investigation |
| Site 6 | SWMU 6 – Former Automotive Hobby Shop Spill | State UST Program |

| Site | Description | Status or Recommended Action |
|---|---|---|
| | Area | |
| Site 7 | SWMU 7 – Page Field Fire Training Pit | Active Investigation |
| Site 8 | AOC A & AOC B – PCB Spill Areas | NFA |
| Site 10 | AOC C – Gasoline Spill Area Near Building 170 | State RCRA Facilities Active Investigation |
| Site 11 | SWMU 9 – Former MCX Service Station Spill Area | NFA |
| Site 12 | SWMU 10 – Jericho Island Disposal Area | LTM ongoing |
| Site 13A | SWMU 11 – Inert Disposal, Horse Island (Disposal Area A) | NFA |
| Site 13B | SWMU 12 – Inert Disposal, Elliott's Beach (Disposal Area B) | NFA |
| Site 13C | SWMU 13 – Inert Disposal Dredge Spoils Area C | Active Investigation |
| Site 14 | SWMU 14 – Storm Sewer System / Storm Sewer Outfalls | Many outfalls are NFA. Remaining outfalls are associated with CERCLA Sites where further investigation is required (e.g., Sites 45, 46, 47, and 49). |
| Site 15 | SWMU 15 – Dirt Roads (with Site 2) | NFA |
| Site 16 | SWMU 16 – Pesticide Rinsate Disposal Area | Proceeding to Proposed Plan and Pre-Remedial Design Investigation |
| Site 17 | SWMU 17 – Page Field Tanks (AS-16) (AVGAS Pipeline) | State UST Program |
| Site 18 | SWMU 18 – Page Field Tanks (AS-17) (AVGAS Pipeline) | State UST Program |
| Site 19 | SWMU AOC D – Former MCX Service Station Spill Area | NFA |
| SWMU 19 | Diesel Shop Vehicle Washing Pad | NFA |
| SWMU 20 | Power Station Oil/Water Separator | NFA |
| SWMU 22 | Motor Pool Car Wash | NFA |
| SWMU 23 | Indoor Dental Lab Satellite Accumulation Area | NFA |
| SWMU 24 | Dental Lab Satellite Accumulation Area | NFA |
| SWMU 25 | Paint Shop Satellite Accumulation Area | NFA |
| SWMU 26 | Pesticide Shop Satellite Accumulation Area | NFA |
| SWMU 28 | Power Plant Satellite Accumulation Area | State UST Program |
| SWMU 29 | Indoor Motor Pool Satellite Accumulation Area | NFA |
| SWMU 30 | Empty Drum Storage Area | NFA |
| SWMU 31 | Weapons Power Plant Satellite Accumulation Area | NFA |
| SWMU 33 | Outdoor Motor Pool Satellite Accumulation Area | NFA |
| SWMU 34 | Motor Pool Waste Oil Above Ground Storage Tank | NFA |

| Site | Description | Status or Recommended Action |
|---|---|---|
| Site 35 | SWMU 35 – Defense Reutilization and Marketing Office (DRMO) Salvage Yard | Will not be closed until MCRD Parris Island closure |
| SWMU 36 | Hazardous Waste Storage Building | State RCRA Closure Program |
| SWMU 37 | Overflow Storage Pad | NFA |
| SWMU 38 | Waste Oil UST | State UST Program |
| SWMU 40 | Sanitary Wastewater Treatment Plant | Active Investigation |
| Site 41 | SWMU 41 – Former Incinerator | Remedy protectiveness still effective, no action needed |
| SWMU 42 | Sanitary Sewer System | NFA |
| SWMU 43 | Motor Pool Waste Oil UST | State UST Program |
| SWMU 44 | Dumpsters | NFA |
| Site 51 | SWMU 51 – Daylight Infiltration Courses | NFA |
| Site 52 | SWMU 52 – Old Weapons Cleaning Areas | Preliminary Assessment Required |
| Site 53 | SWMU 53 – Debris near Causeway | Under investigation |
| Site 55 | SWMU 55 – Fiber Optic Vault | Feasibility Study Finalized in 2014 |

## Sites Considered To Have Potential Regional Impacts

| Site | Description | Status or Recommended Action[1] |
|---|---|---|
| Site 45 | Former MWR Dry Cleaning Facility | Data collected from outfall 881 as part of Site 14 outfalls PA/SI will be used in the development of a Site 45 LTM Plan, if required. |
| Site 46 | Hobby Shop | PA/SI recommended based on Site 14 outfalls (for outfalls 408, 457, 601, 608DNF, and 636B). |
| Site 47 | Old Photo Shop | PA/SI recommended based on Site 14 outfalls (for outfalls 408, 457, 601, 608DNF, and 636B). |
| Site 48 | Existing Photo Shop | PA recommended based on Site 14 outfalls PA/SI (for outfalls 106 and 592) |
| Site 49 | Defense Reutilization and Marketing Office | PA/SI recommended based on Site 14 outfalls (for outfalls 408, 457, 601, 608DNF, and 636B). |
| Site 50 | Hue City Range Waste Munitions Disposal (currently in use) | To be addressed when the firing range closes |
| Site 54 | Old Waste Water Treatment Plant | RI recommended based on Site 14 outfalls PA/SI (for outfall 555) |

**Sites Considered To Have Data Gaps**

| Site | Description | Status or Recommended Action |
|---|---|---|
| Site 5 | SWMU 5 – Former Paint Shop Disposal Area | Further investigation may be required as a result of Site 14 outfalls PA/SI (for outfall 358 which drains this site). |
| Site 9 | SWMU 8 – Paint Waste Storage Area | FS Finalized in 2014. |
| Site 21 | SWMU 21 – Weapons Power Plant Oil/Water Separator | Sampling will be conducted to provide data to advance to RI/FS |
| Site 27 | SWMU 27 – Equipment Parade Deck (New Motor T Facility) | FS Finalized in 2014. |
| Site 32 | SWMU 32 – Laundry Satellite Accumulation Area (with SWMU 45) | Requires further investigation |
| Site 39 | SWMU 39 – Electrolyte Basin | PA/SI recommended based on results of Site 14 outfalls PA/SI (for outfalls 106 and 592). |

Of the 45 sites identified to have potential local impact, many had reported contaminant releases to soil and/or groundwater. Although many operations and buildings are located near sites, most sites do not currently have contaminants accessible to people. Some sites had documented contaminant releases to groundwater; however, groundwater is not used as a drinking water source at MCRD Parris Island.

Drinking water on Parris Island is treated and delivered by BJWSA. It consistently meets or surpasses all water quality standards and inspections from both the US EPA and the SC DHEC. The BJWSA has treated and supplied the drinking water to LBMH, MCAS Beaufort, and MCRD Parris Island since 1965. BJWSA has owned, operated, and maintained the LBMH, MCAS Beaufort, and MCRD Parris Island water and wastewater systems since 2008.

Thirty-two of the 45 local impact sites were identified as NFA or recommended for NFA (indicating that contaminants have been cleaned up or otherwise controlled), or placed in the State UST Program. The remainder of the local impact sites involved fuel storage and/or spills (from USTs, fueling operations, or transformer oils), paint or pesticide wastes, salvage equipment storage, or lead-acid battery storage. Land use controls eliminating direct contact and groundwater monitoring are currently in place at many of these sites to ensure contamination does not migrate offsite.

Fishing is a popular recreational activity in the area surrounding MCRD Parris Island. Five of the local impact sites (Sites 1, 2, 3, 41, and 50) had documentation provided that identified or evaluated potential exposures associated with eating locally caught fish or shellfish impacted by contaminants. The remedy at Site 1 and Site 41 is protective of human health and the environment (Tetra Tech 2006a). An NFA record of decision is in place for Site 2 (Tetra Tech 2006b). Fish and shellfish contamination was determined to present no public health hazard

because land use controls (e.g., fishing is prohibited at Site 3). Shellfish contamination in the tidal areas near the Rifle Range has previously been evaluated in an ATSDR Public Health Assessment and was found not to be an apparent public health hazard for Site 50 (ATSDR 1996).

Seven sites were identified as having potential regional impacts (Sites 45, 46, 47, 48, 49, 50, and 54). Six of the seven regional risk sites are associated with drainage of wastes via storm water outfalls (Site 50 is the only site not associated with drainage wastes via storm water outfall). There is a facility-wide network of drainage swales, culverts, storm water pipes and related outfalls that discharge storm water runoff into surrounding streams, marshes, ponds, and rivers at MCRD Parris Island (Tetra Tech 2012a). Historically, certain wastes generated during normal industrial operations at Parris Island facilities were disposed of into the storm water system (Tetra Tech 2012a). Storm water run-off from CERCLA sites (via process area outfalls or [PAOs]) and from paved and non-paved areas that are not related to CERCLA sites at Parris Island (via non-process area outfalls [NPAOs]) are also collected in the storm water system. The majority of the storm water system was installed over fifty years ago. Much of the vitrified clay piping that makes up the storm water system is old and the integrity of the piping may be comprised in certain locations. The outfalls which discharge to the surrounding marshes and rivers exist under old and potentially compromised conditions. The large network of outfalls located throughout Parris Island minimizes the potential for accumulation of contaminants at any one location. In addition, accumulation of contaminants is disrupted by daily tidal actions and frequent severe storm events (Tetra Tech 2012a). The COPCs identified at outfalls associated with sites 46, 47, 48, 49, and 54 include metals, PCBs, PAHs and pesticides.

Site 45 consists of a groundwater plume of PCE from a spill of unknown quantity at the former MWR Dry Cleaning Facility. In June of 2008, the USGS conducted an investigation at Site 45 to determine the source, transport, and fate of groundwater contamination associated with the PCE spill. PCE contamination in groundwater was suspected of migrating into the storm water system and discharging to the marsh adjacent to Ballast Creek through outfall 881. However, PCE and other contaminants of concern typically associated with a dry cleaning spill were not detected in storm water or sediment at outfall 881 above background levels that were collected as part of the Site 14 preliminary assessment and site investigation (Tetra Tech 2012a). Instead, metals and PAHs were detected at levels exceeding human health criteria at outfall 881, likely related to general area sources. Long-term monitoring at outfall 881 has been recommended as needed for Site 45 (Resolution Consultants 2016).

Site 50 is located within the boundary of an operational firing range (Hue City Range) that is not expected to be evaluated for environmental impacts until after it closes. Operational ranges are addressed in the Marine Corp's Range Vulnerability Assessment Program (REVA). The Military Munitions Rule provides the framework for the REVA. This site was categorized as a regional impact due to potential exposures among people who use this range and possible

accumulation and migration of metals from on-site sources (e.g., lead shot). A previous assessment of metals in an adjoining marsh area and in shellfish did not identify any potential human health concerns (ATSDR 1996).

The remaining six sites (5, 9, 21, 27, 32, and 39) were identified as having data gaps that require further information to characterize, as possible, local or regional impacts. The status and/or recommended actions for these sites include additional sampling, further investigation or proceeding to a feasibility study (FS). Site 5 was determined to be a data gap because the source material needs to be identified to determine the impacts to the soil and groundwater that may migrate and impact sediment along the shoreline (Tetra Tech 2012a). Site 9 was identified as a data gap because pesticide impacts to groundwater need to be determined (Tetra Tech 2014). Site 21 was determined to be a data gap because closure sampling will need to be conducted to provide data for the site to advance to an RI/FS. Site 27 was determined to be a data gap because the Navy is currently working on a cleanup plan for the site (Tetra Tech 2014). Site 32 was determined to be a data gap because the site is included in the list of sites that require further investigation in the MCRD Parris Island Site Management Plan Federal Facilities Agreement between the Navy, the US EPA, and SC DHEC. Site 39 was determined to be a data gap because further investigation may need to be performed based on the results from Outfalls 106 and 592 that drain this site (Tetra Tech 2012a).

### Summary

Based on the documents reviewed summarizing the nature and extent of contamination and the health protective remedial responses that have been implemented or are planned for implementation, the NMCPHC concludes that there are no apparent public health hazards as a result of contamination from past disposal and handling practices at the 45 sites characterized as having local impacts. These sites were determined to be of potential local impact because access to COPCs is limited to direct contact on-site or proximate to a site, and potentially only affecting a small number of people. The status or recommended actions in place for these sites include environmental monitoring, NFAs, state UST program oversight, or the sites have already undergone cleanup or mitigation.

Six of the seven sites were identified as having potential regional impacts are associated with storm water outfalls that discharge COPCs to waterways around MCRD Parris Island. Site 50 is located within an operational firing range identified as a regional impact due to the possible accumulation and migration of metals from on-site sources (e.g., lead shot). At this time, there is no data available that suggests consumption of fish/shellfish caught proximate to the outfalls associated with these regional sites is associated with a public health hazard.

The six sites that were determined to have data gaps require further information to characterize potential exposures to be able to classify them as having the potential for local or

regional impact. Some of these sites have been recommended for further action including sampling of soil and/or groundwater.

It was assumed that any land use described in site documents reviewed for this assessment would remain the same in the future. Any changes in land use could affect the potential for human exposures and thus could change the risk category results of this review. Additionally, any further sampling or other assessment of sites with data gaps could change the risk designation assigned for those sites.

## MCRD Parris Island – Site 45

Note: Due to the extensive documentation of the Site 45 investigation, Site 45 is presented in a separate section in order to facilitate summary of the information/findings. Site 45 is located on MCRD Parris Island (see Figure 5 and Figure 6).

### Background Information

Site 45 (Morale, Welfare, and Recreation [MWR] Dry Cleaning Facility) was a former dry cleaning facility located in the Main Post area near the intersection of Panama Street, Samoa Street, and Kyushu Street in MCRD Parris Island, South Carolina (see Figure 6). In 1988, an underground storage system was removed that had stored hydrocarbon cleaning solvents and four aboveground storage tanks were installed along the northern side of the building. On 11 March 1994, one of the aboveground storage tanks was overfilled with PCE and an unknown quantity of the PCE flowed into the concrete catch basin. The PCE overflow was not collected at the time of the spill and heavy rainfall subsequently washed the contaminant onto the surrounding soil. The contaminated soils were excavated, and an interim remedial action was initiated (Tetra Tech 2004).

In 1997, a new dry cleaning facility was constructed and updated operations with non-hazardous hydrocarbon-based cleaning liquids replaced PCE-related operations. In 2001, the former dry cleaning building, solvent tanks, and other related structures were demolished and removed from the site (Tetra Tech 2004). A second groundwater plume of chlorinated solvents was discovered near the new dry cleaner. Currently, the site is mostly a vacant lot covered with mowed grass that contains some isolated shrubs and trees.

### Documents Reviewed

Documentation from the Navy's ER Program was reviewed for possible human health hazards at Site 45. A total of four documents were reviewed ranging in dates from 2004 to 2012. The documents reviewed include:

- Remedial Investigation (RI)/Resource Conservation and Recovery Act Facilities Investigation (RFI) for Site 45: Volume 1 of 2 Text and Volume 2 of 2 Text. Draft Acting as Final. MCRD Parris Island, SC. November (Tetra Tech 2004)

- Scientific Investigations Report 2009–5161, 80 p. Vroblesky, D.A., Petkewich, M.D., Landmeyer, J.E., and Lowery, M.A., 2009, Source, Transport, and Fate of Groundwater Contamination at Site 45, Marine Corps Recruit Depot, Parris Island, South Carolina (U.S. Geological Survey 2009)
- Remedial Investigation (RI) Addendum for Site 45 Dry Cleaning Facility Spill. Area 3 Revision. 3 MCRD Parris Island, SC. November (Tetra Tech 2010a)
- Remedial Investigation (RI) Addendum for Site 45 Former Morale, Welfare, and Recreation Dry Cleaning Facility. Revision 4. MCRD Parris Island, SC. April (Tetra Tech 2012b)

## Findings

### *Soil*

Chlorinated VOCs, arsenic, and polycyclic aromatic hydrocarbons (PAHs) were detected in soils at concentrations greater than background and soil screening concentrations (US EPA Region 9 PRGs) for direct contact exposure under a residential use scenario. The highest concentrations of VOCs and PAHs were found at the water table. The maximum arsenic concentration (2.1 mg/kg) was only slightly greater than the facility background concentration (1.44 mg/kg; Tetra Tech 2004).

PCE and other chlorinated VOC breakdown products, trichloroethylene (TCE), dichloroethene (DCE), and vinyl chloride (VC), were detected in surface and subsurface site soils at concentrations that can continue to impact site groundwater through leaching and result in groundwater concentrations greater than drinking water standards (MCLs; Tetra Tech 2004).

The human health risk assessment concluded that site soils do not pose unacceptable risks to current maintenance workers, commercial workers, adult visitors, or potential future residents (i.e., the risks calculated were within US EPA target risk levels).[16] However, risks for potential future construction workers exposed to site soils were considered unacceptable, using US EPA target risk levels (Tetra Tech 2004).

### *Groundwater*

Groundwater contamination is present at the site, consisting primarily of PCE and the breakdown products TCE, DCE, and vinyl chloride. Two plumes of groundwater contamination

[16] The RI/RFI reviewed by NMCPHC was consistent with US EPA guidance on risk based management decisions (i.e., acceptable or unacceptable based on cancer and noncancer target risk levels). The US EPA typically defines an acceptable risk or target risk level for cancer as a range between one in 1,000,000 ($1x10^{-6}$) to one in 10,000 ($1x10^{-4}$). Risks below $1x10^{-6}$ are generally considered to be "negligible" and risks greater than $1x10^{-4}$ are generally considered to be "unacceptable". Noncancer risks are defined with a hazard index (HI) which indicates the likelihood of a noncancerous health effect to occur. An HI less than one is generally considered to be "acceptable" and indicates that no adverse health effects are expected to occur.

are present, probably with some degree of intermingling in downgradient areas (USGS 2009). The horizontal and vertical extents of chlorinated VOC-contaminated groundwater are adequately defined (Tetra Tech 2004). The plume is approximately 240 feet long and up to 140 feet wide (less than 1 acre). The plume extends from approximately the northwestern corner of the former dry cleaner building to near the temporary lodging. The contaminant plume is consistent with groundwater flow that is to the south-southeast. Based on approximately 5 years of data, significant plume migration is not apparent (Tetra Tech 2004).

The vertical extent of the groundwater contaminant plume extends from the water table (approximately 4 to 5 feet below ground surface) to a low permeable layer located at a depth of approximately 12 to 22 feet below ground surface. Chlorinated VOCs were detected in the groundwater below this low permeable layer but not at concentrations that exceed drinking water standards (Tetra Tech 2004).

The human health risk assessment concluded that groundwater does not pose unacceptable risks to current maintenance workers, commercial workers, or adult visitors. The risk assessment also concluded that surficial groundwater does pose an unacceptable risk to future potential construction workers (assuming dermal contact with water and inhalation of vapors in a trench) and future potential residents (assuming that groundwater was used as a drinking water source) (Tetra Tech 2004). NMCPHC considers this future residential risk related to drinking water unlikely since all drinking water is provided by the BJWSA and communication with the MCRD Parris Island environmental staff (14 March 2016) indicated that MCRD Parris Island does not have any drinking water wells due to saltwater intrusion or just naturally occurring total dissolved solids in groundwater (Tetra Tech 2004).

### *Vapor Intrusion*

VI from groundwater and/or soil gas in Building 293 (Depot Law Center) and the new dry-cleaning facility were evaluated. The following information and/or conclusions regarding human health risks and VI for Site 45 were obtained from Tetra Tech's 2012 RI Addendum (Tetra Tech 2012b):

- While risk estimates based on the VI modeling for hypothetical residents at a structure located within Site 45 exceed standard risk management benchmarks (e.g., the US EPA's target risk range of $10^{-4}$ to $10^{-6}$), this scenario (constructing a residence over the hot spot of the plume) is not very probable. However, the modeling results do provide useful information for risk managers tasked with risk management decisions for Site 45. Based on the modeled risk, any future construction planned for Site 45 must address the VI pathway. Institutional controls should be considered to ensure this happens.
- Based on current plume dimensions and groundwater flow directions, Building 293 and the new dry cleaning facility are located within 100 feet vertically or horizontally of the

groundwater contamination plume and the groundwater exhibits concentrations of COCs greater than VI screening criteria.

- The groundwater contamination plume has migrated nearer to Building 293, and changes that are proposed to be made to the stormwater drains at the site may influence the groundwater flow directions unexpectedly. Therefore, it is possible that significant VOC concentrations will migrate to Building 293 at some point in the future. Near-slab soil gas sampling may be conducted at Building 293 during the remedial design to better characterize the potential for VI.
- A site-specific VI assessment was not completed for Building 293. Soil gas and additional groundwater data will be collected at this building during the remedial design phase of the process.
- In addition, Building 200, a former temporary lodging facility noted in the original Site 45 RI but has since been demolished, was also located within 100 feet of the groundwater.
- PCE concentrations exceeded both residential and industrial US EPA Regional Screening Levels in 6 of the 9 sub-slab soil gas samples collected in the building during a 2009 pilot testing sampling unrelated to RI Field activities. Concentrations of PCE ranged from 74 to 240 µg/m3. PCE concentrations also exceeded both residential and industrial US EPA Regional Screening Levels in seven of the nine indoor and ambient air samples collected, including a duplicate sample. Concentrations of PCE ranged from 0.29 to 54 µg/m3. The results of the quantitative risk assessments based on maximum soil gas concentrations indicate that current VI risks are less than target risk levels for workers at the new dry cleaning facility. The results of the risk assessment based on measured maximum indoor air concentrations indicate that the carcinogenic risk is at the lower end of US EPA's target risk range and the hazard index is less than its target of 1.0. This suggests that the risks should be managed for the new dry cleaning facility.
- Risks for the new dry cleaning facility based on the US EPA's Johnson and Ettinger Model predicted indoor air concentrations, using maximum soil gas concentrations, which indicate risks associated with VI are negligible. In contrast, risks associated with measured indoor air concentrations, while at the lower end of US EPA's target risk range, are greater than those measured using the soil gas concentrations. This suggests that there is a large in-building contribution to indoor air contribution relative to that from VI. Moreover, evidence from Tichenor's research (1990) supports the possibility of significant off-gassing from clothes dry-cleaned with PCE, and the presence of PCE in indoor air to be less likely from VI (Tichenor, B., L. Sparks, et al. 1990). Overall, the Navy intends to address site-related contamination in soil and groundwater. This ultimately reduces the potential for VI over time.

### *Surface Water/Sediment*

Surface water and sediment (in addition to storm-water present in the storm drains leading from Site 45 to the creek) in the nearby Ballast Creek were tested due to the complex fate and transport of constituents at the site (Figure 6). Leaking storm sewers, which are below the water table, provide a preferential pathway for contaminated shallow groundwater to discharge to the creek and are influenced by tidal flushing at the discharge point (approximately 1,400 feet south of the site [Figure 6]). Storm-sewer water near the discharge point contained low level VOCs that fluctuated based on groundwater levels/tidal influences and indicate some level of leakage from the contaminated aquifer. Based on the location of the storm-sewers relative to constituent concentrations, there is a potential for increased concentrations to be discharged at the discharge point (causing a greater risk from sediment and surface water). Shallow sediment samples showed no or low detectable constituent concentrations. An examination of deeper sediment and a search for potential PCE leaks from the storm sewer outside of Site 45 were beyond the scope of the investigation. All sediment and surface water discussion and decisions are being deferred to a later date (Tetra Tech 2012b).

#### Existing Data Gaps

The primary data gap associated with Site 45 was the lack of deep sediment samples from Ballast Creek Outfall 881 (USGS 2009). According to the Source, Transport, and Fate of Groundwater Contamination report, “free-phase PCE may have entered the storm-sewer system during the 1994 overflow” and “dense non-aqueous phase liquid (DNAPL) PCE could have leaked from various parts of the storm sewer in route to the Ballast Creek discharge” (USGS 2009). The authors proposed that “If the DNAPL was transported all the way to the Ballast Creek discharge point [at STS27], then it likely would have sorbed to and sunk into the sediments” at that point (USGS 2009). As per the RI Addendum (Tetra Tech 2012b), “further surface water and sediment sampling is required to determine if there are potential ecological impacts at the site.” The collection of additional storm sewer samples and sediment samples (as a part of the Site 14 SI) is expected to be completed in time to be considered in the Site 45 PRAP/ROD (Tetra Tech 2012b). Consequently, NMCPHC acknowledges the uncertainty that constituent concentrations in deeper sediment could be of concern to ecological receptors, and in turn, human receptors through fish consumption.

#### Summary

Based on the documents reviewed summarizing the nature and extent of contamination and the health protective remedial responses that have been implemented or are planned for implementation, the NMCPHC concludes that there are no apparent public health hazards associated with releases at Site 45. Site 45 has groundwater contamination, potential VI concerns in buildings proximate to the PCE groundwater plume, and potential regional impacts associated with releases of COCs into storm sewers and subsequent transport and release to

Ballast Creek surface water/sediment via Outfall 881. The remedial responses to the releases to groundwater and VI have been effective at mitigating the impacts on human health. However, more work is scheduled to evaluate VI in the future as the groundwater plume continues to migrate (e.g., VI concerns in Building 293 and the new dry cleaning facility). Data gaps/concerns have been identified for Ballast Creek because deep sediment samples were not collected during the investigation of Ballast Creek (USGS 2009). It is possible that these deep sediment samples may contain free-phase PCE (DNAPL) which could potentially impact ecological receptors and human health via consumption of fish/shellfish (USGS 2009). Consequently, NMCPHC acknowledges the uncertainty that constituent concentrations in deeper sediment could be of concern to ecological receptors, and in turn human receptors through fish consumption. This uncertainty is reduced, somewhat, due to the recommendation that long term monitoring be performed at Outfall 881 (Resolution Consultants 2016).

It was assumed that any land use described in site documents reviewed for this assessment would remain the same in the future. Any changes in land use could affect the potential for human exposures and thus could change the risk category results of this review. Additionally, any further sampling or other assessment of sites with data gaps could change the risk designation assigned for those sites.

## NH Beaufort Housing

### Background Information

NH Beaufort is located within Port Royal, South Carolina along the southern coast of South Carolina in Beaufort County (see Figure 7). NH Beaufort was opened in 1949 on 127 acres of land. The present hospital replaced the NH, Parris Island which was open from 1891 through 1 May 1949. NH Beaufort was commissioned on 29 April 1949, and the first patient was admitted on 5 May 1949.

NH Beaufort is one of the few military treatment facilities that is a complete military compound in itself. Commander Naval Installations Command (CNIC) is the property (land) owner. It provides general medical, surgical, and emergency services to all Active Duty Navy and Marine Corps personnel, as well as retired military personnel and all military dependents residing in the Beaufort area, a total population of approximately 35,000 beneficiaries.

The NH Beaufort consists of the hospital and two Branch Health Clinics – one clinic is located at MCAS Beaufort and the other clinic is located at MCRD Parris Island. Within the grounds of the NH Beaufort is PPV single-story units and Bachelor Enlisted Quarters. A total of 32 residences within NH Beaufort Housing have been inspected with reports generated for USTs.

### Documents Reviewed

A total of 10 documents were reviewed for NH Beaufort Housing. The dates of the documents ranged from 2002 to 2015 and were from Navy contractors, NAVFAC, and the SC DHEC. The

documents included UST assessment reports, waste manifests, work plans, and a project completion report. Each of the documents reviewed were key documents associated with the Naval Hospital Beaufort Housing review and include:

- Contract Management Plan (CH2M Hill 1998)
- Statement of Work #3 (NAVFAC 2002)
- Approved Work Plan Addendum No. 01 Underground Storage Tank Location and Survey, Naval Hospital Beaufort Port Royal, SC (CH2M Hill 2002a)
- Project Completion Report Underground Storage Tank Location and Survey, Naval Hospital Beaufort Port Royal, SC, Revision 01(CH2MHill 2002b)
- Underground Storage Tank Assessment Report for 111 – 116 Ballard Circle, Naval Hospital Housing Area MCAS Beaufort, SC (SC DHEC 2015)
- Underground Storage Tank Assessment Report for 118 – 122 Caron Circle, Naval Hospital Housing Area MCAS Beaufort, SC (SC DHEC 2015)
- Underground Storage Tank Assessment Report for 81 – 85 and 140 Harris Road, Naval Hospital Housing Area MCAS Beaufort, SC (SC DHEC 2015)
- Underground Storage Tank Assessment Report for 101, 124, and 125 McGuire Court, Naval Hospital Housing Area MCAS Beaufort, SC (SC DHEC 2015)
- Underground Storage Tank Assessment Report for 106 – 108 Ray Circle, Naval Hospital Housing Area MCAS Beaufort, SC (SC DHEC 2015)
- Underground Storage Tank Assessment Report for 102 – 105, 109, 110, 117, and 123 Saunders Road, Naval Hospital Housing Area, MCAS Beaufort, SC (SC DHEC 2015)

### Findings

The inspection results indicated that of the 32 residences inspected, USTs were identified at 29 residences (see Figure 7). The three residences identified without USTs are located at 81 Harris Road, 140A Harris Road, and 142D Harris Road (SC DHEC 2002). Inspection results for the USTs located at the 29 residences concluded that each UST is estimated to be 10 feet long, 3 feet in diameter, and approximately 550 gallons with a location top depth of at least 36 inches below ground surface (bgs). A global positioning system (GPS) was used to determine each UST location. A Project Completion report was completed for each of the 32 USTs and included UST removal assessment reports, UST location summaries, residence street address, surface cover, depth to the top of the UST, identification of fill port, potential fill cap removal, and remaining tank contents (SC DHEC 2002).

### Summary

Based on the documents available at the time of the PHR, NMCPHC concludes that there is no indication of VI concerns at the 32 residences located within Naval Hospital Beaufort Housing.

# Section 5: Military Housing Privatization Environmental and Public Health Issues

## Military Housing Privatization Environmental and Public Health Issues

Because a great deal of the focus of this PHR was on LBMH, considerable effort was expended in researching and obtaining access to historical environmental information while determining who was responsible for delivering environmental and public health services to residents before and after it was privatized (2003).

## Background

On February 11, 1996, President Clinton signed into law the National Defense Authorization Act for Fiscal Year 1996, containing authorities for the Military Housing Privatization Initiative (MHPI). This act, Public Law 104-106 (110, Stat 186, Section 2801), includes a series of authorities that allow DoD to work with the private sector to build, renovate and sustain military housing (Office of the Deputy Under Secretary of Defense 2017). The goals are to:

- Obtain private capital to leverage government dollars
- Make efficient use of limited resources, and
- Use a variety of private sector approaches to build and renovate military housing faster and cheaper for American taxpayers

Congress established the Military Housing Privatization Initiative (MHPI) in 1996 as a tool to help the military improve the quality of life for its service members by improving the condition of their housing. The MHPI was designed and developed to attract private sector financing, expertise and innovation to provide necessary housing faster and more efficiently than traditional Military Construction processes would allow. The Office of the Secretary of Defense has delegated to the Military Services the MHPI and they are authorized to enter into agreements with private developers selected in a competitive process to own, maintain and operate family housing via a fifty-year lease.

MHPI addresses two significant problems concerning housing for military Service members and their families: (1) the poor condition of DoD owned housing, and (2) a shortage of quality affordable private housing. Under the MHPI authorities, DoD works with the private sector to revitalize our military family housing through a variety of financial tools-direct loans, loan guarantees, equity investments, conveyance or leasing of land and/or housing/and other facilities. Military Service members receive a Basic Allowance where they can choose to live in private sector housing, or privatized housing.

### Military Service Privatization Program

Each Military Service has their own privatization program but they do have to follow certain general DoD policy guidelines. The Navy's program is referred to as PPV, the Air Force program is called Housing Privatization, and the Army's program is the Residential Community Initiative. Each Service is responsible for: evaluating the housing needs of their servicemen; determining which of their installations should be privatized; establishing their program's policies and procedures; carrying out the private developer solicitation process; and monitoring their projects.

### Building Standards

Both on-base and off-base units are being built to private sector residential standards and follow State and local building codes. Just as private sector housing should be safe, affordable, and quality-built, DoD expects the same of the housing built as part of the housing privatization initiative.

### Contractor/Developer Performance

DoD wants market forces to drive contractor performance. This means that the primary enforcement mechanism is the ability of the service members to choose whether to live in privatized housing or off-base private housing. In addition, the structure of each deal provides mechanisms to oversee developer performance. Management plans and ground leases provide for performance measurement over time. Depending on the financial structure of the deal, DoD may also have loan documents, loan guarantees, and intercreditor agreements. Each deal will specifically design these mechanisms to work together to provide adequate DoD controls. DoD will also require the developer to include funding in contingency escrow accounts.

### DoD Management

DoD has designed a portfolio management and monitoring tool for this purpose called the PEP. The PEP is a semi-annual reporting system that includes detailed information submitted by each of the Military Services to OSD regarding their portfolios of MHPI projects, including information about deal structures, government costs, use of government authorities and on-going program performance. OSD uses this information to monitor the program's progress, to perform financial and performance oversight, and to implement program improvements. Additionally, each Military Service and installation military personnel are responsible for ensuring that developers are complying with the conditions stipulated in their contracts.

## Resident Problem Resolution for PPV

Residents are directed to bring problems to the attention of the project owner's property manager. If the issue cannot be resolved with the property manager, each Military Service has their own unique mediation process.

### Inspection of Privatized Housing Unit

The Government will not inspect move-ins or move-outs because the Government no longer owns the unit. The project owner's property manager is now responsible for this function.

### Public Law 110-417 (National Defense Authorization Act for Fiscal Year 2009)

Law 110-417 modified existing privatization authorities in Subchapter IV, Chapter 169, 10 U.S.C. by adding additional oversight and accountability measures for construction and renovation of housing units.

In 2012, following the mold in Lincoln Military Housing issue, HR 4608 (112th), the Military Housing Oversight and Accountability Act was introduced but not enacted by Congress. Nevertheless, this issue did result in closer oversight of the property manager by DoN through its Housing Office PPV Liaison personnel.

Today, after privatization, almost all FH in CONUS is now PPV where the Private Partner owns the house and leases the land from DoN. Outside CONUS (overseas) most FH is still government-controlled by DoN. Almost all UH both in the U.S. and overseas is government-controlled by DoN.

PPV Housing contracts for the real estate ground lease and conveyance of facilities for MCAS Beaufort/MCRD Parris Island were awarded 1 March 2003 to Actus Lend Lease (AMCC). Contract award period was for 50 years.

There is PPV Housing on MCAS Beaufort, MCRD Parris Island, NH Beaufort, and at LBMH. The PPV Partner is Tri-Command AMCC.

### Documents Reviewed

Real Estate Ground Lease and Conveyance of Facilities - United States of America Department of the Navy as the Government and Tri-Command Managing Member LLC As the Lessee - March 2003, Section 12 – Environmental Protection:

- AMP (Exhibit K)
- LBP Management Plan (Exhibit L)
- Chlordane Management Plan (Exhibit M)

## Findings

### *Transition to PPV Contract*

From research and discussions with Navy Facilities Engineering Command Atlantic (NAVFACLANT), it appears that the BUMED was not involved in determining the scope and content of the PPV contracts (there are now approximately 16 separate ground leases Navy-wide) with regard to the provision of public health services to military housing which were at the time being provided by BUMED's field activities (Navy Environmental and Preventive

Medicine Unit [NEPMUs] and the Navy Center of Excellence for Entomology). The Bureau of Medicine and Surgery is generally mission funded through the Defense Health Agency to provide public health services to Navy and Marine Corps Installations as required by OPNAVINST 5100.23G (Navy Safety and Occupational Health Program Manual – CH-1 of 21 Jul 2011) and OPNAVINST 5090.1D (Environmental Readiness Program Manual – 10 Jan 2014). These public health services include areas such as:

- Occupational and Environmental Health (Worker Medical Surveillance, reproductive hazards)
- Industrial Hygiene (Workplace Exposure Assessment, Indoor Air Quality, mold, asbestos, lead, noise, hazardous materials), radiation health/radon,
- Preventive Medicine (e.g., Drinking Water, Sanitation, Food, Habitability), Pesticides/Vector Control,
- Environmental (Human Health Risk Assessment, Risk Communication),
- Epidemiology (Disease Clusters, health surveillance) and
- Laboratory Services.

The mix of civilian and active duty subject matter experts who deliver these services include but are not limited to:

- Industrial Hygienists/Industrial Hygiene Officers
- Environmental Health Officers
- Sanitarians
- Chemists
- Biochemists
- Preventive Medicine Technicians
- Health Risk Assessors
- Health & Environmental Risk Communicators
- Toxicologists
- Microbiologists
- Audiologists
- Epidemiologists
- Entomologists
- Preventive Medicine Physicians
- Occupational & Environmental Medicine Physicians
- Occupational Health Nurses
- Radiation Health Physicists/Radiation Health Officers

Prior to the Military Housing Privatization Initiative in the early to mid-2000s, when required, these resources mentioned above could be brought to bear to assist DoN and USMC installation commanders (ICOs) to resolve public health issues that might arise in military housing which included FH and UH.

After privatization, because BUMED was not a participant in the PPV contract process, there remains some confusion among BUMED public health providers as to what services, if any, can be provided to privatized housing.

### *Quantity and Quality of Services*

The PPV Partners do not have organic public health staffs rather contract out those services to multiple service providers. The Private Partners typically do not have corporate environment, safety or public health policy/manual to guide their provision of services or risk management actions rather rely on the multiple contractors used for interpretation of and compliance with local, state and federal laws. This arrangement can be problematic for certain situations such as indoor air quality issues and in particular mold. This is a recurring issue Navy and Marine Corps wide which can lead to significantly varied responses and resolutions resulting in dissatisfaction by the residents who turn to media/social media to pressure the ICO into what they believe are appropriate health protective actions. The Private Partners have attempted to address this with the addition of "Mold Addendums" to the lease but those do not appear to be decreasing the frequency of mold issues.

### *Standardization, Specificity, and Technical Accuracy of the Contract*

NAVFAC manages the contracts (e.g., Real Estate Ground Lease and Conveyance of Facilities) between the Private Partner and DoN and each Private Partner has a separate contract. Our understanding is that the Ground Lease is the typical location for addressing environmental topics. Based on our limited review of only the 2003 AMCC contract, specific language regarding public health issues appear to be confined to a discrete number of issues which take the form of "Exhibits" to the contract. For the Tri-Command Ground Lease there were exhibits for AMP (Exhibit K), LBP Management Plan (Exhibit L), and Chlordane Management Plan (Exhibit M). Presumably these are called out separately in the contract because they are issues universal to all housing, public or private.

Section 12 (Environmental Protection) of the Ground Lease describes responsibilities and liabilities between the Government and the Lessee. This section also has several clauses (Section 12.2.4, Section 12.2.18, and Section 12.2.18.1) that leave open to interpretation whether entry into PPV Housing to provide environment, safety and occupational health services is allowed.

Even though the language used cites "occupational health," we believe that since BUMED was not involved in the development of this contract, that the intent was entry and testing by the

Government in response to situations that pertain to “environmental” sources not “occupational” sources. So the current Government (e.g., MCAS Beaufort, NAVFAC MIDLANT) VI investigation from subsurface contamination (soil, groundwater) at LBMH would meet the intent of the above sections.

For environmental issues of concern, the PPV Partner is not responsible for environmental impacts or damage (even if unknown at the time of the Ground Lease) occurring prior to the beginning of the term of the Ground Lease.The PPV Partner is required to comply with "all Environmental laws" to "include, but not limited to, those federal, state, and local laws, ordinances, rules, regulations, and other requirements."

These contracts (e.g., Exhibits) reference older OSHA and EPA standards in force at the time of the contract development (early 2000s). It is now 2017 and it is not clear if there is a process to periodically review the contract content to ensure it is accurate with today’s regulations. Our review of these few Exhibits found a few technical discrepancies regarding regulatory standards, some imprecise language that has the potential to allow leeway for interpretation by the Lessee, and some assumptions that are not fully explained or documented. It is unclear who (e.g., NAVFAC Contracts person or environmental or public health SME) decides which particular potential hazard to include as an exhibit in a contract, and what that decision is based on.

### *Creation of Two Standards of Public Health Support and Recordkeeping*

As a result of the issues raised above, we may have created a perception of two different standards, one potentially lessor, one greater, for public health support for those residents in privatized housing and for those in government controlled housing, which can be literally on or proximate to the same installation.

#### Existing Data Gaps

On a USMC or Navy wide basis, BUMED does not know the content in the existing ground leases nor how many have Exhibits (or for what potential hazards) and how they may differ from lease to lease.

Therefore consistent guidance to BUMED public health practitioners cannot be determined and implemented on a Navy-wide basis.

For those PPV Contracts, we do not know what type or level of environmental or public health SME review was conducted before the contract was signed (circa 2002 – 2003) or any periodic reviews that have occurred since that time.

#### Recommendations

For existing PPV contracts, BUMED public health SMEs should be aware of the public health content of the contract (e.g., Section 12 and Exhibits) so that they can appropriately respond to

day to day requests for service either from residents or the military housing liaison. As a result of a telephone conference between NMCPHC, NAVFACLANT and CNIC on 17 August 2017, NMCPHC will, based on being provided the details of the remaining PPV ground lease contracts, begin to develop PPV guidance for public health practitioners so they provide the appropriate and contractually relevant support to residents and military housing liaisons.

Even though the ground lease specifies that the lessee has the responsibility for implementation and day to day execution of the AMP and LBP Management Plans in compliance with "Environmental Laws" (presumably federal, state and local), it would be prudent for both NAVFACENGCOM (environmental) and BUMED (public health) subject matter experts to know what is in this contract (and the other PPV contracts) and periodically review the content to ensure it is up-to-date and accurate (DoN 2003). Both these programs have the potential to affect residents' health and safety.

# Section 6: PHR Conclusions and Recommendations

A summary of the conclusions and risk management actions that are recommended based on the results of this PHR are presented in this section. Risk management is the process that determines how to protect public health from risks that were identified in the environmental, epidemiology, and other health evaluations performed as part of this PHR. This PHR provides information on potential health risks; risk management is the process of deciding whether or not and how to manage those health risks. Risk management requires consideration of legal, economic, and behavioral factors in making decisions about which risk management actions or alternatives to take to reduce or eliminate identified potential risks where possible.

The conclusions and recommendations for the PHR, the epidemiological investigation, the public health evaluation, and the environmental programs are summarized below. A complete list of the findings for each evaluation conducted as part of the PHR is available in Sections 2 (Epidemiological Investigation), Section 3 (Public Health Evaluations), Section 4 (Environmental Programs), and Section 5 (Military Housing Privatization Environmental and Public Health Issues).

## Public Health Review

### *Conclusions:*

Based on the types and number of pediatric cancers observed and the evaluation of their recognized risk factors, it is unlikely that an environmental or occupational exposure is associated with these cancers. The term “unlikely” means that the evidence is insufficient to connect the environmental and occupational conditions to the observed cancers. Current epidemiologic methods are not adequate to determine if there were other factors, like genetic errors or modifications, in these cases.

### *Recommendations:*

Continue to partner with SC DHEC for each step in the remaining UST investigations (groundwater and VI) process to ensure VI is not a pathway of concern for residents at the properties in LBMH.

As information becomes available from the remaining investigations (groundwater and VI), ensure that information is made available to LBMH residents, is posted on the MCAS Beaufort Laurel Bay Health Study Website (http://www.beaufort.marines.mil/Resources/Laurel-Bay-Health-Study/), and that individual house profiles that describes the history of the UST(s) removal and subsequent investigations (soil, groundwater, VI) are available to residents.

Environmental sites on MCAS Beaufort and MCRD Parris Island with data gaps should continue to be addressed under the applicable regulatory framework (e.g., UST, RCRA, CERCLA).

## Epidemiological Investigation (Section 2)

### *Conclusions:*

**Study Cases**: Fifteen (15) pediatric cases in the study population (born after 01 January 2002) were validated through the review of electronic health records (from January 2001 to December 2016) for members assigned to work at MCAS Beaufort and MCRD Parris Island and living within a 30 mile radius.

**Study Types**: Five (5) types of cancers were validated to-date: ALL, AML, neuroblastoma, soft tissue sarcoma (e.g., infantile rhabdomyosarcoma), and Wilms tumor.

**Risk Factors**: Three (3) of the five (5) validated cancer types have known environmental risk factors (ionizing radiation and benzene).

Cancer rates were not calculated for this study because none of the cancer types had at least 16 cases. The National Cancer Institute uses a minimum of 16 cases of a specific cancer to calculate a valid cancer rate (National Cancer Institute 2003). While rates were not calculated, the observed case counts in the study population were consistent with the expected distribution by pediatric cancer type for the same types of cancers in the general pediatric population.

### *Recommendations:*

For questions regarding environmental exposures and cancer, please see your health care provider.

## Public Health Evaluation (Section 3)

### Drinking Water

#### *Conclusions:*

Groundwater is not used as a drinking water source for LBMH, MCAS Beaufort, MCRD Parris Island, or NH Beaufort Housing; therefore, exposure to contaminants in groundwater via drinking water is not a complete exposure pathway.

BJWSA drinking water, treated and delivered by BJWSA, consistently meets or surpasses all water quality standards and inspections from both the US EPA and the SC DHEC. The BJWSA has treated and supplied the drinking water to LBMH, MCAS Beaufort, and MCRD Parris Island since 1965. BJWSA has owned, operated, and maintained the LBMH, MCAS Beaufort, and MCRD Parris Island water and wastewater systems since 2008.

#### *Recommendations:*

None

## Lead in Drinking Water in Priority Areas

***Conclusions:***

LIPA Programs at MCAS Beaufort and MCRD Parris Island are in compliance with Marine Corps LIPA Policy.

***Recommendations:***

Continue to retest priority areas every five years from the established baseline, or more frequently if required by regulatory agencies.

## Navy Radon and Assessment and Mitigation Program (NAVRAMP)

***Conclusions:***

The NAVRAMP Programs at MCAS Beaufort and MCRD Parris Island are in compliance with Navy and Marine Corps policy.

***Recommendations:***

Continue performing the periodic inspections and preventive maintenance (as required) on existing building mitigation systems and periodically retest buildings with mitigation systems (at least every 2 years) per OPNAV M-5090.1 CH 25 (section 25-3.2.b.1.c) to ensure subject systems are operating properly to reduce the building's radon levels below 4 pCi/L.

## Radiation Safety Program

***Conclusions:***

The Installation's Radiation Safety Program demonstrated compliance with all federal, state, and local requirements.

***Recommendations:***

Continue maintaining the Installation Radiation Safety Program as directed by federal, state and local policy.

## Pest Control Management

***Conclusions:***

The IPMP for LBMH, MCAS Beaufort, and MCRD Parris Island meet all Navy and Marine Corps program requirements.

***Recommendations:***

Continue to coordinate pest control program reviews with NAVFAC, maintain pesticide applicator certifications, and follow established IPMPs.

Continue to implement the LBMH IPMP as managed by Atlantic Marine Corps Communities, LLC and coordinated with the MCAS Beaufort IPMC. Continue to report pesticide applications conducted as part of the IPMP to the MCAS Beaufort IPMC and document in NAVFAC Online Pesticide Reporting System (NOPRS).

## Occupational & Environmental Medicine (OEM)

### *Conclusions:*

The OEM programs administered by NH Beaufort are in compliance with Navy and Marine Corps Occupational Safety and Health Policies.

### *Recommendations:*

The OHC should continue to evaluate workers with concerns about work exposures in general and reproductive hazards specifically. The evaluation of workplaces for hazards, including reproductive hazards, and the evaluation of workers with reproductive concerns should continue to function in accordance with Navy and Marine Corps Occupational Safety and Health Policies.

If any LBMH resident has concerns about possible reproductive or developmental hazards associated with the housing complex, they may call the NH Beaufort OHC to arrange an appointment (843-228-5508). When contacting the clinic, please ask to speak with the Clinic Occupational Health Nurse. Tri-command civilian or active duty workers who have concerns about potential workplace hazards should notify their supervisor who can refer the worker to the OHC for evaluation.

NH Beaufort health care providers should be familiar with, and continue to refer to the Provider Guidance for Pediatric and Adult Cancers that was developed by NMCPHC specifically for health concerns regarding LBMH (see Appendix E).

## Industrial Hygiene (IH)

### *Conclusions:*

The IH program administered by NH Beaufort is in compliance with Navy and Marine Corps Occupational Safety and Health Policies.

### *Recommendations:*

Navy Medicine East IH Program Manager should continue to coordinate with NH Beaufort IH services to:

- Continue to perform exposure monitoring and sampling where indicated to update exposure assessments in the workplace.
- Assess exposure results and document rationale for exposure judgement.

IH should continue to evaluate workplaces for hazards, including reproductive hazards, and continue to function in accordance with the Navy and Marine Corps Occupational Safety and Health Policies.

# Environmental Programs (Section 4)

## Laurel Bay Military Housing

### USTs

***Conclusions*:**

The investigation to address potential health concerns related to home heating oil USTs is ongoing. The SC DHEC has been, and continues to be involved in the review, oversight and approval of data and determination of follow-on actions for the 1,100 LBMH residences with historical use of home heating oil stored in former USTs.

***Recommendations*:**

MCAS Beaufort continue to work each step of the UST tank removal process (soil, groundwater, VI evaluations) with SC DHEC for LBMH properties.

It is assumed that any land use described in site documents reviewed for this assessment will remain the same in the future. Any changes in land use could affect the potential for human exposures and thus could change the potential impact category results of this review. Additionally, any further sampling or other assessment of sites with data gaps could change the category designations for those sites.

### Asbestos and Lead Based Paint

***Conclusions*:**

The ground lease agreement between DoN and AMCC, specifically Exhibit K (AMP) and Exhibit L (LBP Management Plan), require AMCC to implement AMP and LBP Management Plans that are compliant with Environmental Laws. Note that the ground lease itself is more specific and requires the PPV Partner to comply with "all Environmental laws" to "include, but not limited to, those federal, state, and local laws, ordinances, rules, regulations, and other requirements." Day-to-day compliance with the AMP is a responsibility of AMCC. There is no DoN direct oversight done or required by the ground lease agreement.

***Recommendations*:**

Even though the ground lease specifies that the Lessee has the responsibility for implementation and day-to-day execution of the AMP and LBP Management Plans in compliance with “Environmental Laws” (presumably federal, state and local), it would be prudent for both NAVFACENGCOM (environmental) and BUMED (public health) subject matter experts to know what is in this contract (and the other Navy-wide sixteen PPV contracts) and periodically review the content to ensure it is up-to-date and accurate. Both these programs have the potential to affect residents’ health and safety.

## MCAS Beaufort

***Conclusions*:**

Based on the documents reviewed, there are no apparent public health hazards as a result of contamination from past disposal and handling practices at 130 out of 141 sites that were determined to have local impacts. Sites classified as having local impacts were identified as potentially affecting a small number of people from possible exposures on-site or immediately

proximate to sites. The status or recommended actions in place for these sites include NFAs, state UST program oversight, environmental monitoring, or the sites have already undergone cleanup or mitigation.

The 11 sites (i.e., 11 of 141 sites) that were determined to have data gaps require further information to characterize potential exposures to classify the sites as having potential local or regional impacts. Many of these sites are located proximate to the operational air field and/or the sites are currently in use and corrective action has been deferred until the airfield/site has been closed. Several of these sites have been recommended for further action including sampling of soil and groundwater.

***Recommendations*:**

In order to assess their potential impact on public health, the 11 sites with data gaps should continue to be addressed under the applicable regulatory framework.

## MCRD Parris Island

***Conclusions*:**

Based on the document review, there are no apparent public health hazards as a result of contamination from past disposal and handling practices at 45 of the 58 sites categorized as having potential local impacts. The status or recommended actions in place for these sites include NFAs, state UST program oversight, environmental monitoring, or the sites have already undergone cleanup or mitigation.

There is a facility-wide network of drainage swales, culverts, storm water pipes and related outfalls which discharge storm water runoff into surrounding streams, marshes, ponds, and rivers at MCRD Parris Island (Tetra Tech 2012a). Six of seven sites identified as having potential regional impacts (i.e., Sites 45, 46, 47, 48, 49, and 54 are associated with drainage of wastes via storm water outfalls. The COPCs identified at outfalls associated these sites include metals, PCBs, PAHs and pesticides. Conclusions and recommendations for Site 45 are presented below. Site 50 is located within the boundary of an operational firing range that is not expected to be evaluated for environmental impacts until after it closes.

Six sites (i.e., Sites 5, 9, 21, 27, 32, and 39) , some of which have been recommended for further action(e.g., soil and/or groundwater monitoring) were determined to have data gaps and require further information to characterize potential exposures as having the potential for local or regional impact.

***Recommendations*:**

The seven sites determined to have the potential for regional health impact and the six sites determined to have data gaps warrant further evaluation to better identify any specific public health hazards. The status and/or recommended actions for these sites include additional sampling, further investigation, or proceeding to an FS. These sites should continue to be

addressed under the applicable regulatory framework. NMCPHC recommends consideration of the fish consumption pathway, in addition to other complete exposure pathways, as these sites undergo further investigation.

## MCRD Parris Island Site 45

***Conclusions*:**

Based on documents reviewed that summarized the nature and extent of contamination and the health protective remedial responses that have been implemented or are planned for implementation, there are no apparent public health hazards associated with releases at Site 45. Site 45 has groundwater contamination, potential VI concerns in buildings proximate to the PCE groundwater plume, and potential regional impacts associated with releases of COCs into storm sewers and subsequent transport and release to Ballast Creek surface water/sediment via Outfall 881. The remedial responses to the releases to groundwater and VI have been effective at mitigating the impacts on human health. However, more work is scheduled to evaluate VI in the future as the groundwater plume continues to migrate (e.g., VI concerns in Building 293 and the new dry cleaning facility). NMCPHC acknowledges the uncertainty that constituent concentrations in deeper sediment could be of concern to ecological receptors, and in turn human receptors through fish consumption.

***Recommendations:***

In order to assess the potential impact on public health (e.g., VI by office workers, groundwater direct contact by construction workers), the results of further investigations/LTM performed at Site 45 should continue to be addressed under the applicable regulatory framework. LTM at outfall 881 should consider the fish/shellfish consumption pathway in the LTM plan for Site 45 (Resolution Consultants 2016).

## Naval Hospital Beaufort Housing

***Conclusions*:**

Based on the documents available at the time of the PHR, there is no indication of VI concerns at the 32 residences located within NH Beaufort Housing.

***Recommendations*:**

None.

## Military Housing Privatization Environmental and Public Health Issues (Section 5)

***Conclusions*:**

Better coordination is needed between CNIC, NAVFAC, and BUMED with regard to the development of the environmental and public health content for the ground lease contracts (and the exhibits [asbestos, LBP, chlordane pesticide]) between DoN and the PPV partners. There are Issues regarding standardization, specificity, technical accuracy, applicability and

provisions of services of the contracts with respect to Navy and Marine Corps environmental and public health personnel.

### *Recommendations*:

For existing PPV contracts, both NAVFAC environmental and BUMED public health SMEs should be made aware of the environmental and public health content of the 16 different Navy-wide PPV contracts that are in existence (e.g., Section 12 Environmental Protection and Exhibits [Asbestos, LBP, Chlordane]) so that they can respond appropriately to requests for service either from residents or the military housing liaison.

Once provided the details of the remaining 16 PPV ground lease contracts, NMCPHC will begin to develop PPV guidance for public health practitioners so they can provide the appropriate and contractually-relevant support to residents and military housing liaisons. The development of similar PPV guidance for NAVFAC environmental SMEs is recommended.

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# Tables

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**Table 1: Public Health Review of MCAS Beaufort Sites**

| Name of Site | Site Description | Current Status or Recommended Actions | Source of Status | Risk Classification | Constituents of Concern or Potential Concern | Risk Rational/Additional Site Information | Source of Primary Documents Used in the Evaluation |
|---|---|---|---|---|---|---|---|
| A-B Pipeline | A release of JP-5 from an 8-inch transfer pipeline running from Tank Farm A to Tank Farm B in the southeast corner of MCAS was identified in 2003 and subsequently repaired. The site is on a narrow strip of land bordered to the north and south by a salt marsh. | Recommended actions from the 2015 GW report include continued GW monitoring. | Review of GW report (USACE, 2015). | Local | GW: benzene, ethylbenzene, toluene, total xylene, naphthalene, and benzo(a) pyrene<br><br>Soil: naphthalene, benzo(a)anthracene, benzo(b)fluoranthene, and chrysene | The site is located in the southeast corner of the base on a narrow strip of land bordered to the north and south by marsh. There is a road directly north of the release. The petroleum release affected a limited area of soil only in the immediate vicinity of the pipeline repair. Results had shown that the contaminants were not migrating north across the road to the marsh (downgradient). GW contaminant concentrations indicate a minimal impact from the release. Based on the results of the latest sampling event it appears that the contaminant concentrations have remained stable from the April 2014 sampling event to the current, March 2015, sampling event. Monitoring wells show an overall trend of decreasing concentrations (10 years of sampling). | 2004. U.S. Army Corps of Engineers. Initial Assessment Report for A-B Transfer Pipeline. MCAS Beaufort, SC. 13 October.<br><br>2015. U.S. Army Corps of Engineers. A-B Pipeline. MCAS Beaufort, SC. Draft. March. |
| AOC A - Stained Concrete Pad | Elevated concrete pad with black stains leading to drain near Building 414. No information on whether the operation of the unit was provided by facility personnel during the Visual Site Inspection. | NFA | [CH2MHill]. 2015. Figure II.L-4 SWMU and AOC Location Map. MCAS Beaufort, South Carolina. | Local | None Identified | NFA | [CH2MHill]. 2015. Figure II.L-4 SWMU and AOC Location Map. MCAS Beaufort, South Carolina. |
| AOC B - Product Storage Area | This site consists of a series of steel 55-gallon drums that contain several products that are used in maintenance activities in Building 594. These include various engine lube oils, cutting oils, and other lube oils. Several of the drums are placed horizontally on brackets for easy access to these products. Others are placed on a large concrete walkway. | NFA | [CH2MHill]. 2015. Figure II.L-4 SWMU and AOC Location Map. MCAS Beaufort, South Carolina. | Local | None Identified | NFA | [CH2MHill]. 2015. Figure II.L-4 SWMU and AOC Location Map. MCAS Beaufort, South Carolina. |
| AOC C - Mop Washing Area | AOC C is approximately 0.25-acres and includes the former location of a mop washing double sink, drying rack, and the area impacted by the mop washing activities. Mops were previously washed in the double sink and hung to dry on the rack, which allowed for solvents used in cleaning to drip onto the concrete pad and to possibly migrate offsite. AOC C is located adjacent to the flight line in a restricted access area. The mop washing area was taken out of service sometime before 1988 and was removed from the site between 1986 and 1997. Currently, the site consists of mostly open, grassy land with three structures: Buildings 1019 (flammable materials storage) and 1187 (open bay storage shed with above ground fuel tank containing waste oil), and an oil-water separator/waste water system vault complex. A maintenance shop (Building 896) associated with the hangar (416) is located approximately 100 ft northeast of AOC C. | Recommended actions from the 2014 RFI report include additional soil sampling to investigate elevated concentrations of benzene, ethylbenzene, and naphthalene in GW. Following the additional soil sampling, it was recommended to prepare a CMS to evaluate remedial alternative to address COCs for the site (Tetra Tech 2014). | Review of RFI report (Tetra Tech, 2014). | Local | COCs:<br>GW: arsenic, benzene, ethylbenzene, manganese, naphthalene<br>Migration from Soil to GW: benzene, naphthalene<br><br>COPCs:<br>GW: arsenic, benzene, cobalt, ethylbenzene, iron, manganese, naphthalene, thallium, VI<br>Migration from Soil to GW: 2-methylnaphthalene, antimony, arsenic, benzene, cadmium, chromium, cobalt, copper, iron, lead, m&p-xylenes, manganese, naphthalene, silver<br>Surface Soil: arsenic, chromium, cobalt, iron<br>Subsurface Soil: arsenic, chromium, cobalt, iron | The HHRA evaluated direct contact exposure to chemicals detected in surface soil, subsurface soils, and GW for construction, industrial, and maintenance workers, adolescent trespassers, and hypothetical on-site residents (adults, children, and lifelong residents). Unacceptable non carcinogenic risks (associated with a hazard index[HI] greater than 1) were calculated for child and adult hypothetical residents. Unacceptable carcinogenic risks (associated with an incremental lifetime cancer risk [ILCR] greater 1x10-4 for carcinogens) were calculated for child, adult, and lifelong hypothetical residents. A majority of the risks associated with these receptors stem from exposure to GW.<br><br>No chemicals of concern were identified for soil (surface and subsurface) because the total media-specific risks for soil for all receptors were either equal to or less than 1x10-4 (upper limit of the US EPA target risk range) for carcinogens or less than 1 for noncarcinogens.<br><br>Chemicals detected in surface and subsurface soil may have the potential to adversely impact GW. Results indicated that arsenic in surface soil and benzene, naphthalene, and arsenic detected in subsurface soil may have the potential to adversely impact GW. However, arsenic concentrations are not considered to be problematic because there is no pattern to the arsenic concentrations in soil. It is also considered to be attributable to background conditions or industrialized activities that occur throughout this area of the base rather than AOC C activities (Tetra Tech 2014).<br><br>VI is not considered to be a significant exposure pathway (ILCRs are less than 1x10-4 and did not contribute significantly to GW HIs for residents), and is only possible under a future scenario if inhabitable structures are built on top of the site. | 2014. Tetra Tech. Resource Conservation and Recovery Act Facility Investigation Report for Area of Concern C Mop Washing Area. MCAS Beaufort, SC. 1 February. |
| AOC D - Container Storage Area and associated "Drip Pan" | Five 5-gallon buckets and assorted metal drip pans used in association with maintenance operations in Building 418 are stored at this location. | NFA | [CH2MHill]. 2015. Figure II.L-4 SWMU and AOC Location Map. MCAS Beaufort, South Carolina. | Local | None Identified | NFA | [CH2MHill]. 2015. Figure II.L-4 SWMU and AOC Location Map. MCAS Beaufort, South Carolina. |
| AOC E - Product Storage Area | This site consists of six steel 55-gallon product oil and hydraulic fluid drums located outside of Building 565. The drums are stored horizontally on metal stands to allow for gravity flow through spouts. | NFA | [CH2MHill]. 2015. Figure II.L-4 SWMU and AOC Location Map. MCAS Beaufort, South Carolina. | Local | None Identified | NFA | [CH2MHill]. 2015. Figure II.L-4 SWMU and AOC Location Map. MCAS Beaufort, South Carolina. |
| AOC F - Product Storage Area | The site consists of 20-25 black and green, steel and plastic, 55-gallon drums used for product storage at Building 661. Three drums are set horizontally on metal stands to allow gravity flow of product through spouts. | NFA | [CH2MHill]. 2015. Figure II.L-4 SWMU and AOC Location Map. MCAS Beaufort, South Carolina. | Local | None Identified | NFA | [CH2MHill]. 2015. Figure II.L-4 SWMU and AOC Location Map. MCAS Beaufort, South Carolina. |

| Name of Site | Site Description | Current Status or Recommended Actions | Source of Status | Risk Classification | Constituents of Concern or Potential Concern | Risk Rational/Additional Site Information | Source of Primary Documents Used in the Evaluation |
|---|---|---|---|---|---|---|---|
| AOC G - Battery Repair Shop | This maintenance activity is located within Building 780. Within this room, various maintenance activities associated with batteries are conducted. These include recharging, filling with water or acid, and removing and neutralizing the acid prior to disposal of batteries. In addition, a number of batteries are stored outside the battery shop (and Building 780) on wooden pallets. | NFA | [CH2MHill]. 2015. Figure II.L-4 SWMU and AOC Location Map. MCAS Beaufort, South Carolina. | Local | None Identified | NFA | [CH2MHill]. 2015. Figure II.L-4 SWMU and AOC Location Map. MCAS Beaufort, South Carolina. |
| AOC H - Product Storage Area | At this site, three steel 55-gallon drums of product compressor oils are located outside Building 816. These drums are stored horizontally and are supported on brackets. The brackets are placed directly on the ground. Paths of stressed vegetation were observed leading from unit to topographically lower areas. | NFA | [CH2MHill]. 2015. Figure II.L-4 SWMU and AOC Location Map. MCAS Beaufort, South Carolina. | Local | None Identified | NFA | [CH2MHill]. 2015. Figure II.L-4 SWMU and AOC Location Map. MCAS Beaufort, South Carolina. |
| AOC I - Automotive Parts Storage Area at Automotive Hobby Shop | This site is located at the northeast corner of the concrete parking area associated with the automotive hobby shop (Building 773). This area measures approximately 10 ft by 20 ft. In this area various automotive components and parts are stored or repaired after removal from vehicles. | NFA | Marine Corps Air Station Beaufort, SC SWMU Sites Status. Revision 1. Author Unknown. PDF. January, 2006. | Local | None Identified | NFA | Marine Corps Air Station Beaufort, SC. 2006. Revision 1. January. Author Unknown. PDF. |
| AOC J - MCX Service Station | This gasoline station was located at the intersection of Gordon Street and Hoffecker Avenue, in the southern portion of the MCAS Beaufort at former Building 629. The site is a former gasoline filling station for civilian vehicles. The site has an investigative history dating back to 1986 when leaks were detected in gasoline pipelines and also in a heating oil UST used to heat Building 629. Personnel discovered a loss of approximately 1,500 gallons of unleaded regular gasoline. The heating oil UST was taken out of service immediately and removed in 1987. The gasoline USTs and a portion of the piping leading to the dispenser islands were replaced in 1993. The building and all tanks and appurtenances were later removed during the decommissioning of the site in 2004. Active remediation attempts at the site included the injections of oxygen release compound in 1999 and 2000 and the excavation of 250 yards of petroleum-contaminated soil during the removal of the UST and dispensing system in August 2004. The site is undergoing Monitored Natural Attenuation and GW monitoring. This site encompasses approximately 1.1 acres. Addressed under RCRA Subtitle I. | Recommended actions from the 2012 GW report include continued GW monitoring. | Review of GW report (USACE, 2012). | Local | GW: benzene, ethylbenzene, MTBE, naphthalene | UST and piping leaked below ground surface, thus surficial soils are not contaminated. The bulk of contamination has been demonstrated to exist below the water table. The GW plume has been defined laterally. Additional releases are no longer a possibility at (the former) Building 629 and a significant portion of the contaminant source has been removed; therefore, contaminant levels are expected to remain steady, then decline with time. Soil samples collected from the bottom of the deep dispenser area excavation (seven ft below ground surface) indicate relatively low levels of contamination, suggesting that the soil removal was effective in removing the heaviest contamination at that location. There are no known completed exposure pathways. The extent of GW contamination appears be stable given the long investigative history of the site. Bioscreen models indicate steady-state conditions are achieved a short distance from the source areas. GW monitoring results from 2012 suggest that monitored natural attenuation is likely having an impact at the site. The drainage ditch (downgradient) is a potential GW receptor; however, surface water samples (from the ditch) have not contained petroleum constituents. The potential pathway exists, but no risk has been established since the ditch is not accessible; no ingestion or contact likely even if contamination was detected and low levels pose no volatilization risk. Whatever mechanism is responsible for the lack of contamination in the surface water, no risk is posed to human health or the environment by the intersection of the contaminant plume by the ditch. GW flow direction and detection of COCs indicate that the plume may be migrating north. However, if the plume is migrating to the north, the lack of COCs in the adjacent stream is curious and would suggest continued monitoring is necessary. | 2006. U.S. Army Corps of Engineers. Tier 2 Assessment Report for Building 629 Underground Storage Tank. MCAS Beaufort, SC. 6 April.<br><br>2012. U.S. Army Corps of Engineers. Semi Annual Groundwater Sampling Report 10 Building 629 December 2011 Event. MCAS Beaufort, SC. 30 June. |
| AOC K - Explosive Ordinance Disposal (EOD) Range | AOC-K is an EOD range originally comprised of a pit approximately 100 ft. in diameter, almost completely surrounded by a dirt embankment approximately 15 ft. high (original open detonation [OD] unit). The former pit area has been completely reconstructed under the supervision of SC DHEC. The OD unit is now comprised of an engineered unit including a 5.5-ft clay liner overlain by 10.5 ft. of compacted fill. The engineered OD unit is approximately 230-ft square at its perimeter. The base of the OD unit consists of clay compacted to obtain a vertical permeability of 1´ 10-6 cm/sec. The clay layer is a minimum of 5.5 ft. in thickness and is a 137 ft. by 137-ft square. Overlying the clay is a minimum of 10.5-ft thick layer of compacted fill. The top of the compacted fill is the detonation surface. The detonation surface is a 66-ft by 66-ft square area bounded within a bermed area of a 70-ft by 70-ft square. The berms surrounding the detonation surface are 8.5-ft high and constructed with a 2:1 slope. A roadway accessing the detonation surface was constructed within the western and northern side of the OD unit and breaches the berm on the northern side of the unit. The OD unit was modified in June 2013 (following SC DHEC approval of the design) to incorporate an improved ingress/egress ramp to the existing structure. In addition to the OD unit, two transportable burn units are located within the 20-acre EOD Range. The OD and open burning (OB) units are currently permitted as hazardous waste operations. The remainder of the EOD range is in use for military training. Unit regulated under R.61-79.264 (RCRA-regulated unit). Approximate time frame of use: circa 1965 - present. In use. | Corrective Action Required (Deferred) | [CH2MHill]. 2015. Figure II.L-4 SWMU and AOC Location Map. MCAS Beaufort, South Carolina. | Local | No Information Available | The site is located on the northern most part of the base and surrounded by forest. Dynamite, C-4 demolition charges, and trinitrotoluene demolition charges were authorized for use at the site. The site is presently in use and will require corrective action when closed. | 2011. Site Inspection Report for Munitions Response Program Sites Unexploded Ordnance 1 and 2. MCAS Beaufort, SC. 1 September.<br><br>2013. ARCADIS/Malcolm Pirnie. Range Environmental Vulnerability Assessment 5-Year Review. MCAS Beaufort, and the Townsend Bombing Range, GA. June.<br><br>[CH2MHill]. 2015. Figure II.L-4 SWMU and AOC Location Map. MCAS Beaufort, South Carolina. |

| Name of Site | Site Description | Current Status or Recommended Actions | Source of Status | Risk Classification | Constituents of Concern or Potential Concern | Risk Rational/Additional Site Information | Source of Primary Documents Used in the Evaluation |
|---|---|---|---|---|---|---|---|
| AOC L - Air Conditioner Filter Cleaning Facility | This facility is responsible for the cleaning of air conditioner filters for the Air Station. The activity includes wash tubs and tables within the building and racks, which are located outside the building, on a concrete pad. The drains from the wash tubs inside the facility terminate at the edge of the concrete pad; the waste stream flows into a sewer on the pad and into the sanitary treatment system. | NFA | [CH2MHill]. 2015. Figure II.L-4 SWMU and AOC Location Map. MCAS Beaufort, South Carolina. | Local | None Identified | NFA | [CH2MHill]. 2015. Figure II.L-4 SWMU and AOC Location Map. MCAS Beaufort, South Carolina. |
| AOC M - Generator | A large generator (USMC 262630) is stored on a concrete pad adjacent to Building 843. The unit is awaiting disposal. | NFA | [CH2MHill]. 2015. Figure II.L-4 SWMU and AOC Location Map. MCAS Beaufort, South Carolina. | Local | None Identified | NFA | [CH2MHill]. 2015. Figure II.L-4 SWMU and AOC Location Map. MCAS Beaufort, South Carolina. |
| AOC N - Product Storage Area | At this site, six to 10 green and white steel 55-gallon drums containing product oil and hydraulic fluid are stored next to Building 663. Below the drum spouts, a wooden trough, partially filled with oil-saturated "Speedy-Dri" is removed from the trough and disposed of as a hazardous waste. | NFA | Marine Corps Air Station Beaufort, SC SWMU Sites Status. Revision 1. Author Unknown. PDF. January, 2006. | Local | None Identified | NFA | Marine Corps Air Station Beaufort, SC. 2006. Revision 1. January. Author Unknown. PDF. |
| AOC O - Waste Disposal Area | This site is located about 200-300 ft west of the current firefighting training site (SWMU 18). It consists of two areas. The first is approximately 100 sq ft where the vegetation is highly stressed. The second is an area of several hundred square ft where various items are scattered about, including several electric motors and empty hazardous material containers. | NFA | [CH2MHill]. 2015. Figure II.L-4 SWMU and AOC Location Map. MCAS Beaufort, South Carolina. | Local | None Identified | NFA | [CH2MHill]. 2015. Figure II.L-4 SWMU and AOC Location Map. MCAS Beaufort, South Carolina. |
| AOC P - Suspect Disposal Area | AOC P is approximately 0.5 acres and is located 200 to 300 ft west of the active crash crew training area (SWMU 18). The site is currently wooded, and is not designated for a particular use by MCAS Beaufort. AOC P was originally identified during an RFA in 1986. Rusted and dented product containers (5-gallon and 55-gallon) were found scattered over the area. The RFA indicated that labels on containers indicated that they previously contained hazardous constituents; however, the types of hazardous constituents were not specified in the RFA, and no other information exists to identify those potential constituents. Inert material (construction debris) was also found onsite. | NFA | [CH2MHill]. 2015. Figure II.L-4 SWMU and AOC Location Map. MCAS Beaufort, South Carolina. | Local | None Identified | NFA | 2011. Tetra Tech. Sampling and Analysis Plan Confirmatory Sampling for Solid Waste Management Units 76, 86, 87, and Area of Concern P. MCAS Beaufort, SC. 1 September.<br><br>2015. CH2MHill. Figure II.L-4 SWMU and AOC Location Map. MCAS Beaufort, South Carolina.<br><br>2015. SC DHEC. Letter of Approval of a Confirmatory Sampling Report for Solid Waste Management Units 76, 86, 87, and AOC P from Laurel Petrus of SC DHEC RCRA Federal FAcilities to United States Marine Corps Air Station Commanding Officer NREAO Mr. William Drawdy. 29 September. |

| Name of Site | Site Description | Current Status or Recommended Actions | Source of Status | Risk Classification | Constituents of Concern or Potential Concern | Risk Rational/Additional Site Information | Source of Primary Documents Used in the Evaluation |
|---|---|---|---|---|---|---|---|
| AOC Q - Moore Street | Moore Street is located in an open field on the southeastern side of MCAS near the end of the runway. Approximately 0.4 miles southeast of the site flows Brickyard Creek. During a recent geotechnical investigation along the fence line at Moore Street, a petroleum odor was noted in two borings. The source of the odor was unknown. | NFA | Review of sampling event report (NAVFAC, 2015). | Local | None Identified | NFA | 2015. NAVFAC Southeast. Sampling Report for Moore Street, Solid Waste Management Unit 89, and Building 448. MCAS Beaufort, SC. February.<br><br>2015. SC DHEC. Letter of Approval for Sampling Report for AOC Q (Moore Street) Solid Waste Management Unit 89, and Building 448 from Laurel Petrus of SC DHEC RCRA Federal Facilities to United States Marine Corps Air Station Commanding Officer NREAO Mr. William Drawdy. 17 June.<br><br>2017. SC DHEC. No Further Action Letter for AOC Q (Moore Street) from Laurel Petrus of SC DHEC RCRA Federal Facilities Section to United States Marine Corps Air Station Commanding Officer NREAO Mr. William A. Drawdy. 2 February. |
| Building 603 | JP-5 release. | NFA | "POL Sites: MCAS Beaufort." Figure Provided by NMCPHC. Date Unknown. PDF File. | Local | None Identified | NFA | "POL Sites: MCAS Beaufort." Figure Provided by NMCPHC. Date Unknown. PDF File. |
| Building 1040 | Gasoline/diesel release. The site is located adjacent to the airfield. | NFA | "POL Sites: MCAS Beaufort." Figure Provided by NMCPHC. Date Unknown. PDF File. | Local | None Identified | NFA | "POL Sites: MCAS Beaufort." Figure Provided by NMCPHC. Date Unknown. PDF File.<br><br>2007. SC DHEC. No Further Action Letter for Building 1040 from Susan Block of SC DHEC Bureau of Land and Waste Management to Marine Corps Air Station Commanding Officer NREAO William A. Drawdy. 17 May. |
| Boresight Range | Used to sight in exterior mounted gun pods for F-4 and A-4 aircraft. This range is inactive but not closed; it is in an operational training area and is used as a gun jam clearing area. This historical use area has been inactive for over 15 years. Located near the operational pistol range in the northeastern portion of MCAS Beaufort. Approximate time frame of use 1957 - 1992. | No recommendations were provided in the 5-Year Range Environmental Vulnerability Assessment (REVA) Review. The range is inactive but not closed. | Review of the 5-Year REVA Review (ARCADIS/Malcolm Pirnie, 2013). | Local | Not evaluated. | The site is located in the northeastern corner of the base. The Boresight Range was determined to be a historical use area during the baseline. A historical use area refers to formerly used areas that lie within a designated operational range area. The Boresight Range was determined to cause no immediate threat to human health during the baseline since it was a historical use area that had not been used in numerous years (over 15) and there was no information regarding historical munitions usage or other information about the range. | 2011. Tetra Tech. Site Inspection Report for Munitions Response Program Sites Unexploded Ordnance 1 and 2. MCAS Beaufort, SC. 1 September.<br><br>2013. ARCADIS/Malcolm Pirnie. Range Environmental Vulnerability Assessment 5-Year Review. MCAS Beaufort and the Townsend Bombing Range, GA. June. |

| Name of Site | Site Description | Current Status or Recommended Actions | Source of Status | Risk Classification | Constituents of Concern or Potential Concern | Risk Rational/Additional Site Information | Source of Primary Documents Used in the Evaluation |
|---|---|---|---|---|---|---|---|
| Building 448 | Building 448 is located to the east of the runway at the end of Iwate Maru Rd. The site is within a small fenced area that encircles the communications tower. A diesel spill occurred when a small day tank within building 448 was overfilled due to a faulty high level shutoff. The diesel fuel flowed onto the floor and then into the soil on the east side of the building. The date of the spill could not be identified from the reports available. Two excavation events were conducted on the site including confirmation sampling; the second was conducted on March 6, 2012. | NFA | Review of sampling event report (NAVFAC, 2015). | Local | None Identified | NFA | 2015. NAVFAC Southeast. Sampling Report for Moore Street, Solid Waste Management Unit 89, and Building 448. MCAS Beaufort, SC. February.<br><br>2015. SC DHEC. Letter of Approval for Sampling Report for AOC Q (Moore Street) Solid Waste Management Unit 89, and Building 448 from Laurel Petrus of SC DHEC RCRA Federal Facilities to United States Marine Corps Air Station Commanding Officer NREAO Mr. William Drawdy. 17 June. |
| Crash Site | JP-5 release. | NFA | "POL Sites: MCAS Beaufort." Figure Provided by NMCPHC. Date Unknown. PDF File. | Local | None Identified | NFA | "POL Sites: MCAS Beaufort." Figure Provided by NMCPHC. Date Unknown. PDF File. |
| Former Boresight Range | Approximate time frame of use circa 1945. Location of combat aircraft loading area. | Corrective action required (Deferred) | Identified in Site Inspection Report (2011). | Data Gap | No Information Available | Further documentation on the site was not identified during the PHR. This range is located proximate to the airfield and cannot be addressed at this time. It will require corrective action when the airfield is closed. | 2011. Tetra Tech. Site Inspection Report for Munitions Response Program Sites Unexploded Ordnance 1 and 2. MCAS Beaufort, SC. 1 September. |
| Former Pistol Range | Approximate time frame of use: 1945 - 1948. Location of combat aircraft loading area. | Corrective action required (Deferred) | Identified in Site Inspection Report (2011). | Data Gap | No Information Available | Further documentation on the site was not identified during the PHR. This range is located proximate to the airfield and cannot be addressed at this time. It will require corrective action when the airfield is closed. | 2011. Tetra Tech. Site Inspection Report for Munitions Response Program Sites Unexploded Ordnance 1 and 2. MCAS Beaufort, SC. 1 September. |
| Former Skeet Ranges | Approximate time frame of use: 1945 - 1948. Location of combat aircraft loading area. | Corrective action required (Deferred) | Identified in Site Inspection Report (2011). | Data Gap | No Information Available | Further documentation on the site was not identified during the PHR. This range is located proximate to the airfield and cannot be addressed at this time. It will require corrective action when the airfield is closed. | 2011. Tetra Tech. Site Inspection Report for Munitions Response Program Sites Unexploded Ordnance 1 and 2. MCAS Beaufort, SC. 1 September. |
| Gas Chamber | Approximate time frame of use circa 1945. Building 154 was reportedly a gas chamber (1960s) that was used in conjunction with the activities of the Naval Air Station. However, no gas chamber was listed with Public Works at this building. The building no longer exists. An interview with personnel at the Air Station revealed that a wooded area near the picnic area was also used for chemical training. The gas chamber was described as a tent gas chamber located in the wooded area south of Geiger Blvd. However, there is no documentation placing the exact location of this reported training area. This area, identified as "disposal area" or "dump area" on maps is currently SWMU 2. To date, it is not known what activities were performed at this site. Building 2090 was identified during the PHR as a CBRN GAS CHAMBER. Currently, the wooded area is an Installation Restoration Program (IRP) Site. | Unknown | Identified in Site Inspection Report (2011). | Local | None (See SWMU 2 for additional information on site location) | No gas chamber was listed with Public Works at Building 154. This site has been surveyed for contamination (at SWMU 2); however, no contaminants suspected to have been used at the gas chamber have been found to date. | 2011. Tetra Tech. Site Inspection Report for Munitions Response Program Sites Unexploded Ordnance 1 and 2. MCAS Beaufort, SC. 1 September. |

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| Small Arms/Indoor Pistol Range | Approximate time frame of use circa 1960s to early 1970s. The building is used in conjunction with operations at the current Pistol Range. The Pistol Range is located in the northeastern portion of MCAS Beaufort near the historical use Boresight Range. The Pistol Range commenced operations in 1959 and was refurbished in 2003. It is equipped with 12 firing lanes and an earth backstop berm. Concrete walls and overhead baffles with a ballistic canopy keep projectiles from escaping the range. The range impact berm is mined as needed (typically once every 5 to 6 years); the most recent such event occurred in 2010 and included a reconstruction of the berm. | Site specific recommended actions were not discussed in the 5-Year Review (2013). REVA recommended action guidelines based on the evaluation ranking results and include considering, identifying, and implementing best management practices, if necessary, and sampling appropriate media (GW, surface water, and/or soil). | Review of the 5-Year REVA Review (ARCADIS/Malcolm Pirnie, 2013). | Local | GW: Lead<br>Surfacewater: Lead | The Pistol range is located in the northeastern corner of the base surrounded by forested areas. The surfacewater and GW rankings for the Pistol range were determined to be moderate. A moderate ranking indicates that there is a potential for lead migration to a receptor, but probably not as an immediate threat to human health and the environment. Actions may be necessary to mitigate future concerns. There are no known human receptors that are likely to be adversely affected from potential migration in surface water/sediment. There are no known human receptors for GW potentially impacted by the ranges at MCAS Beaufort because the installation obtains its drinking water from the Beaufort-Jasper water & Sewer Authority. The only known GW receptor pathway would be the discharge of GW from the surficial aquifer into the surface water bodies in the area of MCAS Beaufort. | 2011. Tetra Tech. Site Inspection Report for Munitions Response Program Sites Unexploded Ordnance 1 and 2. MCAS Beaufort, SC. 1 September.<br><br>2013. ARCADIS/Malcolm Pirnie. Range Environmental Vulnerability Assessment 5-Year Review. MCAS Beaufort, and the Townsend Bombing Range, GA. June. |
| Nuclear, Biological, Chemical (NBC) Training Area | Utilized to train Marines in the proper use of gas masks. O-chlorobenzalmalononitrile (CS agent) is used as a training tool. No munitions containing indicator munitions constituents (MC) had been expended in the area. Building 2090 was identified during the PHR as a CBRN GAS CHAMBER. | Unknown | Identified in the 5-Year REVA Review (ARCADIS/Malcolm Pirnie, 2013). | Local | No Information Available | No records were located indicating NBC materials were ever used or stored at MCAS Beaufort. The NBC Training Area did not use munitions containing munitions constituents. | 2011. Tetra Tech. Site Inspection Report for Munitions Response Program Sites Unexploded Ordnance 1 and 2. MCAS Beaufort, SC. 1 September.<br><br>2013. ARCADIS/Malcolm Pirnie. Range Environmental Vulnerability Assessment 5-Year Review. MCAS Beaufort, and the Townsend Bombing Range, GA. June. |
| Release 5 - Station Fuels UST (UST 46 & 47) | Release 5 is located at the corner of Moore Street and Rutledge Street. The site is a filling station for military vehicles. A leaking fuel transfer line was reported to the State in February 2001. Repairs to the transfer line were subsequently made. Contamination is present along dispensing lines adjacent to removed UST 770 (Mogas) and along active diesel dispensing line coming from UST 771 (diesel). | Long-term GW Monitoring | Review of GW report (USACE, 2014). | Local | GW: benzene, lead, MTBE, naphthalene, toluene<br>Soil: benzene | Although a contaminant plume persists, it does not appear to be migrating away from the source or high concentration areas. Monitoring wells to the west (direction of GW flow) remain contaminant free. Based on the results from the July 2014 sampling event, natural attenuation appears to be impacting the contaminant concentrations. Downgradient detections may indicate a shift in the center of the MTBE mass away from the source area. The detection of lead in excess of the RBSL is likely the result of high turbidity. The extent of GW contamination has been defined laterally and vertically. A filling station was identified at the site but no other buildings immediately downgradient of the plume were identified. A Public Works (PW) Administration Building is upgradient of the site (<100 ft). Tank leaked below ground surface, thus surficial soils are not contaminated. Sources onsite are unlike to have migrated to the salt marsh due to slow GW flow rates and intrinsic attenuation factors. Fate and transport models indicate contamination will not reach tidal creek. No exposure points exist that could realistically be impacted by site contamination. There are no known completed exposure pathways. | 2003. U.S. Army Corps of Engineers. Tier 1 Assessment Report Station Fuels Underground Storage Tank. MCAS Beaufort, SC. 20 August.<br><br>2007. U.S. Army Corps of Engineers. Tier 2 Assessment Report for Station Fuels Underground Storage Tank. MCAS Beaufort, SC. 31 December.<br><br>2008. SC DHEC. No Further Action Letter for USTs #46 and #47 (Release 5-Station Fuels UST) from Denise Place of SC DHEC UST Regulatory Assistance Program to Commanding Officer NREAO William A. Drawdy. 27 August.<br><br>2014. U.S. Army Corps of Engineers. Annual Groundwater Sampling Report. MCAS |
| Release 7 | Aviation gas (AVGAS) release. Terminus of C street at runway (in front of firehouse). | NFA | Identified in Initial Assessment Report (2009). | Local | None Identified | NFA | 2009. U.S. Army Corps of Engineers. Initial Assessment Report for Release 7. MCAS Beaufort, SC. 30 June. |

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| Skeet Range | Used for recreational purposes. Approximate time frame of use: 1963 - present. In use. | Site is inactive and used for recreational purposes. | Identified in the 5-Year REVA Review (ARCADIS/Malcolm Pirnie, 2013). | Data Gap | No Information Available | The Skeet Range was not assessed during the baseline assessment due to recreational use only. Further site documentation was not identified during the PHR. The Site is inactive. | 2011. Tetra Tech. Site Inspection Report for Munitions Response Program Sites Unexploded Ordnance 1 and 2. MCAS Beaufort, SC. 1 September.<br><br>2013. ARCADIS/Malcolm Pirnie. Range Environmental Vulnerability Assessment 5-Year Review. MCAS Beaufort, and the Townsend Bombing Range, GA. June. |
| SWMU 1 (also part of UXO 1) - Fenced Hazard Area (Former Landfill) | Located on an unnamed island in a marsh that drains to Albergotti Creek and is connected to the mainland by a manmade causeway accessible from Lafrene Road. The use of this site is unknown and although the RFA indicated the site was reportedly used as a land disposal area for "radioactive hazards and toxic chemical agents," it is believed the site may have been used as a NBC training area based on warning signs labeled "Gas" and "Atom" present at the western boundary. Reportedly, chemical training took place in the wooded area near the picnic area (dump area). However, no records have been located indicating nuclear, biological, or chemical materials ever being used or stored at MCAS Beaufort. This SWMU has been transferred to the Military Munitions Response Program. Approximate size is 0.8 acres. Period of operation: 1960 - 1970's. | Corrective measure implementation is ongoing | Review of RCRA facility investigation report and final munitions response report (USACE 2003 and Tetra Tech 2014). | Data Gap | GW: antimony, arsenic, chromium, nickel, thallium<br>Sediment: benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, dibenzo(a,h)anthracene, indeno(1,2,3-cd)pyrene, benzo(k)fluoranthene, carbazole, chrysene, dibenzofuran, fluoranthene, naphthalene, arsenic, chromium, lead<br>Subsurface Soil: arsenic, chromium, nickel<br>Surface Soil: 4,4-DDD, 4,4-DDT, antimony, arsenic, benzene, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, cadmium, carbazole, chlordane, chromium, chrysene, dibenzo(a,h)anthracene, endrine ketone, heptachlor, indeno(1,2,3-cd)pyrene, lead, mercury, nickel, PCB-Arochlor 1254 | Corrective measure implementation is ongoing | 2003. U.S. Army Corps of Engineers. RCRA Facility Investigation for Solid Waste Management Units 1 and 2. MCAS Beaufort, SC. 1 May.<br><br>2011. Tetra Tech. Site Inspection Report for Munitions Response Program Sites Unexploded Ordnance 1 and 2. MCAS Beaufort, SC. 1 September.<br><br>2014. Tetra Tech. Final Munitions Response After Action Report Munition and Explosives of Concern Remedial Investigation/RCRA Facility Investigation at Unexploded Ordnance 1 (UXO 1) and Unexploded Ordnance 2 (UXO 2). MCAS Beaufort, SC. 1 December. |

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| SWMU 2 (also part of UXO 1) - Lafrene Road Landfill | Landfill that consisted of two separate areas on an unnamed island about 400 ft. east of Lafrene Road in a marsh that drains to Albergotti Creek. Wastes included domestic trash, garbage, sewage sludge, contaminated jet fuel, motor and lube oils, hydraulic fluids, antifreeze, spent solvents, empty pesticide containers, cleaning rags, oil cans and filters, paint thinners, paint brushes, paint rollers, rags, mercury amalgam, asbestos breaks and sewage treatment plant sludge. Landfill operations were initiated in a borrow pit that had been used to supply fill dirt to the base. The pit was filled with trash and other wastes, including liquids in 55-gallon drums. A bulldozer flattened drums near the edge of the pit and the liquid waste ran onto the ground surface. The soil receiving the liquid waste and crushed drums were then pushed into the pit. Wastes in the pit were burned approximately once per week without the use of additional fuel. Waste and construction debris were also pushed out over the edge of the island, thereby extending the boundary of the island into the marsh. During a 2010 Site Inspection, an Aircraft Bomb Rack identified as a Triple Ejection Rack was located on the ground surface. This SWMU has been transferred to the Military Munitions Response Program. Approximate size 2 acres. Period of operation: 1958 - 1965. | Corrective measure implementation is ongoing | Review of RCRA facility investigation report and final munitions response report (USACE, 2003 and TT, 2014). | Data Gap | GW: antimony, arsenic, chromium, nickel, thallium<br>Sediment: arsenic, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, carbazole, chromium, chrysene, dibenzo(a,h)anthracene, dibenzo(a,h)anthracene, dibenzofuran, fluoranthene, indeno(1,2,3-cd)pyrene, lead, naphthalene<br>Subsurface Soil: arsenic, chromium, nickel<br>Surface Soil: 4,4-DDD, 4,4-DDT, alpha-chlordane, antimony, arsenic, benzene, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, cadmium, carbazole, chlordane, chromium, chrysene, dibenzo(a,h)anthracene, di-n-butylphthalate, endrine ketone, gamma-chlordane, heptachlor, indeno(1,2,3-cd)pyrene, lead, mercury, nickel, PCB-Arochlor 1254, | Corrective measure implementation is ongoing | 2003. U.S. Army Corps of Engineers. RCRA Facility Investigation for Solid Waste Management Units 1 and 2. MCAS Beaufort, SC. 1 May.<br><br>2011. Tetra Tech. Site Inspection Report for Munitions Response Program Sites Unexploded Ordnance 1 and 2. MCAS Beaufort, SC. 1 September.<br><br>2014. Tetra Tech. Final Munitions Response After Action Report Munition and Explosives of Concern Remedial Investigation/RCRA Facility Investigation at Unexploded Ordnance 1 (UXO 1) and Unexploded Ordnance 2 (UXO 2). MCAS Beaufort, SC. 1 December. |
| SWMU 3 - Borrow Pit Landfill | SWMU 3 is located in the southern portion of the base. A borrow pit located about 200 ft south of the sewage treatment plant was used as landfill for about one year (from 1957 to 1958) for domestic trash and garbage, contaminated jet fuel (mostly JP-4), waste motor and lube oils, hydraulic fluids, antifreeze, spent nonchlorinated solvents (mineral spirits, methyl ethyl ketone, toluene, and Freon), empty pesticide containers, cleaning rages, oil cans and filters, paint spray booth filters, paint thinners and strippers, paint brushes, paint rollers, rags, mercury amalgam, asbestos brakes. Drummed wastes were reportedly punctured, allowed to drain, and then crushed. Wastes in the pit were reportedly burned weekly. Approximate size of 0.4 - 6 acres. Period of operation: 1957 - 1958, however aerial photographs from 1965, 1972 and 1979 suggest a much larger area. | Recommended actions from the 2006 RFI report include preparation of a CMS, GW monitoring, stabilization of the site, removal of trash, and collection of more soil samples. | Review of the RFI report (Tetra Tech, 2006). | Local | COCs:<br>GW: arsenic, iron, vanadium<br><br>COPCs:<br>GW: 1,4-dichlorobenzene, aluminum, arsenic, chlorobenzene, chloroform, chromium, iron, manganese, mercury, vanadium<br>Sediment: antimony, aroclor-1260, benzo(a)pyrene, benzo(b)fluoranthene, copper, iron, manganese<br>Soil to GW: aluminum, antimony, aroclor-1248, aroclor-1254, aroclor-1260, benzaldehyde, cadmium, chromium, chromium, cobalt, delta-BHC, dieldrin, iron, lead, manganese, methylene chloride, phenanthrene<br>Subsurface Soil: aluminum, vanadium<br>Surface Soil: aroclor-1248, aroclor-1260, cadmium, iron, vanadium<br>Surfacewater: iron, manganese, vanadium | Potential cancer risks and HIs were calculated for current/future adolescent trespassers and base/facility maintenance workers and future construction workers, industrial workers, recreational users (child/adult), and on-site residents (child/adult). Risk estimates developed for receptor exposure to COPCs in soil, surface water and sediment do not exceed EPA benchmarks for cancer or non-cancer risk. However, noncarcinogenic and carcinogenic risk estimates developed for the hypothetical future resident exposed to COPCs in GW do exceed EPA cancer and non-cancer risk benchmarks and were due primarily to exposure arsenic and 1,4-dichlorobenzene. The risk estimates were subject to a number of significant uncertainties including the presence of turbidity (suspended particulate matter) in the GW sample and consequently, the risks due to ingestion of GW may be overestimated. No link has been identified between landfill sampling results and marsh sediment and surface water sampling results. However, some environmental impact was identified in the marsh sediments. No surface water was identified within the site. NFA at SWMU 3 may be warranted; however, in light of SWMU 3 being a former landfill, GW monitoring using the well installed during the RFI is recommended. No maximum surface or subsurface soil concentration exceeded the SSL (inhalation of particulates or VOCs emanating from surface and subsurface soils); therefore, a quantitative analysis of the inhalation exposure pathway was not performed. The potential for the migration of contaminants from soil to GW indicated that there were a few chemicals detected in the soil with the potential to adversely impact the GW. However, the chemicals were either not detected in the GW or were not detected in the soil frequently enough to indicate the presence of a source of contaminants. Consequently, migration of chemicals from the soil to the GW was considered to be insignificant. | 2006. Tetra Tech. Final RCRA Facility Investigation Report for Solid Waste Management Unit 3. Volume 1 of 2. MCAS Beaufort, SC. 1 November. |

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| SWMU 4 (also UXO 2) - Southeast Point Disposal Area | The site is located in the southeastern portion of the air station adjacent to Albergottie Creek. Small disposal area located approximately 200 ft east of Geiger Blvd near the fueling wharf. The area is identified by small piles of concrete and steel rubble that cover an area about 40 ft by 70 ft. Historical records are limited, but the site was used for a brief period from the late 1950s to early 1960s. Likely used for dumping of excess building materials and construction debris. Several munitions-related items (practice bombs) have been observed in the area (200 ft south of the SWMU 4 boundary). SWMU 4 investigation area occupies approximately two acres. This SWMU has been transferred to the Military Munitions Response Program. | NFA | Review of RFI report (USACE, 2000) and Review of SI report (2011). | Local | None Identified | NFA | 2000. U.S. Army Corps of Engineers. Final RCRA Facility Investigation Findings Report for Solid Waste Management Unit 4. MCAS Beaufort, SC. 1 December.<br><br>2011. Tetra Tech. Site Inspection Report for Munitions Response Program Sites Unexploded Ordnance 1 and 2. MCAS Beaufort, SC. 1 September.<br><br>2014. Tetra Tech Inc. Final Munitions Response After Action Report Munition and Explosives of Concern Remedial Investigation/RCRA Facility Investigation at Unexploded Ordnance 1 (UXO 1) and Unexploded Ordnance 2 (UXO 2). MCAS Beaufort, SC. 1 December.<br><br>2015. Tetra Tech. Corrective Measures Study Report for Munitions Response Program Unexploded Ordnance 2 (UXO 2). MCAS Beaufort, SC. 1 March. |
| SWMU 5 - Pesticide Residue Pit Area | Consists of two areas used for disposal of pesticide and herbicide rinsate. The first is a ground area that was used for pesticide rinsate disposal as a result of pesticide storage and mixing in Building 617 (demolished in 1979). The second is a small gravel pit located at the northwestern corner of the former pest control shop. This pit consisted of a small gravel-filled hole about 3 ft in diameter and 3 ft deep. The ground area is adjacent to the gravel pit. Pesticides included Baygon, chlordane, diazinon, dalapon, diuron, dursban, mirex, ureabor, malathion, and possibly DDT. Wastes disposed are primary pesticide containers and equipment rinsate. Excavation and disposal for soils and monitored natural attenuation with Land Use Controls for the GW was implemented in 2011. Approximate size: Ground Area: 10 ft by 20 ft ; Pit: 3 ft diameter, 3 ft deep. Period of operation: 1956 - 1972 and 1972 -1979. Requires land use controls. | Recommended actions from the 2015 GW report include continued GW monitoring. | Review of GW report (2015). | Local | COCs:<br>GW: arsenic, tetrachloroethene<br><br>COPCs:<br>GW: arsenic, benzene, beryllium, chloroform, iron, manganese, naphthalene, VI, tetrachloroethene, trichloroethene<br>Soil to GW: 2,4-D, alpha-chlordane, benzaldehyde, chloride, chromium, cobalt, dieldrin, gamma-chlordane, methylene pentachlorophenol,<br>Subsurface Soil: aroclor-1260, aluminum, iron, vanadium<br>Surface Soil: aroclor-1260, iron | Results of the August 2014 GW monitoring event indicate the concentration of tetrachloroethene (6.3 ug/L) in one sample exceeded the SC and US EPA MCL of 5 ug/L. No other analytes were detected at concentrations exceeding the SC MCL, US EPA MCL, or US EPA Tapwater RSL. A total of 177.15 tons of soil were removed from the excavation and confirmation samples indicated (soil) cleanup activities were complete (in 2011). Land use controls, including signage and administrative controls have been enacted at the site. The concentrations of contaminants in post-excavation samples (collected following the excavation in 2006 of the rinsate pit drum and concrete pad) indicated that additional excavation was required; therefore, the results of the post-excavation samples were not considered in the (human health) risk evaluation. Due to the very high concentrations of chlordane, additional remediation was required (and completed in 2011). Potential cancer risks and HIs were calculated for current/future base maintenance workers, industrial workers, construction workers, adolescent trespassers, hypothetical future child/adult recreational users, and child/adult on-site residents. Noncarcinogenic and carcinogenic risk estimates developed for the hypothetical future resident exposed to COPCs in GW exceed US EPA cancer and noncancer risk benchmarks. These elevated risk estimates were due primarily to exposure to PCE and arsenic in GW. Cumulative His and ILCRs for future residents exposed to COPCs from VI were less than 1 and within US EPA target risk range, respectively. Industrial workers would also be expected to be within acceptable levels. Those chemicals exceeding the SSLs were either not detected in GW or were not detected in soil frequently enough to indicate the presence of a significant residual source of contamination. No organic contaminants were detected at significant concentrations in a surface water sample taken from a ditch discovered north and downgradient. | 2008. Tetra Tech. RCRA Facility Investigation Report for Solid Waste Management Unit 5 Former Pesticide Rinsate Pit. Volume 1 of 2 Text. MCAS Beaufort, SC. 1 February.<br><br>2010. Tetra Tech. Corrective Measures Study for Solid Waste Management Unit 5. MCAS Beaufort, SC. 1 April.<br><br>2012. Shaw Environmental. Final Completion Report for Removal Actions at Solid Waste Management Units 5 and 12. MCAS Beaufort, SC. 1 August.<br><br>2015. Resolution Consultants. Transmittal Form and Attached Final 7th Quarterly Groundwater Monitoring Report Solid Waste Management Unit 5 (SWMU 5) Long Term Monitoring. MCAS Beaufort, SC. 12 January. |

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| SWMU 6 - Inert Landfill Seepage Trenches | Liquid and slurry wastes were disposed in 10 to 12 separate seepage trenches which covered a total area of approximately 0.9 acres and were located near the northeastern and southeastern corners of the Inert Landfill (SWMU 14). Each trench, which was about 15 ft wide, 50 ft long, and 4 ft deep, was used until seepage of the contaminated liquids (i.e., fuel, lube oils, hydraulic fluids, solvents) into the soil was no longer effective. The trenches received contaminated jet fuels (primarily JP-4 until 1969, then JP-5), waste motor oils, lube oils, hydraulic fluids, antifreeze, spent solvents (primarily PD-680, mineral spirits, methyl ethyl ketone [MEK], and Freon), and strippers (sodium hydroxide). In addition, the trenches were used for the disposal of grit and grease from the Air Station's sewage treatment plant (estimated 23,000 cubic ft). While the use of the trenches for industrial waste was terminated in 1979, disposal of grit and grease (initiated in 1978) continued until 1985. The IAS reported that an estimated 400,000 gallons of liquid wastes were dumped into the trenches during the period of operation. Approximate size is 0.9 acres. Period of operation: 1966 - 1985. | Corrective action required [CH2MHill 2015]. A CMS work plan was completed and reviewed (Tetra Tech 2012). The CMS was identified but not reviewed during the PHR. | [CH2MHill]. 2015. Figure II.L-4 SWMU and AOC Location Map. MCAS Beaufort, South Carolina. | Local | COCs:<br>GW: 1,1-dichloroethane, 1,2-dichloropropane, 1,4-dichlorobenzene, 1,4-dioxane, aldrin, alpha-BHC, arsenic, benzene, beryllium, beta-BHC, chloride, chromium, delta-BHC, dieldrin, epoxide, heptachlor iron, manganese, vinyl<br><br>COPCs:<br>GW: 1,1-dichloroethane, 1,2,4-trimethylbenzene, 1,2-dichloroethane, 1,2-dichloropropane, 1,3,5-trimethylbenzene, 1,4-dichlorobenzene, 1,4-dioxane, aldrin, alpha-BHC, aluminum, arsenic, barium, benzene, beryllium, beta-BHC, cadmium, calcium, chloride, chromium, cobalt, copper, delta-BHC, dichlorodifluoromethane, dieldrin, epoxide, ethylbenzene, heptachlor, iron, lead, manganese, mercury, naphthalene, nickel, selenium, sodium, thallium, trichloroethene, vanadium, vinyl, zinc<br>Subsurface Soil: 1,2,4-trimethylbenzene, 1,2-dibromoethane, 1,4-dichlorobenzene, acetone, antimony, arsenic, cadmium, chloride, chromium, lead, mercury, methylene, naphthalene, nickel, silver, toluene, zinc<br>Surface Soil: arsenic, mercury, methylene chloride<br>Surfacewater: 1,2-dichlroethene, aluminum, calcium, iron, manganese, sodium, zinc<br>VI: 1,1-dichloroethane, benzene, chloride, dichlorodifluoromethane, vinyl | The site is located in the southeast corner and is located in a heavily wooded area. The area is undeveloped, and there are currently no plans for future development. Training exercises may occasionally utilize the unpaved roads and adjacent lands. No COPCs were detected in marsh sediment samples. For both Phase I and Phase II RFI, all (construction workers) HIs are less than 1, indicating that adverse noncarcinogenic health effects are not anticipated under the defined exposure conditions. All (construction worker) ILCRs are less than 1x10-6, the lower limit of the US EPA target risk range. All HIs for hypothetical child and adult residents using the Phase I RFI GW data exceed 1, indicating that adverse noncarcinogenic effects are anticipated under the defined exposure conditions. However, when the Phase II RFI GW data are used, adverse noncarcinogenic effects are only anticipated for the child resident under the RME. All individual target organ HIs for the adult resident under the RME and central tendency exposure (CTE) and the child resident under the CTE are less than 1. With the exception of the Phase II RFI ILCR for the adult resident and the Phase I RFI ILCR for the child resident under the CTE, ILCRs for hypothetical residents exceed 1x10-4, the upper limit of the US EPA target risk range. The Phase II ILCRs for the child resident are slightly greater than the Phase I ILCRs, while the Phase II ILCRs for the adult resident are slightly lower than the Phase I ILCRs. Exposures from VI were not evaluated in the Phase I RFI because no COPCs were identified for this exposure pathway. | 1992. ABB Environmental. Final Expanded Site Inspection and Site Inspection. MCAS Beaufort, SC. 1 June.<br><br>2003. U.S. Army Corps of Engineers. RCRA Facility Investigation for Solid Waste Management Units 6 and 14 seepage Trenches and Inert Landfill. MCAS Beaufort. 1 June.<br><br>2012. Tetra Tech. Phase 2 RCRA Facility Investigation Letter Report for Solid Waste Management Units 6 and 14. MCAS Beaufort. SC. 1 May.<br><br>2012. Tetra Tech. Corrective Measures Study Work Plan for Solid Waste Management Units 6 and 14. MCAS Beaufort, SC. 1 July.<br><br>[CH2MHill]. 2015. Figure II.L-4 SWMU and AOC Location Map. MCAS Beaufort, South Carolina. |

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| SWMU 7 - UST 13 - Day Tanks | Located in the south-central portion of MCAS Beaufort, north of the intersection of Simpson Street and Kimes Avenue. The facility consists of two 210,000-gallon-capacity jet fuel (JP-4 and JP-5) storage tanks (Tank 551 and 865), one cut-and-cover earth-mounded tank, the other an above ground storage tank, a defueling storage tank, a fuel filtration system, an oil/water separator, and associated piping. The tanks have stored JP-4 and JP-5. An 8-inch diameter underground pipeline delivers fuel between the Day Tanks and the Fueling Pier (UST 9). Two other 8-inch pipelines extend to the rapid refueling pits adjacent to the flight line and dispensers located approximately 300 ft to the southwest. Several historical spills resulting in the release of more than 150,000 gallons of jet fuel have been documented between 1957 and 1993. Active (multi-phase extraction systems) and passive systems (absorbent socks) have been used to recover hydrocarbons at the site and the site is undergoing GW monitoring. The site is currently in operation, encompasses approximately 1.19 acres. Addressed under the SC Pollution Control Act. | Recommended actions from the 2012 semi-annual GW report include monitoring and recovery be continued of light non-aqueous phase liquid (LNAPL) by utilizing absorbent socks. | Review of semi-annual GW report (2012). | Local | GW: 1-methylnaphthalene, 2-methylnaphthalene, benzene, naphthalene, PAHs | An multi-phase extraction (MPE) system was installed in the spring of 2005. Approximately 744 pounds of hydrocarbons as LNAPL and an additional 535 pounds of hydrocarbons were recovered in the aqueous and vapor phase prior to the shutdown of the system in May 2006. A passive recovery system was implemented immediately upon shutdown of the MPE system and includes the installation of hydrophobic oil sorbent socks. Monitored natural attenuation along with the current LNAPL recovery program utilizing absorbent socks seems to be an appropriate remedy for the site. The contaminant plume has remained stable, and the MNA geochemical parameter data suggests that biodegradation is occurring. The horizontal and vertical extent of existing GW contamination exceeding regulatory limits or RBSLs is small. The migration of contaminants into the deeper Floridan aquifer is not occurring as indicated by analytical results of GW. Contaminants in GW have migrated less than 200 ft from the tanks in 26 years (the amount of time since the most severe releases occurred). Future site use will remain the same. Contamination at the site poses a relatively low risk of migration to potential receptors. The shallow aquifer beneath the site is limited in vertical extent and has no present or future potential for use as a potable GW resource. Contaminant attenuation due to natural degradation and slow desorption rates through the silt and clay-rich sediments have further limited the downgradient extent of migration. | 1996. ABB Environmental. Final Draft Contamination Assessment Report for Day Tanks 551 and 865. MCAS Beaufort, SC. Draft Acting as Final. 1 October.<br><br>2002. U.S. Army Corps of Engineers. Final Draft Annual Sampling Event 3 for Day Tanks 551 and 865. MCAS Beaufort, SC. 8 October.<br><br>2012. Tetra Tech. Final Semiannual Report for Long Term Monitoring and Light Non Aqueous Phase Liquid Recovery March 2012 Monitoring Event at Underground Storage Tank Sites 9 and 13. MCAS Beaufort, SC. 1 August. |
| SWMU 8 - Kavieng Street Landfill | The unit was formerly used as an unlined landfill. This landfill covered 0.6 acres and was used for a three-year period (1955-1957) during MCAS-Beaufort's expansion and reactivation. The landfill was eventually covered with dirt, and the site is now overgrown with brush and trees. Wastes reported to have been disposed of in the landfill include domestic trash, empty pesticide containers, contaminated cleaning rags, oil cans and filters, paint brushes, rollers and rags, paint spray booth filters, contaminated jet fuel (JP-4), waste motor and lube oils, hydraulic fluids, spent solvents, mineral spirits, paint thinners and strippers, mercury amalgam waste, used asbestos brakes, and sludge from the Air Station's Sewage Treatment Plant. Drums brought to the area were flattened with bulldozer and the liquid contents spilled onto the ground. The piled trash was periodically burned, and the residues, along with the crushed drums and soil containing the spilled liquids, were pushed over the bluff. The land was built up and the site was extended into the marsh. Approximate size is 2 acres. Period of operation: 1955 - 1957. Requiring land use controls. | Recommended actions from the 2014 statement of basis include maintaining the existing soil cover while also monitoring the GW and implementing land use controls on both soil and GW. | Review of the Statement of Basis report (2014). | Local | COPCs:<br>GW: barium, chloroform, iron, manganese<br>Soil to GW: manganese<br>Surface Soil: manganese | Laboratory results indicate there appears to be limited impact to subsurface soil and GW from past activities. Contamination has been adequately characterized at the site. The landfill has a sufficient soil covering that further prevents any contact with past contamination. Human health risk estimates developed for receptor exposure in soil and GW did not exceed EPA benchmarks for cancer or noncancer risk, except for iron in GW. However, the GW quality appears to be impacted by tidal waters of the adjacent marsh as evidence by its brackish/saline qualities. The potential for ecological impacts from site-related contaminants are considered low as concentrations in most samples were similar to background values. No significant health risks or impacts to the local community are anticipated with the proposed remedy under the current or likely future land use. The concentrations of all chemicals detected in soil were less than the inhalation SSLs. Therefore, risks associated with the inhalation pathway are considered insignificant and this pathway does not require further evaluation. Because there are no risks to receptors due to exposure to soil samples collected at the site (collected in drainage ways to evaluate potential migration to the marsh), there appears to be no possibility of the landfill having an adverse effect on the marsh. The GW data indicates that the marsh, not the landfill, has impacted the GW at the site. Consequently, sampling of surface water and sediment in the marsh is not warranted. | 2010. Tetra Tech. RCRA Facility Investigation at Solid Waste Management Unit 8. MCAS Beaufort, SC. 1 April.<br><br>2012. Tetra Tech. Final RCRA Corrective Measures Study for Solid Waste Management Unit 8. MCAS Beaufort, SC. 10 April.<br><br>2014. Tetra Tech. Statement of Basis for Solid Waste Management Unit 8 Kavieng Street Landfill. MCAS Beaufort, SC. 17 June. |
| SWMU 9 - Former Lube Oil Pit | The site is located adjacent to the 2nd Field Services Support Group Maintenance Area along DeLalio Avenue. The area is a sparsely overgrown field of approximately 1 acre. Within the area, an open concrete pit was used for changing vehicle motor oil and performing minor repair work. The pit, approximately 4 ft deep and wide enough to allow vehicles to straddle it, was built to service vehicles. This lube oil change pit was previously enclosed in a small concrete structure that was demolished in 1974. | NFA | [CH2MHill]. 2015. Figure II.L-4 SWMU and AOC Location Map. MCAS Beaufort, South Carolina. | Local | None Identified | NFA | [CH2MHill]. 2015. Figure II.L-4 SWMU and AOC Location Map. MCAS Beaufort, South Carolina. |
| SWMU 10 - Tank Bottom Sludges Disposal Area | The fueling station located on Reeds Avenue includes two 210,000-gallons fuel storage tanks (Structures 401 and 402). The tanks are built above ground with an earthen cover and are surrounded by an earthen containment berm. When installed in 1956, these steel tanks were used for storage of AVGAS, a fuel that contained tetraethyl-lead. In 1969, the contents of Tank 402 were replaced with JP-4. Tank 401 was used for AVGAS storage until 1977. In that year, the contents of Tank 401 were replaced with No.1 fuel oil. Sludges generated during cleaning of the tanks were disposed in the area surrounding Tanks 401 and 402. Releases include tank bottom sludges containing tetraethyl-lead. | NFA | [CH2MHill]. 2015. Figure II.L-4 SWMU and AOC Location Map. MCAS Beaufort, South Carolina. | Local | None Identified | NFA | [CH2MHill]. 2015. Figure II.L-4 SWMU and AOC Location Map. MCAS Beaufort, South Carolina. |

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| SWMU 11 - Former Ground Support Equipment Maintenance Area | Maintenance of Ground Support Equipment was performed in Building 857 from the late 1950s to 1983 and in Building 915 from 1983 to 1985. The areas around these buildings are designated as SWMU 11. A concrete pad, a sandy area, and a wooded area (covering approximately 0.4 acres) are located outside Building 857. This area was observed to be stained with black oily material by the Navy Assessment and Control of Installation Pollutants (NACIP) IAS team in October 1985. Unauthorized disposal of waste motor oils, lubricants, hydraulic fluids, solvents, and paint wastes reportedly occurred within area. Nearly 4,400 gallons of liquid wastes were disposed in this area. In addition, sand blast waste generated in Building 857 was also disposed on the soils outside this building. Some of the contaminated soil was reportedly removed from the site and disposed off-site in 1983, but considerable visual evidence of contamination still existed in October 1985. A 0.3 acre area partly covered by grass and asphalt surrounds Building 925. Period of operation is estimated as late 1950s to 1985. | NFA | [CH2MHill]. 2015. Figure II.L-4 SWMU and AOC Location Map. MCAS Beaufort, South Carolina. | Local | None Identified | NFA | [CH2MHill]. 2015. Figure II.L-4 SWMU and AOC Location Map. MCAS Beaufort, South Carolina. |
| SWMU 12 - Former Eastern Fire Training Pit | SWMU 12 is located in the central portion of the base. The site consists of two pits located approximately 300 ft apart and 200 ft west of the North Ulith Road extension. Both pits were reported to have been about 30 ft in diameter. The first pit, is located in a dirt area adjacent to, and south of, the concrete runway. There is no visible evidence of this pit. The northernmost of these pits was located on the former Naval Air Station concrete runway and was bermed to contain waste flammables used for burning. An estimated 15,400 gallons of waste flammables were burned annually in these pits. About 90 percent of the waste flammables burned in these pits was JP-4. This fuel was obtained by defueling jet aircraft The balance of wastes consisted of waste motor oils, contaminated jet fuel, and solvents. These wastes were generated at the aircraft maintenance hangers. In 2006, MCAS Beaufort began cutting back the wooded area bordering SWMU 12 to the west to improve the line of sight from the Air Operations Control Building and Tower. During this activity, remnants of seven severely corroded drums were identified in the formerly wooded areas. Period of operation: mid 1950s - late 1970s. | A CMS work plan was completed in 2012 and the CMS has not yet been completed. Recommended soil and GW corrective measures are expected to be monitored natural attenuation with long term monitoring and land use controls. | Review of CMS report and final completion report for removal actions (TT, 2012 and Shaw, 2012). | Local | COCs:<br>GW: 1,2-dibromo-3-chloropropane, arsenic, benzene, ethylbenzene, iron, toluene, total xylenes, vanadium<br><br>COPCs:<br>GW COPC: 1,2,4-trichlorobenzene, 1,2-dibromo-3-chloropropane, 2-methylnaphthalene, 3&4-methylphenol, alpha-BHC, arsenic, barium, benzene, chromium, ethylbenzene, iron, m+p-xylenes, manganese, naphthalene, o-xylenes, toluene, total xylenes, vanadium<br>Soil to Air: benzene, naphthalene, total xylenes<br>Soil to GW: 1,2,3,4,6,7,8-HPCDD, 1,2,3,7,8,9-HXCDD, benzaldehyde, benzene, chloride, chromium, cobalt, methylene<br>Subsurface Soil: 2-methylnaphthalene, benzene, naphthalene, total xylenes<br>Surface Soil: bis(2-ethylhexyl)phthalate, iron, vanadium<br>VI (via GW): benzene, isopropylbenzene, toluene | The site is located in the central portion of the base and is near the eastern end of an abandoned east-west runway. Risk estimates developed for receptor exposure to chemicals of potential concern in surface and subsurface soil do not exceed EPA benchmarks for cancer or noncancer risk. Noncarcinogenic and carcinogenic risk estimates developed for the hypothetical future resident exposed to COPCs in GW do exceed EPA cancer and noncancer risk benchmarks. Chemicals with maximum concentrations that exceeded screening levels based on migration to GW SSLs were either not detected in GW or were not detected in soil frequently enough to indicate the presence of a significant residual source of contamination. Cumulative HIs and ILCRs for future residents exposed to COPCs that have volatilized from GW and migrated through building foundations into indoor air were less than an HI of 1 and within the US EPA target risk range of 1x10-4 and 1x10-6, respectively. Risks for industrial worker would also be expected to be within acceptable levels because these receptors would be exposed to volatiles in indoor air on a less frequent basis than residential receptors. An interim corrective measure was completed in the fall of 2011 to excavate the soil sample locations that contained the highest COC concentrations reported in the RFI. A total of 328.97 tons of contaminated soil was removed. A small amount of contaminated subsurface soil could not be removed from around and beneath a buried power cable that powered the active flight line area.<br>Soil to GW COCs were not evaluated in the risk assessment, though benzene, ethylbenzene, naphthalene, toluene and total xylenes were listed as COCs in the Corrective Measures Work Plan. | 2008. Tetra Tech. Final RCRA Facility Investigation for Solid Waste Management Unit 12. Volume 1 of 2. MCAS Beaufort, SC. 1 August.<br><br>2012. Tetra Tech. Corrective Measure Study for Solid Waste Management Unit 12. MCAS Beaufort, SC. 1 February.<br><br>2012. Shaw Environmental. Final Completion Report for Removal Actions at Solid Waste Management Units 5 and 12. MCAS Beaufort, SC. 1 August. |
| SWMU 13 - Western Fire Training Pits | This site is located approximately 200 ft south of the present fire training pit SWMU 18 on and adjacent to an unused runway. Dimensions of the burn area are estimated to have been 15 ft by 100 ft A series of small, irregularly shaped shallow pits are adjacent to the runway. These were reported to be burn areas where firefighting training with small extinguishers occurred. This area was reportedly used for short periods both prior to and after the concrete pit at SWMU 12 was used. This site was estimated to have operated for two years. | NFA | [CH2MHill]. 2015. Figure II.L-4 SWMU and AOC Location Map. MCAS Beaufort, South Carolina. | Local | None Identified | NFA | [CH2MHill]. 2015. Figure II.L-4 SWMU and AOC Location Map. MCAS Beaufort, South Carolina. |

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| SWMU 14 - Inert Landfill | The inert landfill is located in the southeastern portion of MCAS-Beaufort. The unit is an uncontrolled, unlined landfill. Operations at this landfill were initiated in 1966. The total area used for solid waste disposed at this site was approximately 20 acres. Wastes disposed at the inert landfill included domestic trash, empty pesticide containers, contaminated cleaning rages, empty oil cans, used paint brushes, paint spray booth filters, used paint brushes, rollers and rags, mercury amalgam waste, used asbestos brakes and sludge. The disposal of trash and other solid waste continued until 1977, at which time use of the inert landfill was restricted to the disposal of construction debris, yard waste, and sludge from the Air Station's sewage treatment plant. Approximate size: 20 acres. Period of operation: 1966-1977; 1966-1981. | A CMS work plan was completed in 2012 and was reviewed. A CMS and MNA LTM work plan was identified but not reviewed during the PHR. | [CH2MHill]. 2015. Figure II.L-4 SWMU and AOC Location Map. MCAS Beaufort, South Carolina. | Local | COCs:<br>GW): 1,1-dichloroethane, 1,2-dichloropropane, 1,4-dichlorobenzene, 1,4-dioxane, aldrin, alpha-BHC, arsenic, benzene, beryllium, beta-BHC, chromium, delta-BHC, dieldrin, epoxide, heptachlor iron, manganese, vinyl chloride<br><br>COPCs:<br>GW: 1,1-dichloroethane, 1,2,4-trimethylbenzene, 1,2-dichloroethane, 1,2-dichloropropane, 1,3,5-trimethylbenzene, 1,4-dichlorobenzene, 1,4-dioxane, aldrin, alpha-BHC, aluminum, arsenic, barium, benzene, beryllium, beta-BHC, cadmium, calcium, , chromium, cobalt, copper, delta-BHC, dichlorodifluoromethane, dieldrin, epoxide, ethylbenzene, heptachlor heptachlor, iron, lead, manganese, mercury, naphthalene, nickel, selenium, sodium, thallium, trichloroethene, vanadium, vinyl chloride, zinc<br>Subsurface Soil: 1,2,4-trimethylbenzene, 1,2-dibromoethane, 1,4-dichlorobenzene, acetone, antimony, arsenic, cadmium, chloride, chromium, lead, mercury, methylene, naphthalene, nickel, silver, toluene, zinc<br>Surface Soil: arsenic, mercury, methylene chloride<br>Surfacewater: 1,2-dichlroethene, aluminum, calcium, iron, manganese, sodium, zinc<br>VI: 1,1-dichloroethane, benzene, dichlorodifluoromethane, vinyl chloride | The site is located in the southeast corner in a heavily wooded area. The area is undeveloped, and there are currently no plans for future development. Training exercises may occasionally utilize the unpaved roads and adjacent lands. No COPCs were detected in marsh sediment samples. For both Phase I and Phase II RFI, all (construction workers) HIs are less than 1, indicating that adverse noncarcinogenic health effects are not anticipated under the defined exposure conditions. All (construction worker) ILCRs are less than 1x10-6, the lower limit of the US EPA target risk range. All HIs for hypothetical child and adult residents using the Phase I RFI GW data exceed 1, indicating that adverse noncarcinogenic effects are anticipated under the defined exposure conditions. However, when the Phase II RFI GW data are used, adverse noncarcinogenic effects are only anticipated for the child resident under the RME. All individual target organ HIs for the adult resident under the RME and CTE and the child resident under the CTE are less than 1. With the exception of the Phase II RFI ILCR for the adult resident and the Phase I RFI ILCR for the child resident under the CTE, ILCRs for hypothetical residents exceed 1x10-4, the upper limit of the US EPA target risk range. The Phase II ILCRs for the child resident are slightly greater than the Phase I ILCRs, while the Phase II ILCRs for the adult resident are slightly lower than the Phase I ILCRs. Exposures from VI were not evaluated in the Phase I RFI because no COPCs were identified for this exposure pathway. | 1992. ABB Environmental. Final Expanded Site Inspection and Site Inspection. MCAS Beaufort, SC. 1 June.<br><br>2003. U.S. Army Corps of Engineers. RCRA Facility Investigation for Solid Waste Management Units 6 and 14 seepage Trenches and Inert Landfill. MCAS Beaufort. 1 June.<br><br>2012. Tetra Tech. Phase 2 RCRA Facility Investigation Letter Report for Solid Waste Management Units 6 and 14. MCAS Beaufort. SC. 1 May.<br><br>2012. Tetra Tech. Corrective Measures Study Work Plan for Solid Waste Management Units 6 and 14. MCAS Beaufort, SC. 1 July.<br><br>[CH2MHill]. 2015. Figure II.L-4 SWMU and AOC Location Map. MCAS Beaufort, South Carolina. |
| SWMU 15 - PCB Spill Area | A PCB transformer (Structure 948) located on a concrete pad approximately 30 ft south of Building 947 leaked PCB-contaminated oil. Some of this material ran off the pad onto the surrounding soil. The area was reportedly cleaned up by an EPA-certified contractor. Visual inspection was used to confirm that all contaminants were removed. Period of operation is estimated to be from the late 1960s to the late 1970s for approximately 2 years. | NFA | Marine Corps Air Station Beaufort, SC SWMU Sites Status. Revision 1. Author Unknown. PDF. January, 2006. | Local | None Identified | NFA | Marine Corps Air Station Beaufort, SC. 2006. Revision 1. January. Author Unknown. PDF. |

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| SWMU 16 - Storm Sewer Drainage Outfall | Two major surface drainage channels at the air station drain south and east, into the marsh 700 ft east of Kavieng Street and 700 ft south of Kines Avenue. The outfall into the marsh is located approximately 100 ft northeast of the Kavieng Street Landfill. These drainage channels collect runoff from the aircraft maintenance hangers and GSE maintenance areas of the station, as well as from surrounding natural areas. The north-south drainage channel collects runoff from an approximate 200-acre area north of Second Street; storm sewers empty into a 2,700 ft long natural drainage channel. The east-west drainage channel is approximately 5,000 ft long. The initial 3,400 ft of this channel is lined with concrete while the remainder consists of a natural drainage ditch. These channels were used from 1956 to 1971 for disposal of liquid wastes (e.g., JP-4, AVGAS, JP-5, waste oil, and solvents) from the aircraft maintenance hangars. Flow from the Storm Sewer Drainage Outfall is directed through an oil/water skimmer and boom system and is discharged to the adjacent marsh. This site is currently in use and will be investigated when it closes. | Corrective Action Required (Deferred) | Marine Corps Air Station Beaufort, SC SWMU Sites Status. Revision 1. Author Unknown. PDF. January, 2006. | Data Gap | Surfacewater: cadmium, chromium, | SWMU 16, the storm sewer outfall, is an active site, therefore further investigation will be deferred until the unit under goes closure (SC DHEC, 1999). Chromium was identified in both surface water and GW samples in concentrations that exceeded US EPA guidelines for salt water. As the source for the chromium was unclear, the site was recommended for further investigation to evaluate the source, extent, and depth of the chromium contamination. Cadmium exceeded the MCL in surface water samples obtained at sampling locations in the marsh associated with SWMU 16, suggesting that discharge to the marsh from the storm water drainage system was serving as a transport pathway. | 1992. ABB Environmental. Draft Final RCRA Facility Investigation Work Plan. Volume 1 of 2. MCAS Beaufort, SC. Draft Acting as Final. 1 June.<br><br>1996. U.S. Army Corps of Engineers. Final Confirmatory Sampling Plan for Solid Waste Management Units 12, 16, 17, 57, 67, and Area of Concern C. MCAS Beaufort, SC. 1 July.<br><br>1999. South Carolina Department of Health and Environmental Control. Letter Regarding Regulatory Decision for No Further Investigation at Solid Waste Management Units 16 and 67. MCAS Beaufort, SC. 28 May. |
| SWMU 17 - Funa Futi Road Disposal Area | This unit is a rectangular site (approximately 50 ft by 130 ft) located in a wooded area approximately 15 ft from the edge of a dirt road in the northeast corner of the air station. This area was discovered around 1980 and, except for observations made during the NACIP IAS visual inspection, no other information concerning this site is available. | NFA | [CH2MHill]. 2015. Figure II.L-4 SWMU and AOC Location Map. MCAS Beaufort, South Carolina. | Local | None Identified | NFA | [CH2MHill]. 2015. Figure II.L-4 SWMU and AOC Location Map. MCAS Beaufort, South Carolina. |
| SWMU 18 - Current Fire Training Pits | This site is currently used for fire training purposes and is located near SWMU 13 on a former runway. Two berms surround the fire training site. One is approximately 30 ft in diameter and contains the fuel/water layered system. The other is approximately 60 ft in diameter. A mock-up of an aircraft is located in the center of these berms. This site is currently in use and will be investigated when closed. | Corrective Action Required (Deferred) | [CH2MHill]. 2015. Figure II.L-4 SWMU and AOC Location Map. MCAS Beaufort, South Carolina. | Local | Subsurface Soil: None<br>GW: Benzene | The site is located on the former runway. Results of the initial soil and GW sampling combined with the addendum sampling indicate that the site contains low levels of petroleum-related compounds in the soil and GW, with background levels of metals. There is no evidence of a widespread, GW contamination plume and both the downgradient and crossgradient wells were clean. The constituents associated with fuel products (JP-5) were identified in both soil and GW in the immediate vicinity of the burn pit. Currently in use and will be investigated when closed. | 1997. U.S. Army Corps of Engineers. Draft Final Confirmatory Sampling Event for Solid Waste Management Unit 18. MCAS Beaufort, SC. Draft Acting as Final. 1 July.<br><br>1997. U.S. Army Corps of Engineers. Addendum to Draft Final Confirmatory Sampling Event for Solid Waste Management Unit 18. MCAS Beaufort, SC. Draft Acting as Final. 1 November.<br><br>[CH2MHill]. 2015. Figure II.L-4 SWMU and AOC Location Map. MCAS Beaufort, South Carolina. |
| SWMU 19 - Satellite Storage Tank 999 | This unit is a satellite storage tank with an approximate capacity of 300 gallons. It is used for storage of waste liquids from the maintenance operations that occur in Building 414. These wastes are removed by a suction pump into a hazardous waste transport vehicle for transfer to the RCRA Hazardous Waste Storage Tank (SWMU #74). Waste removal is periodic and depends on the level of maintenance activity at the facility. | NFA | [CH2MHill]. 2015. Figure II.L-4 SWMU and AOC Location Map. MCAS Beaufort, South Carolina. | Local | None Identified | NFA | [CH2MHill]. 2015. Figure II.L-4 SWMU and AOC Location Map. MCAS Beaufort, South Carolina. |
| SWMU 20 - Satellite Storage Tank 1000 | This unit is a satellite storage tank with an approximate capacity of 300 gallons. It is used for storage of waste liquids from the maintenance operations that occur in Building 414. These wastes are removed by a suction pump into a hazardous waste transport vehicle for transfer to the RCRA Hazardous Waste Storage Tank (SWMU 74). Waste removal is periodic and depends on the level of maintenance activity at the facility. | NFA | [CH2MHill]. 2015. Figure II.L-4 SWMU and AOC Location Map. MCAS Beaufort, South Carolina. | Local | None Identified | NFA | [CH2MHill]. 2015. Figure II.L-4 SWMU and AOC Location Map. MCAS Beaufort, South Carolina. |

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| SWMU 21 - Satellite Storage Tank 1002 | This unit is a satellite storage tank with an approximate capacity of 300 gallons. It is used for storage of waste liquids from the maintenance operations that occur in Building 728. These wastes are removed by a suction pump into a hazardous waste transport vehicle for transfer to the RCRA Hazardous Waste Storage Tank (SWMU #74). Waste removal is periodic and depends on the level of maintenance activity at the facility. | NFA | [CH2MHill]. 2015. Figure II.L-4 SWMU and AOC Location Map. MCAS Beaufort, South Carolina. | Local | None Identified | NFA | [CH2MHill]. 2015. Figure II.L-4 SWMU and AOC Location Map. MCAS Beaufort, South Carolina. |
| SWMU 22 - Satellite Storage Tank 996 | This is a satellite storage tank with an approximate capacity of 300 gallons. It is used for storage of waste liquids from the maintenance operations that occur in Building 729. These wastes are removed by a suction pump into a hazardous waste transport vehicle for transfer to the RCRA Hazardous Waste Storage Tank (SWMU #74). Waste removal is periodic and depends on the level of maintenance activity at the facility. | NFA | [CH2MHill]. 2015. Figure II.L-4 SWMU and AOC Location Map. MCAS Beaufort, South Carolina. | Local | None Identified | NFA | [CH2MHill]. 2015. Figure II.L-4 SWMU and AOC Location Map. MCAS Beaufort, South Carolina. |
| SWMU 23 - Satellite Storage Tank 997 | This is a satellite storage tank with an approximate capacity of 300 gallons. It is used for storage of waste liquids from the maintenance operations that occur in Building 416. These wastes are removed by a suction pump into a hazardous waste transport vehicle for transfer to the RCRA Hazardous Waste Storage Tank (SWMU 74). Waste removal is periodic and depends on the level of maintenance activity at the facility. | NFA | [CH2MHill]. 2015. Figure II.L-4 SWMU and AOC Location Map. MCAS Beaufort, South Carolina. | Local | None Identified | NFA | [CH2MHill]. 2015. Figure II.L-4 SWMU and AOC Location Map. MCAS Beaufort, South Carolina. |
| SWMU 24 - Satellite Storage Tank 998 | This is a satellite storage tank with an approximate capacity of 300 gallons. It is used for storage of waste liquids from the maintenance operations that occur in Building 416. These wastes are removed by a suction pump into a hazardous waste transport vehicle for transfer to the RCRA Hazardous Waste Storage Tank (SWMU 74). Waste removal is periodic and depends on the level of maintenance activity at the facility. | NFA | [CH2MHill]. 2015. Figure II.L-4 SWMU and AOC Location Map. MCAS Beaufort, South Carolina. | Local | None Identified | NFA | [CH2MHill]. 2015. Figure II.L-4 SWMU and AOC Location Map. MCAS Beaufort, South Carolina. |
| SWMU 25 - Satellite Storage Tank 995 | This is a satellite storage tank with an approximate capacity of 300 gallons. It is used for storage of waste liquids from the maintenance operations that occur in Building 594. These wastes are removed by a suction pump into a hazardous waste transport vehicle for transfer to the RCRA Hazardous Waste Container Storage Tank (SWMU #74). Waste removal is periodic and depends on the level of maintenance activity at the facility. | NFA | [CH2MHill]. 2015. Figure II.L-4 SWMU and AOC Location Map. MCAS Beaufort, South Carolina. | Local | None Identified | NFA | [CH2MHill]. 2015. Figure II.L-4 SWMU and AOC Location Map. MCAS Beaufort, South Carolina. |
| SWMU 26 - Satellite Storage Tank 994 | This is a satellite storage tank with an approximate capacity of 300 gallons. It is used for storage of waste liquids from the maintenance operations that occur in Building 418. These wastes are removed by a suction pump into a hazardous waste transport vehicle for transfer to the RCRA Hazardous Waste Storage Tank (SWMU 74). Waste removal is periodic and depends on the level of maintenance activity at the facility. | NFA | [CH2MHill]. 2015. Figure II.L-4 SWMU and AOC Location Map. MCAS Beaufort, South Carolina. | Local | None Identified | NFA | [CH2MHill]. 2015. Figure II.L-4 SWMU and AOC Location Map. MCAS Beaufort, South Carolina. |
| SWMU 27 - Satellite Storage Tank 993 | This is a satellite storage tank with an approximate capacity of 300 gallons. It is used for storage of waste liquids from the maintenance operations that occur in Building 565. These wastes are removed by a suction pump into a hazardous waste transport vehicle for transfer to the RCRA Hazardous Waste Storage Tank (SWMU 74). Waste removal is periodic and depends on the level of maintenance activity at the facility. This tank is located underneath an elevated ramp lip upon which vehicles are driven to perform maintenance services. The outlet for a valve-controlled drain system in the secondary containment system around the tank is adjacent to the sanitary sewer drain that leads to the sewage treatment system. | NFA | [CH2MHill]. 2015. Figure II.L-4 SWMU and AOC Location Map. MCAS Beaufort, South Carolina. | Local | None Identified | NFA | [CH2MHill]. 2015. Figure II.L-4 SWMU and AOC Location Map. MCAS Beaufort, South Carolina. |

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| SWMU 28 - Satellite Storage Tank 992 | This is a satellite storage tank with an approximate capacity of 300 gallons. It is used for storage of waste liquids from the maintenance operations that occur in Building 780. These wastes are removed by a suction pump into a hazardous waste transport vehicle for transfer to the RCRA Hazardous Waste Storage Tank (SWMU 74). Waste removal is periodic and depends on the level of maintenance activity at the facility. This tank is located underneath an elevated ramp upon which vehicles are driven to perform maintenance services. The outlet for a valve-controlled drain system in the secondary containment system around the tank is adjacent to the sanitary sewer drain that leads to the sewage treatment system. | NFA | [CH2MHill]. 2015. Figure II.L-4 SWMU and AOC Location Map. MCAS Beaufort, South Carolina. | Local | None Identified | NFA | [CH2MHill]. 2015. Figure II.L-4 SWMU and AOC Location Map. MCAS Beaufort, South Carolina. |
| SWMU 29 - Satellite Storage Tank 1003 | This is a satellite storage tank with an approximate capacity of 300 gallons. It is used for storage of waste liquids from the maintenance operations that occur in Building 661. These wastes are removed by a suction pump into a hazardous waste transport vehicle for transfer to the RCRA Hazardous Waste Storage Tank (SWMU 74). Waste removal is periodic and depends on the level of maintenance activity at the facility. | NFA | [CH2MHill]. 2015. Figure II.L-4 SWMU and AOC Location Map. MCAS Beaufort, South Carolina. | Local | None Identified | NFA | [CH2MHill]. 2015. Figure II.L-4 SWMU and AOC Location Map. MCAS Beaufort, South Carolina. |
| SWMU 30 - Satellite Storage Tank | This is a satellite storage tank with an approximate capacity of 300 gallon. It is used for storage of waste liquids from the maintenance operations that occur in Building 843. These wastes are removed by a suction pump into a hazardous waste transport vehicle for transfer to the RCRA Hazardous Waste Storage Tank (SWMU 74). Waste removal is periodic and depends on the level of maintenance activity at the facility. This site is currently in use and will be investigated when closed. | Corrective Action Required (deferred) | [CH2MHill]. 2015. Figure II.L-4 SWMU and AOC Location Map. MCAS Beaufort, South Carolina. | Local | No Information Available | No release to the environment was identified during the PHR. To be investigated when closed. | [CH2MHill]. 2015. Figure II.L-4 SWMU and AOC Location Map. MCAS Beaufort, South Carolina. |
| SWMU 31 - Temporary Hazardous Waste Storage Site | Steel 55-gallon drums used to temporarily accumulate hazardous waste prior to transfer to the hazardous waste container storage facility. Wastes managed include solvents, empty paint cans, rags contaminated with JP-5, lube oils, hydraulic fluids, empty oil cans, contaminated absorbent material, and other miscellaneous wastes generated from routine aircraft maintenance. | NFA | [CH2MHill]. 2015. Figure II.L-4 SWMU and AOC Location Map. MCAS Beaufort, South Carolina. | Local | None Identified | NFA | [CH2MHill]. 2015. Figure II.L-4 SWMU and AOC Location Map. MCAS Beaufort, South Carolina. |
| SWMU 32 - Temporary Hazardous Waste Storage Site | Steel 55-gallon drums used to temporarily accumulate hazardous waste prior to transfer to the hazardous waste container storage facility. Wastes managed include solvents, empty paint cans, rags contaminated with JP-5, lube oils, hydraulic fluids, empty oil cans, contaminated absorbent material, and other miscellaneous wastes generated from routine aircraft maintenance. | NFA | [CH2MHill]. 2015. Figure II.L-4 SWMU and AOC Location Map. MCAS Beaufort, South Carolina. | Local | None Identified | NFA | [CH2MHill]. 2015. Figure II.L-4 SWMU and AOC Location Map. MCAS Beaufort, South Carolina. |
| SWMU 33 - Temporary Hazardous Waste Storage Site | Steel 55-gallon drums used to temporarily accumulate hazardous waste prior to transfer to the hazardous waste container storage facility. Wastes managed include solvents, empty paint cans, rags contaminated with JP-5, lube oils, hydraulic fluids, empty oil cans, contaminated absorbent material, and other miscellaneous wastes generated from routine aircraft maintenance. | NFA | [CH2MHill]. 2015. Figure II.L-4 SWMU and AOC Location Map. MCAS Beaufort, South Carolina. | Local | None Identified | NFA | [CH2MHill]. 2015. Figure II.L-4 SWMU and AOC Location Map. MCAS Beaufort, South Carolina. |
| SWMU 34 - Temporary Hazardous Waste Storage Site | Steel 55-gallon drums used to temporarily accumulate hazardous waste prior to transfer to the hazardous waste container storage facility. Wastes managed include solvents, empty paint cans, rags contaminated with JP-5, lube oils, hydraulic fluids, empty oil cans, contaminated absorbent material, and other miscellaneous wastes generated from routine aircraft maintenance. | NFA | [CH2MHill]. 2015. Figure II.L-4 SWMU and AOC Location Map. MCAS Beaufort, South Carolina. | Local | None Identified | NFA | [CH2MHill]. 2015. Figure II.L-4 SWMU and AOC Location Map. MCAS Beaufort, South Carolina. |
| SWMU 35 - Temporary Hazardous Waste Storage Site | Steel 55-gallon drums used to temporarily accumulate hazardous waste prior to transfer to the hazardous waste container storage facility. Wastes managed include solvents, empty paint cans, rags contaminated with JP-5, lube oils, hydraulic fluids, empty oil cans, contaminated absorbent material, and other miscellaneous wastes generated from routine aircraft maintenance. | NFA | [CH2MHill]. 2015. Figure II.L-4 SWMU and AOC Location Map. MCAS Beaufort, South Carolina. | Local | None Identified | NFA | [CH2MHill]. 2015. Figure II.L-4 SWMU and AOC Location Map. MCAS Beaufort, South Carolina. |
| SWMU 36 - Temporary Hazardous Waste Storage Site | Steel 55-gallon drums used to temporarily accumulate hazardous waste prior to transfer to the hazardous waste container storage facility. Wastes managed include solvents, empty paint cans, rags contaminated with JP-5, lube oils, hydraulic fluids, empty oil cans, contaminated absorbent material, and other miscellaneous wastes generated from routine aircraft maintenance. | NFA | [CH2MHill]. 2015. Figure II.L-4 SWMU and AOC Location Map. MCAS Beaufort, South Carolina. | Local | None Identified | NFA | [CH2MHill]. 2015. Figure II.L-4 SWMU and AOC Location Map. MCAS Beaufort, South Carolina. |

| Name of Site | Site Description | Current Status or Recommended Actions | Source of Status | Risk Classification | Constituents of Concern or Potential Concern | Risk Rational/Additional Site Information | Source of Primary Documents Used in the Evaluation |
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| SWMU 37 - Temporary Hazardous Waste Storage Site | Steel 55-gallon drums used to temporarily accumulate hazardous waste prior to transfer to the hazardous waste container storage facility. Wastes managed include solvents, empty paint cans, rags contaminated with JP-5, lube oils, hydraulic fluids, empty oil cans, contaminated absorbent material, and other miscellaneous wastes generated from routine aircraft maintenance. | NFA | [CH2MHill]. 2015. Figure II.L-4 SWMU and AOC Location Map. MCAS Beaufort, South Carolina. | Local | None Identified | NFA | [CH2MHill]. 2015. Figure II.L-4 SWMU and AOC Location Map. MCAS Beaufort, South Carolina. |
| SWMU 38 - Temporary Hazardous Waste Storage Drum | One steel 55-gallon drum outside Building 858 is used to store hazardous wastes associated with maintenance operations in Building 858. However, this drum was not located in any temporary hazardous waste storage area that was identified as such by Air Station personnel. This drum was found behind Building 858, partially obscured by materials apparently in storage. | NFA | [CH2MHill]. 2015. Figure II.L-4 SWMU and AOC Location Map. MCAS Beaufort, South Carolina. | Local | None Identified | NFA | [CH2MHill]. 2015. Figure II.L-4 SWMU and AOC Location Map. MCAS Beaufort, South Carolina. |
| SWMU 39 - Temporary Hazardous Waste Storage Site | Steel 55-gallon drums used to temporarily accumulate hazardous waste prior to transfer to the hazardous waste container storage facility. Wastes managed include solvents, empty paint cans, rags contaminated with JP-5, lube oils, hydraulic fluids, empty oil cans, contaminated absorbent material, and other miscellaneous wastes generated from routine aircraft maintenance. | NFA | [CH2MHill]. 2015. Figure II.L-4 SWMU and AOC Location Map. MCAS Beaufort, South Carolina. | Local | None Identified | NFA | [CH2MHill]. 2015. Figure II.L-4 SWMU and AOC Location Map. MCAS Beaufort, South Carolina. |
| SWMU 40 - Temporary Hazardous Waste Storage Site | Three steel 55-gallon drums stored on wooden pallets containing rags contaminated with JP-5 and contaminated absorbent materials. Drums are used to temporarily accumulate hazardous waste prior to transfer to the hazardous waste container storage facility. | NFA | [CH2MHill]. 2015. Figure II.L-4 SWMU and AOC Location Map. MCAS Beaufort, South Carolina. | Local | None Identified | NFA | [CH2MHill]. 2015. Figure II.L-4 SWMU and AOC Location Map. MCAS Beaufort, South Carolina. |
| SWMU 41 - Temporary Hazardous Waste Storage Site | Steel 55-gallon drums used to temporarily accumulate hazardous waste prior to transfer to the hazardous waste container storage facility. Wastes managed include oil rags, paint cans, saturated absorbent material, and miscellaneous wastes associated with maintenance operations in Buildings 661 and 663. | NFA | [CH2MHill]. 2015. Figure II.L-4 SWMU and AOC Location Map. MCAS Beaufort, South Carolina. | Local | None Identified | NFA | [CH2MHill]. 2015. Figure II.L-4 SWMU and AOC Location Map. MCAS Beaufort, South Carolina. |
| SWMU 42 - Temporary Hazardous Waste Storage Area | No Information Available. | NFA | [CH2MHill]. 2015. Figure II.L-4 SWMU and AOC Location Map. MCAS Beaufort, South Carolina. | Local | None Identified | NFA | [CH2MHill]. 2015. Figure II.L-4 SWMU and AOC Location Map. MCAS Beaufort, South Carolina. |
| SWMU 43 - Temporary Hazardous Waste Storage Site | Steel 55-gallon drums used to temporarily accumulate hazardous waste prior to transfer to the hazardous waste container storage facility. Wastes managed include rags contaminated with lube oils and hydraulic fluids, empty oil and paint cans, contaminated absorbent material and other miscellaneous wastes generated from routine aircraft maintenance. | NFA | [CH2MHill]. 2015. Figure II.L-4 SWMU and AOC Location Map. MCAS Beaufort, South Carolina. | Local | None Identified | NFA | [CH2MHill]. 2015. Figure II.L-4 SWMU and AOC Location Map. MCAS Beaufort, South Carolina. |
| SWMU 44 - Temporary Hazardous Waste Storage Site | Two steel 55-gallon drums used to temporarily accumulate hazardous waste prior to transfer to the hazardous waste container storage facility. The primary waste managed is contaminant-saturated absorbent generated by maintenance operations in Building 565. | NFA | [CH2MHill]. 2015. Figure II.L-4 SWMU and AOC Location Map. MCAS Beaufort, South Carolina. | Local | None Identified | NFA | [CH2MHill]. 2015. Figure II.L-4 SWMU and AOC Location Map. MCAS Beaufort, South Carolina. |
| SWMU 45 - Temporary Hazardous Waste Storage Area | No Information Available | NFA | [CH2MHill]. 2015. Figure II.L-4 SWMU and AOC Location Map. MCAS Beaufort, South Carolina. | Local | None Identified | NFA | [CH2MHill]. 2015. Figure II.L-4 SWMU and AOC Location Map. MCAS Beaufort, South Carolina. |
| SWMU 46 - Temporary Hazardous Waste Storage Site | Two-55-gallon drums used to temporarily accumulate hazardous waste prior to transfer to the hazardous waste container storage facility. Wastes managed are primarily solvents associated with maintenance operations in Building 565. | NFA | [CH2MHill]. 2015. Figure II.L-4 SWMU and AOC Location Map. MCAS Beaufort, South Carolina. | Local | None Identified | NFA | [CH2MHill]. 2015. Figure II.L-4 SWMU and AOC Location Map. MCAS Beaufort, South Carolina. |
| SWMU 47 - Temporary Hazardous Waste Storage Site | This unit is a temporary hazardous waste storage area located adjacent to Building 625. Steel 55-gallon drums are used to temporarily store wastes generated in Building 625. The drums are located outside the building on wooden pallets that are placed either on the concrete or the ground (Note: photos of this unit were not returned by the facility). These containers are stored until transferred to the RCRA Hazardous Waste Container Storage Facility (SWMU 75). | NFA | [CH2MHill]. 2015. Figure II.L-4 SWMU and AOC Location Map. MCAS Beaufort, South Carolina. | Local | None Identified | NFA | [CH2MHill]. 2015. Figure II.L-4 SWMU and AOC Location Map. MCAS Beaufort, South Carolina. |

| Name of Site | Site Description | Current Status or Recommended Actions | Source of Status | Risk Classification | Constituents of Concern or Potential Concern | Risk Rational/Additional Site Information | Source of Primary Documents Used in the Evaluation |
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| SWMU 48 - Temporary Hazardous Substance Storage Area | This site consists of a metal storage container (with an approximate capacity of 500 gallons) near the automotive hobby shop. This tank is used to store various petroleum wastes (including lube oils, engine oils, etc.) produced during maintenance operations in this building. | NFA | [CH2MHill]. 2015. Figure II.L-4 SWMU and AOC Location Map. MCAS Beaufort, South Carolina. | Local | None Identified | NFA | [CH2MHill]. 2015. Figure II.L-4 SWMU and AOC Location Map. MCAS Beaufort, South Carolina. |
| SWMU 49 - Temporary Hazardous Waste Storage Site | No Information Available | NFA | [CH2MHill]. 2015. Figure II.L-4 SWMU and AOC Location Map. MCAS Beaufort, South Carolina. | Local | None Identified | NFA | [CH2MHill]. 2015. Figure II.L-4 SWMU and AOC Location Map. MCAS Beaufort, South Carolina. |
| SWMU 50 - Temporary Hazardous Waste Storage Site | This unit is a temporary hazardous waste storage area located adjacent to Building 863. Steel 55-gallon drums are used to temporarily store hazardous waste generated in this facility. In addition, a series of 5-gallon containers and 1-gallon paint containers are placed next to the 55-gallon containers; some of these smaller containers were filled with inert materials. The containers are placed on wire pallets which are placed on an asphalt surface until transferred to the RCRA Hazardous Waste Container Storage Facility (SWMU 75). | NFA | [CH2MHill]. 2015. Figure II.L-4 SWMU and AOC Location Map. MCAS Beaufort, South Carolina. | Local | None Identified | NFA | [CH2MHill]. 2015. Figure II.L-4 SWMU and AOC Location Map. MCAS Beaufort, South Carolina. |
| SWMU 51 - Temporary Hazardous Waste Storage Site | Steel 55-gallon drums used to temporarily accumulate wastes generated in the "Ammo Popper." The principal waste manage is ash. Brass is collected and recycled. | NFA | [CH2MHill]. 2015. Figure II.L-4 SWMU and AOC Location Map. MCAS Beaufort, South Carolina. | Local | None Identified | NFA | [CH2MHill]. 2015. Figure II.L-4 SWMU and AOC Location Map. MCAS Beaufort, South Carolina. |
| SWMU 52 - Temporary Hazardous Waste Storage Site | This unit is a temporary hazardous waste storage site located near Building 617. Steel 55-gallon drums and a trailer-mounted 300-gallon container (approximate size) are used to temporarily store wastes generated in this facility and nearby fueling sites. The drums are located over a large area and are placed on various surfaces (including concrete pads, gravel, and the ground). These drums are stored until transferred to the RCRA Hazardous Waste Container Storage facility (SWMU 75). The trailer-mounted container is emptied periodically by the hazardous waste transport truck. | NFA | [CH2MHill]. 2015. Figure II.L-4 SWMU and AOC Location Map. MCAS Beaufort, South Carolina. | Local | None Identified | NFA | [CH2MHill]. 2015. Figure II.L-4 SWMU and AOC Location Map. MCAS Beaufort, South Carolina. |
| SWMU 53 - Steel 55-Gallon Drum | This site consists of a steel 55-gallon drum located outside Building 816 that is used to store re-usable waste No. 6 fuel oil. The drum is supported horizontally on a bracket that is placed directly on the ground. | NFA | [CH2MHill]. 2015. Figure II.L-4 SWMU and AOC Location Map. MCAS Beaufort, South Carolina. | Local | None Identified | NFA | [CH2MHill]. 2015. Figure II.L-4 SWMU and AOC Location Map. MCAS Beaufort, South Carolina. |
| SWMU 54 - Pressurized Leak Detection System | At this site, a black 650-gallon tank (approximate size) is used in conjunction with a pressurized leak detection testing system for aircraft fuel tanks. The tank holds a light-weight oil which is pumped into the fuel tanks to test for leaks. Approximately once every 80-90 days, the oil in the tank is replaced. | NFA | [CH2MHill]. 2015. Figure II.L-4 SWMU and AOC Location Map. MCAS Beaufort, South Carolina. | Local | None Identified | NFA | [CH2MHill]. 2015. Figure II.L-4 SWMU and AOC Location Map. MCAS Beaufort, South Carolina. |
| SWMU 55 - Scrap Metal Waste Storage Area | Scrap metals, generated from shops inside Building 594, are stored in 55-gallon drums without lids. | NFA | [CH2MHill]. 2015. Figure II.L-4 SWMU and AOC Location Map. MCAS Beaufort, South Carolina. | Local | None Identified | NFA | [CH2MHill]. 2015. Figure II.L-4 SWMU and AOC Location Map. MCAS Beaufort, South Carolina. |
| SWMU 56 - Contaminated Fuel Storage Tank | The site consists of a steel tank (approximate capacity is 10,000 gallons) holding contaminated fuel (primarily JP-5) used for fire training purposes. The tank structure is mounted on a concrete pad with secondary containment walls surrounding it. | NFA | [CH2MHill]. 2015. Figure II.L-4 SWMU and AOC Location Map. MCAS Beaufort, South Carolina. | Local | None Identified | NFA | [CH2MHill]. 2015. Figure II.L-4 SWMU and AOC Location Map. MCAS Beaufort, South Carolina. |
| SWMU 57 - Mag 31 Product Storage Area | MAG 31 has stored a series of products (including Freon, various lube oils, solvent- based cleaning compounds, MEK, hydraulic fluids) in various size containers (55-gallon drums, 5-gallon pails, etc.). Over 200 55-gallon drums and several hundred smaller size containers were counted. A number of the containers were corroded and rusted through with evidence of product loss. Many were marked with an "H" apparently indicating hazardous material. Several 55-gallon drums had no apparent identification markings; one was labeled "No ID". | NFA | [CH2MHill]. 2015. Figure II.L-4 SWMU and AOC Location Map. MCAS Beaufort, South Carolina. | Local | None Identified | NFA | [CH2MHill]. 2015. Figure II.L-4 SWMU and AOC Location Map. MCAS Beaufort, South Carolina. |

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| SWMU 58 - Dumpster | This unit is a standard metal dumpster, made of sheet metal with the approximate dimensions of 6 ft by 6 ft by 5 ft. These are located adjacent to almost all maintenance activities throughout the Air Station. | NFA | Identified in NAVFAC Figure, Table, or List | Local | None Identified | NFA | Identified in NAVFAC Figure, Table, or List |
| SWMU 59 - Safety Kleen Machines | No Information Available | NFA | Identified in NAVFAC Figure, Table, or List | Local | None Identified | NFA | Identified in NAVFAC Figure, Table, or List |
| SWMU 60 - Dirty Rag Containers | Containers with lids are used to temporarily store used rags associated with routine aircraft and vehicular maintenance. These containers are located inside the aircraft hangers and maintenance shops on concrete floors. | NFA | Identified in NAVFAC Figure, Table, or List | Local | None Identified | NFA | Identified in NAVFAC Figure, Table, or List |
| SWMU 61 - Floor Drains and Associated Sewer System | Floor drains are located in all of the aircraft hangers. They are approximately 12-18 inches wide and extend to the length of the hanger floor itself. Those associated with the vehicular maintenance activities are either 12-18 inches in width or in diameter and are either inside the facility or just outside. Generally, all aircraft maintenance drains lead to the sewage treatment plant. Although Air Station personnel could not confirm it, most vehicular maintenance area drains also lead to the plant. | NFA | [CH2MHill]. 2015. Figure II.L-4 SWMU and AOC Location Map. MCAS Beaufort, South Carolina. | Local | None Identified | NFA | [CH2MHill]. 2015. Figure II.L-4 SWMU and AOC Location Map. MCAS Beaufort, South Carolina. |
| SWMU 62 - Waste Recovery Drums | Steel 55-gallon drums used to temporarily store wastes generated during routine aircraft maintenance. In most cases, 2 to 4 drums are located inside the maintenance areas on concrete floors. When the drums are full, they are taken to the RCRA Hazardous Waste Container Storage Facility (SWMU 76). | NFA | Identified in NAVFAC Figure, Table, or List | Local | None Identified | NFA | Identified in NAVFAC Figure, Table, or List |
| SWMU 63 - CFR-Burn Pit Oil/Water Separator | These units are designed to separate oil and other hydrocarbon materials from water used to extinguish fires during crash, fire, and rescue training operations. A pump failure in 2007 resulted in an accidental release of fuel and water from the UST. Soil was removed from the area. The unit is currently in use and will be investigated when closed. | Corrective Action Required (Deferred) - Site is in Use. | [CH2MHill]. 2015. Figure II.L-4 SWMU and AOC Location Map. MCAS Beaufort, South Carolina. | Local | No Information Available | A release of water and fuel from a pump failure was identified during the PHR. To be investigated when closed. | 2007. South Carolina Department of Health and Environmental Control. Letter Regarding Regulatory Response to Notification of an Accidental Discharge from Oil Water Separator at Solid Waste Management Unit 63. MCAS Beaufort, SC. 28 December.<br><br>[CH2MHill]. 2015. Figure II.L-4 SWMU and AOC Location Map. MCAS Beaufort, South Carolina. |
| SWMU 64 - Oil/Water Separator | This is one of the major oil/water separators on MCAS Beaufort and is located at the fueling station on Simpson Street. This unit separates water and other contaminants from the JP-5 that is stored in the associated storage tanks (Tanks 865 and 551). This site is currently in use and will be investigated when closed. | Corrective Action Required (Deferred) - Site is in Use. | Identified in NAVFAC Figure, Table, or List | Local | No Information Available | No release to the environment was identified during the PHR. To be investigated when closed. | "Units Regulated Under R.61-79.264 (RCRA-regulated units)." Figure Provided by the NMCPHC. Date Unknown. Excel File. |
| SWMU 65 - Oil/Water Separator | This unit is one of the major oil/water separators on MCAS Beaufort and is located at the fueling station on Reeds Street. The unit separates water and contaminants from the fuel that is stored in the associated storage tanks (Tanks 401 and 402). This site is currently in use and will be investigated when closed. | Corrective Action Required (Deferred) - Site is in Use. | Identified in NAVFAC Figure, Table, or List | Local | No Information Available | No release to the environment was identified during the PHR. To be investigated when closed. | "Units Regulated Under R.61-79.264 (RCRA-regulated units)." Figure Provided by the NMCPHC. Date Unknown. Excel File. |
| SWMU 66 - Oil/Water Separator | This unit is one of the major oil/water separators on the air station and is located (near Building 426) at the Air Station heating plant. The unit separates water and other contaminants from the fuel that is stored in the associated storage tanks (Tanks 401 and 402). The unit is regulated under the Leaking Underground Storage Tank program. | NFA | [CH2MHill]. 2015. Figure II.L-4 SWMU and AOC Location Map. MCAS Beaufort, South Carolina. | Local | None Identified | NFA | [CH2MHill]. 2015. Figure II.L-4 SWMU and AOC Location Map. MCAS Beaufort, South Carolina. |

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| SWMU 67 - Sewage Treatment Plant | From 1985 through 2011, SWMU 67 treated sanitary sewage generated at the base along with small quantities of waste and rinse waters associated with aircraft maintenance facilities and general runoff from portions of the base. This facility consisted of the following process units: aeration grit tank, distributer box, primary tanks, parshall flume metering dows tanks, sludges pumps, trickler filter anaerobic digester, final settling tanks, sludges concentrator, sludge drying beds, and chlorine contact tank. Treated sanitary sewage was discharged to an unnamed tributary southwest of the plant, which flows into Albergottie Creek. The outfall facility was permitted under National Pollutant Dishcarge Elimination System (NPDES) Permit No. SC0000825. In 2008, plant operations were transferred to the BJWSA. The facility was demolished in August 2011. | Recommended actions from the 2014 confirmatory sampling investigation report include a RFI and a risk assessment to determine the extent of the contaminants detected in site media and the risk to human health and the environment. | Review of confirmatory sampling investigation report (Resolution, 2014). | Data Gap | Surface Soil: aroclor-1260<br>Subsurface Soil: aluminum<br>GW: aluminum, 1,1-biphenyl, arsenic, cadmium, cobalt, dibenzofuran, dieldrin, iron, lead, manganese, naphthalene, selenium, vanadium<br>Surfacewater: aluminum, arsenic, cobalt, iron, manganese, selenium, vanadium | Based on the results of the Confirmatory Sampling investigation, additional delineation is warranted for SWMU 67. A RFI and a risk assessment should be conducted to determine the extent of the contaminants detected in site media and the risk to human health and the environment. Based on the sampling results and the comparison to the PALs for this site, the contaminants of concern at SWMU 67 are limited to PCBs in surface soil, SVOCs, pesticides, and metals in GW, PCBs and pesticides in sediments, and metals in surface water. | 1999. South Carolina Department of Health and Environmental Control. Letter Regarding Regulatory Decision for No Further Investigation at Solid Waste Management Units 16 and 67. MCAS Beaufort, SC. 28 May.<br><br>1999. U.S. Army Corps of Engineers. Final Addendum to Confirmatory Sampling Event for Solid Waste Management Units 17, 57, and 67. MCAS Beaufort, SC. 1 November.<br><br>2014. Resolution Consultants. Final Confirmatory Sampling Investigation Report for Solid Waste Management Unit 67. MCAS Beaufort, SC. 1 January. |
| SWMU 68 - East Rapid Refueling Pits Pipeline | These units are JP-5 process fuel vessels and associated piping used for aircraft refueling operations. The process fuel vessels are located outside next to the runways on bermed concrete pads. The concrete pads drain to the stormwater drainage system located next to the unit. A release of JP-5 from an underground pipeline was identified in 1997 and subsequently repaired. The site is surrounded by the airfield and is currently in operation. The site encompasses approximately 1.07 acres. It is currently undergoing GW monitoring and continued free product removal. Addressed under the SC Pollution Control Act. | Recommended actions from the 2015 GW report include a change to biennial GW sampling with continued product recovery. | Review of GW report (2015). | Local | None Identified | The site is surrounded by the airfield. Based on the results of the latest sampling event, it appears that the dissolved phase of free product remains stabilized in an area directly surrounding the recovery wells. All constituents were nondetect or well below Class GB Standards or RBSLs. Multiple sampling events (9) have returned analytical results below the RBSLs and GW flow suggests any remaining contaminants have stabilized and should not migrate off site. | 2015. U.S. Army Corps of Engineers. East Rapid Refueling Pits Pipeline Release. Draft. MCAS Beaufort, SC. February. |
| SWMU 69 - West Pits Transfer Pipeline | These units are JP-5 process fuels vessels and associated piping used for aircraft refueling operations. The process fuel vessels are located outside next to the runways on bermed, concrete pads. The concrete pads drain to the stormwater drainage system located next to the unit. The West Pits transfer pipeline system provides jet fuel to refueling hydrants located on the MCAS flight line. A minor release of JP-5 was discovered during pipeline replacement operations in the vicinity of a flange pit in 2003 and subsequently repaired. A large area of soil was excavated around the flange pit and along the pipeline run to the southwest during replacement/repairs the system. The site is surrounded by the airfield and is currently in operation. The site encompasses approximately 1.21 acres. It is currently undergoing GW monitoring. Addressed under the SC Pollution Control Act. | Recommended actions from the 2015 GW report include continuing monitored natural attenuation. | Review of GW report (2015). | Local | GW: benzene, naphthalene<br>Soil: ethylbenzene, naphthalene, total xylenes | The site is surrounded by the airfield. A decreasing trend in naphthalene concentrations beginning in June 2010 indicates that monitored natural attenuation is likely having an impact at the site. The exceeding wells have been largely stable above the RBSL since the inception of monitoring. The plume is limited in extent and has been defined laterally and vertically. Though the potential for downward vertical migration exists, the lack of contamination in DMW-1 (deep well) suggests that it is not taking place at any significant rate. No exposure points exist that could realistically be impacted by site contamination. Surficial soils are not contaminated since the pipeline leaked below ground surface. | 2004. U.S. Army Corps of Engineers. Initial Assessment Report for West Pits Transfer Pipeline. MCAS Beaufort, SC. 29 September.<br><br>2005. U.S. Army Corps of Engineers. Tier 2 Assessment Report or West Pits Pipeline. MCAS Beaufort, SC. 22 September.<br><br>2015. U.S. Army Corps of Engineers. West Pits Transfer Pipeline. MCAS Beaufort, SC. Draft. February. |
| SWMU 70 - Operating Air Compressor | An operating air compressor located outside Building 416 was observed to be releasing oils into the environment. The vegetation in the area was stressed and oil-saturated soils were evident. No pictures of this unit were returned by the facility. | NFA | [CH2MHill]. 2015. Figure II.L-4 SWMU and AOC Location Map. MCAS Beaufort, South Carolina. | Local | None Identified | NFA | [CH2MHill]. 2015. Figure II.L-4 SWMU and AOC Location Map. MCAS Beaufort, South Carolina. |
| SWMU 71 - "Ammo Popper" | This unit is a thermal treatment device used to deactivate small arms ammunition. Constructed of heavy steel plate, this unit is similar to other deactivation units which EPA has classified as incinerators under RCRA. However, MCAS Beaufort only processes small arms ammunition that are defined as Class C by DOT (49 CFR 173.101). | NFA | [CH2MHill]. 2015. Figure II.L-4 SWMU and AOC Location Map. MCAS Beaufort, South Carolina. | Local | None Identified | NFA | [CH2MHill]. 2015. Figure II.L-4 SWMU and AOC Location Map. MCAS Beaufort, South Carolina. |

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| SWMU 72 - Base Photo Lab | This facility serves as the base photographic laboratory where photographic film is developed. | NFA | [CH2MHill]. 2015. Figure II.L-4 SWMU and AOC Location Map. MCAS Beaufort, South Carolina. | Local | None Identified | NFA | [CH2MHill]. 2015. Figure II.L-4 SWMU and AOC Location Map. MCAS Beaufort, South Carolina. |
| SWMU 73 - Base Dental Clinic | This facility serves as the base dental facility. During normal medical/dental practices, x-rays are taken and teeth are filled, thus generating solid wastes. | NFA | [CH2MHill]. 2015. Figure II.L-4 SWMU and AOC Location Map. MCAS Beaufort, South Carolina. | Local | None Identified | NFA | [CH2MHill]. 2015. Figure II.L-4 SWMU and AOC Location Map. MCAS Beaufort, South Carolina. |
| SWMU 74 - Hazardous Waste Storage Tank (#979) | 10,000 gallon, carbon steel tank used for the storage of liquid hazardous wastes generated at MCAS including waste fuel, waste oil, and mixed paint waste. The unit is in a bermed area which is lined with a synthetic polymer liner. Clean closed under RCRA. | NFA | [CH2MHill]. 2015. Figure II.L-4 SWMU and AOC Location Map. MCAS Beaufort, South Carolina. | Local | None Identified | NFA | [CH2MHill]. 2015. Figure II.L-4 SWMU and AOC Location Map. MCAS Beaufort, South Carolina. |
| SWMU 75 - Hazardous Waste Container Storage Facility | Building 1030 is 1,600 sq. ft. and is divided into six storage bays, each having a separate spill containment structure. The building allows for a maximum inventory of 240 palletized 55-gallon drums, including aisle space and double stacking of drums. Four bays store a maximum of 48 drums each; two bays store a maximum of 24 drums each. The building comprises <0.1 acre. Unit regulated under R.61-79.264 (RCRA-regulated unit). | Corrective Action Required (Deferred) | [CH2MHill]. 2015. Figure II.L-4 SWMU and AOC Location Map. MCAS Beaufort, South Carolina. | Data Gap | No Information Available | SWMU 75 is currently a RCRA-regulated unit. No release to the environment was identified during the PHR. | [CH2MHill]. 2015. Figure II.L-4 SWMU and AOC Location Map. MCAS Beaufort, South Carolina.<br><br>"Units Regulated Under R.61-79.264 (RCRA-regulated units)." Figure Provided by the NMCPHC. Date Unknown. Excel File. |
| SWMU 76 - Former Incinerator Disposal Area | SWMU 76 is located in a formerly wooded area towards the southern portion of MCAS Beaufort and was discovered during tree clearing operations southwest of runway 32. The open field is approximately 5.5 acres in size. The site is located on or very near to the area that was occupied by an incinerator (former Building 231, demolished sometime between 1945 and 1959) that operated sometime between 1943 and 1959. Currently there is a mound where the incinerator was located and a small concrete vault of unknown use. A rusty drum was found near the concrete tank and surficial debris such as wire was found in several places. Vegetation in the area showed no signs of distress. The structures at this site were demolished sometime around 1956. The period of operation is estimated at 1942 - 1946. | Recommended actions based on the 2002 RFA report include confirmatory sampling on the large mounded area to characterize what materials, if any, are buried there. Sampling and Analysis Plan based on 2011 Tetra Tech Confirmatory Sampling. | Review of RCRA facility assessment report (NAVFAC Southern, 2002). | Data Gap | Soil: arsenic | A sampling and analysis plan has been developed for the site as of September 2011. More current documentation on the site was not identified during the PHR. | 2002. NAVFAC Southern. Draft RCRA Facility Assessment. MCAS Beaufort, SC. Draft Acting as Final. 1 May.<br><br>2011. Tetra Tech. Sampling and Analysis Plan Confirmatory Sampling for Solid Waste Management Units 76, 86, 87 and Area of Concern P. MCAS Beaufort, SC. 1 September.<br><br>2015. SC DHEC. Letter of Approval of a Confirmatory Sampling Report for Solid Waste Management Units 76, 86, 87, and AOC P from Laurel Petrus of SC DHEC RCRA Federal Facilities to United States Marine Corps Air Station Commanding Officer NREAO Mr. William Drawdy. 29 September. |

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| SWMU 77 - Acid Neutralization Pit | SWMU 77 is a two ft by two ft by 2.5 ft. deep, in-ground, concrete-walled, acid-neutralization pit with accompanying piping. It was used to neutralize used and surplus battery electrolytes. It was located near the intersection of Drayton Street and 2nd Street next to former building 36. The pit was connected by underground piping to Building 36. The vault was designed with an influent pipe, which is connected to Building 36, and an effluent pipe, which exits to the northeast. It is unknown where the effluent pipe drained (possibilities include a drain field, sanitary sewer, or storm sewer). The pit was discovered by accident in December 2000 when heavy equipment was driven across it, cracking the concrete-slab cover. The pit was removed in January 2009. | NFA | Review of confirmatory sampling report (2011). | Local | None Identified | The site is located adjacent to the airfield. Based on the soil and GW analytical results, operation of the former acid neutralization pit and drainage system has not significantly impacted soil or GW at the site. Various metals were detected in soil samples from the vicinity of the former acid neutralization pit and drainage system, typically at concentrations within the range of MCAS background concentration and/or below residential and industrial RSLs. Low levels of some SVOCs, PCBs, and VOCs were detected in one or more soil samples, however the concentrations did not exceed residential or industrial RSLs, and are not considered indicative of an ongoing release. Metals and one VOC were detected in GW samples from monitoring wells at the site at concentrations which did not exceed MCLs or tapwater RSLs. | 2011. GEL Engineering. Confirmatory Sampling Report for Solid Waste Management Unit 77. MCAS Beaufort, SC. 6 October.<br><br>2016. SC DHEC. No Further Action Letter for SWMU 77 from Laurel Petrus of SC DHEC RCRA Federal Facilities to United States Marine Corps Air Station Commanding Officer NREAO William A. Drawdy. 15 August. |
| SWMU 78 - Oil/Water Separator (OWS) at Former Jet Engine Test Cell | The OWS was in operation from late 1994 to May 2003 and was used for the collection of effluent from quenching test cell exhaust and floor washing. The main waste component of the effluent was JP-5 jet fuel. | NFA | [CH2MHill]. 2015. Figure II.L-4 SWMU and AOC Location Map. MCAS Beaufort, South Carolina. | Local | None Identified | NFA | [CH2MHill]. 2015. Figure II.L-4 SWMU and AOC Location Map. MCAS Beaufort, South Carolina. |
| SWMU 79 - Hangar 416 (formerly associated with SWMU 63) | Formerly associated with SWMU 63, now individually assessed. This site is currently in use and will be investigated when closed. | Corrective Action Required (Deferred) | [CH2MHill]. 2015. Figure II.L-4 SWMU and AOC Location Map. MCAS Beaufort, South Carolina. | Local | No Information Available | No release to the environment was identified during the PHR. To be investigated when closed. | [CH2MHill]. 2015. Figure II.L-4 SWMU and AOC Location Map. MCAS Beaufort, South Carolina.<br><br>"Units Regulated Under R.61-79.264 (RCRA-regulated units)." Figure Provided by the NMCPHC. Date Unknown. Excel File. |
| SWMU 80 - Wash Rack 953 (formerly associated with SWMU 63) | Formerly associated with SWMU 63, now individually assessed. This site is currently in use and will be investigated when closed. | Corrective Action Required (Deferred) | [CH2MHill]. 2015. Figure II.L-4 SWMU and AOC Location Map. MCAS Beaufort, South Carolina. | Local | No Information Available | No release to the environment was identified during the PHR. To be investigated when closed. | [CH2MHill]. 2015. Figure II.L-4 SWMU and AOC Location Map. MCAS Beaufort, South Carolina.<br><br>"Units Regulated Under R.61-79.264 (RCRA-regulated units)." Figure Provided by the NMCPHC. Date Unknown. Excel File. |
| SWMU 81 - Wash Rack 959 (formerly associated with SWMU 63) | Formerly associated with SWMU 63, now individually assessed. This site is currently in use and will be investigated when closed. | Corrective Action Required (Deferred) | Identified in NAVFAC Figure, Table, or List | Local | No Information Available | No release to the environment was identified during the PHR. To be investigated when closed. | [CH2MHill]. 2015. Figure II.L-4 SWMU and AOC Location Map. MCAS Beaufort, South Carolina.<br><br>"Units Regulated Under R.61-79.264 (RCRA-regulated units)." Figure Provided by the NMCPHC. Date Unknown. Excel File. |

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| SWMU 82 - Hangar 414 (formerly associated with SWMU 63) | Formerly associated with SWMU 63, now individually assessed. This site is currently in use and will be investigated when closed. Aviation gasoline release. | Corrective Action Required (Deferred) | [CH2MHill]. 2015. Figure II.L-4 SWMU and AOC Location Map. MCAS Beaufort, South Carolina. | Local | No Information Available | No release to the environment was identified during the PHR. To be investigated when closed. | [CH2MHill]. 2015. Figure II.L-4 SWMU and AOC Location Map. MCAS Beaufort, South Carolina.<br><br>"Units Regulated Under R.61-79.264 (RCRA-regulated units)." Figure Provided by the NMCPHC. Date Unknown. Excel File. |
| SWMU 83 - Building 843 (formerly associated with SWMU 63) | Formerly associated with SWMU 63, now individually assessed. This site is currently in use and will be investigated when closed. | Corrective Action Required (Deferred) | [CH2MHill]. 2015. Figure II.L-4 SWMU and AOC Location Map. MCAS Beaufort, South Carolina. | Local | No Information Available | No release to the environment was identified during the PHR. To be investigated when closed. | [CH2MHill]. 2015. Figure II.L-4 SWMU and AOC Location Map. MCAS Beaufort, South Carolina.<br><br>"Units Regulated Under R.61-79.264 (RCRA-regulated units)." Figure Provided by the NMCPHC. Date Unknown. Excel File. |
| SWMU 84 - Site 23 Surface Debris Area | SWMU 84 is located near the northeast corner of MCAS Beaufort approximately 900 ft. east-southeast of the pistol range. The area is situated within a small drainage feature that opens in to a salt marsh. The area contains a small amount (i.e., estimated to be approximately two cubic yards at the most) of domestic type debris (i.e., metal springs, shelving, other metal parts, plastic debris, wooden debris, and flower pots) situated on the surface along the bank of the drainage feature. The site was originally investigated as a possible landfill, however environmental evaluations determined that the site was not a landfill. Surface debris were removed from the site in 2011. The site has determined by SC DHEC as NFA. | NFA | Review of the Data Summary Letter Report (Tetra Tech, 2014). | Local | None Identified | NFA | 2014. Tetra Tech. Data Summary Letter Report for Solid Waste Management Unit 84 Site 23 Surface Debris Area. MCAS Beaufort, SC. 6 June. |
| SWMU 85 - Automotive Parts Debris Piles | The SWMU is located near the northwest corner of MCAS Beaufort, near the end of Runway 14. It is approximately 0.14 acres in size and contains two debris piles and several small soil piles that may contain debris. The debris consisted mostly of tires with some automotive gas tanks. Other debris included corrugated sheet metal, other automotive parts (i.e., car seat, bumper, car door) cinder blocks, automotive hoses, and glass bottles. | NFA | [CH2MHill]. 2015. Figure II.L-4 SWMU and AOC Location Map. MCAS Beaufort, South Carolina. | Local | None Identified | NFA | [CH2MHill]. 2015. Figure II.L-4 SWMU and AOC Location Map. MCAS Beaufort, South Carolina. |

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| SWMU 86 - Delaney Property Automotive Repair Facility | SWMU 86 was an automotive repair facility owned by a private individual. MCAS took ownership of the 2-acre property in January 2007 to mitigate encroachment issues. The site is located near the end of runway 14 in the northwest corner of MCAS. All structures have been demolished at the site but there once existed a building, hydraulic lift, waste oil tank (AST), and septic tank. | NFA | Review of sampling and analysis plan report (Tetra Tech, 2011). | Local | None Identified | NFA | 2006. Ensafe. Final Environmental Condition of Property Report for Delaney Auto Service. MCAS Beaufort, SC. 1 April.<br><br>2011. Tetra Tech. Sampling and Analysis Plan Confirmatory Sampling for Solid Waste Management Units 76, 86, 87, and Area of Concern P. MCAS Beaufort, SC. 1 September.<br><br>2015. SC DHEC. Letter of Approval of a Confirmatory Sampling Report for Solid Waste Management Units 76, 86, 87, and AOC P from Laurel Petrus of SC DHEC RCRA Federal Facilities to United States Marine Corps Air Station Commanding Officer NREAO Mr. William Drawdy. 29 September. |
| SWMU 87 - Former 1940s Era Wastewater Treatment Plant | SWMU 87 is located near the center of MCAS and covers approximately 2 acres. The WWTP consisted of sedimentation basins, sludge digester, sludge drying beds, control building, and piping. The period of operation is estimated at 1942 - 1946. No information is known to exist regarding the type of wastewater received and where disposal of the wastewater treatment plant (WWTP) waste occurred; nor is there information regarding the demolition/decommissioning of the WWTP. | Corrective Action Required | [CH2MHill]. 2015. Figure II.L-4 SWMU and AOC Location Map. MCAS Beaufort, South Carolina. | Data Gap | No Information Available | A sampling and analysis plan has been developed for the site as of September 2011. More current documentation on the site was not identified during the PHR. | 2011. Tetra Tech. Sampling and Analysis Plan Confirmatory Sampling for Solid Waste Management Units 76, 86, 87, and Area of Concern P. MCAS Beaufort, SC. 1 September.<br><br>2015. CH2MHill. Figure II.L-4 SWMU and AOC Location Map. MCAS Beaufort, South Carolina.<br><br>2015. SC DHEC. Letter of Approval of a Confirmatory Sampling Report for Solid Waste Management Units 76, 86, 87, and AOC P from Laurel Petrus of SC DHEC RCRA Federal Facilities to United States Marine Corps Air Station Commanding Officer NREAO Mr. William Drawdy. 29 September. |
| SWMU 88 - P454 Petroleum Contaminated Area | Area of petroleum contaminated soil discovered during construction activities for a new hangar. The site is located in the airfield portion of MCAS adjacent to a taxiway. | Corrective Action Required | [CH2MHill]. 2015. Figure II.L-4 SWMU and AOC Location Map. MCAS Beaufort, South Carolina. | Local | GW: 1-methylnaphthalene, 2-methylnaphthalene, ethylbenzene, naphthalene, total PAHs,<br>Soil: naphthalene<br>Soil to GW: 1-methylnaphthalene, 2-methylnaphthalene, naphthalene | The site is located adjacent to the airfield. Two soil samples had detections that exceeded the SC DHEC risks based screening levels for soil to GW. One soil sample contained naphthalene at a level which exceeded the EPA RSL for residential soil but was below the EPA RSL for industrial soil. Six GW samples had detections that exceeded the EPA tapwater standards for at least one parameter. Four GW samples had detections that exceeded the SC DHEC RBSLs for GW. The remaining GW samples were either nondetect or had detections below the applicable EPA tapwater standards and SC DHEC RBSLs for all parameters. No GW samples had detections that exceeded the EPA MCLs. | 2011. Shaw Environmental. Final Sampling Report for Petroleum Contaminated Area Solid Waste Management Unit 88. MCAS Beaufort, SC. 1 November.<br><br>[CH2MHill]. 2015. Figure II.L-4 SWMU and AOC Location Map. MCAS Beaufort, South Carolina. |

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| SWMU 89 (UXO 1) - Surface Debris Area | SWMU 89 is a recently logged, partially wooded area approximately 3.5 acres in size where surface debris were observed. The extent and number of piles present are unknown, and the debris may have been spread across the site due to recent logging activities. The surface debris consists of, but is not limited to, several crushed and deteriorated drums, wire, steel grates, paint cans, panels, a pull cart, and possible munitions-related debris. | NFA was recommended based on the 2015 sampling event. | Review of sampling event report (NAVFAC, 2015). | Local | Surface Soil: aluminum, arsenic, antimony, benzo(a)pyrene, cobalt, iron, manganese, thallium | Soil appears to have been impacted to a limited extent by past activities. Exceedances of metals are limited in aerial extent and are low-level exceedances of (residential) criteria. Benzo(a)pyrene exceeded criteria in three widely scattered locations. The exceedances are not collocated/adjacent to each other, indicating that the potential contaminant source is probably not a point source that is likely to release more contamination. The low-level contaminant concentrations and their distribution indicate that the source of contamination is likely atmospheric, from the nearby airfield. | 2015. NAVFAC Southeast. Sampling Report for Moore Street, Solid Waste Management Unit 89, and Building 448. MCAS Beaufort, SC. February.<br><br>2015. SC DHEC. Letter of Approval for Sampling Report for AOC Q (Moore Street) Solid Waste Management Unit 89, and Building 448 from Laurel Petrus of SC DHEC RCRA Federal Facilities to United States Marine Corps Air Station Commanding Officer NREAO Mr. William Drawdy. 17 June. |
| SWMU 90 - Hydraulic Lift at Building 857 | A hydraulic lift discovered in 2014 in Building 857. The lift consists of two hydraulic cylinders, one of which is situated within a concrete trench and the other is located next to the trench, installed directly in the ground. The cylinder in the trench is attached to a track that allowed it to move horizontally within the trench. Trench is approximately 186in x 82in x 16in and has a sump for the collection of water at one end. The sump appears to have contained a sump pump that removed any accumulation of water and discharged to a ditch outside of the building. It is unknown whether a release from the hydraulic lift has occurred. The lift was last used more than 10 years ago. | Corrective Action Required | Identified in SWMU Assessment Report (2014). | Local | No Information Available | Corrective Action Required. | 2014. Solid Waste Management Unit (SWMU) Assessment Report for SWMU 90 - Hydraulic Lift at Building 857. MCAS Beaufort, SC. 19 December. |
| UST 9 - Fueling Pier | Located on an east-to-west trending spit of land extending to Brickyard Creek that is bounded to the north and south by tidal marshes. The facility consists of two 596,250-gallon cut-and-cover steel UST (Tanks 567 and 568), with interconnected pipelines and a fuel off-loading pier on Brickyard Creek. The tanks were installed circa 1956 for bulk fuel storage of jet aviation fuel (JP-4 and JP-5). The tanks are top filled via an 8-inch pipeline that transfers fuel from barges moored at the Brickyard Creek pier. An 8-inch diameter underground pipeline delivers fuel between the Day Tanks (UST 13) and the Fueling Pier. LNAPL was detected in several leak detection wells installed in 1991 as part of a program to monitor for accidental releases of LNAPL into the subsurface. The amount of LNAPL that has been spilled or leaked is not known. Active (multi-phase extraction systems) and passive systems (absorbent socks) have been used to recover hydrocarbons at the site and the site is undergoing GW monitoring. | Recommended actions from the 2012 semi-annual GW report include monitoring and recovery of the LNAPL (utilizing absorbent socks) be continued. | Review of semi-annual GW report (2012). | Local | GW: 1-methylnaphthalene, 2-methylnaphthalene, benzene, ethylbenzene, naphthalene, total PAH<br>Soil: benzene, ethylbenzene, naphthalene, toluene, xylenes | The shallow aquifer beneath the site is limited in extent and has no potential use as a potable GW resource in the future because the future land use will remain the same. Monitored natural attenuation, along with the current LNAPL recovery program utilizing absorbent socks seems to be an appropriate remedy for the site. The contaminant plume has remained stable, and the MNA geochemical parameter data suggests that biodegradation is occurring. An MPE system was installed in the spring of 2005 and operated until October 2008, when it was determined that the LNAPL has been removed to the maximum extent practicable. A passive recovery system was implemented immediate upon shutdown of the MPE system and includes in the installation of hydrophobic oil sorbent socks into the monitoring wells where LNAPL is present. GW movement and subsequent contaminant migration within the shallow sand aquifer is relatively slow. Flow direction is generally south-southwest, away from the adjacent marsh. Available data indicates that contamination from the site has not reached the adjacent marsh or Brickyard Creek at concentrations detrimental to flora and fauna native to these environments. Contamination poses a relatively low risk for migration to potential receptors. Analytical and hydrogeology data obtained in 1993 from the deep well located beneath the worst contaminated portion of the shallow aquifer, indicated that the vertical migration of contamination into the deeper Floridan aquifer was occurring. However, analytical data from the May 1997 sampling event showed no detectable concentrations of petroleum hydrocarbons in the deep well. | 1998. ABB Environmental. Final Draft Corrective Action Plan for Fueling Pier Tanks 567 and 568. MCAS Beaufort, SC. Draft Acting as Final. 1 February.<br><br>2002. Battelle. Final November 2001 Sampling Report for Fueling Pier Tanks 567 and 568. MCAS Beaufort, SC. 1 October.<br><br>2012. Tetra Tech. Final Semiannual Report for Long Term Monitoring and Light Non Aqueous Phase Liquid Recovery March 2012 Monitoring Event at Underground Storage Tank Sites 9 and 13. MCAS Beaufort, SC. 1 August. |
| UST 11 - Tank Farm B/UST 13 | UST 11 was identified as both Tank Farm C (from a reviewed report) and Tank Farm B (NAVFAC list). Both were included as separate units for the review. | Groundwater monitoring and LNAPL recovery. | Identified in NAVFAC Figure, Table, or List | Local | No Information Available | No release to the environment was identified during the PHR. | No Information Available |

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| UST 11 - Tank Farm C | Tank Farm C is located at the intersection of Reed Avenue and R.C. West Road on the western side of MCAS Beaufort. The facility is enclosed by a security fence and consists of two 210,000 gallon, cut-and-cover steel tanks (tanks 401 & 402), a truck loading and unloading stand, and a rail line. The tanks were constructed in 1957. The tanks are used to store JP-5 aviation fuel. In June 1990, inventory control at the tank farm indicated a petroleum release had occurred. Inventory control at the time of the fuel release indicated that approximately 10,600 gallons of JP-5 aviation fuel leaked into the ground from the line leaks. Approximately 13,000 gallons of mixed fuel and water were pumped from a large excavation constructed during the repair of the pipeline. UST 11 was identified as both Tank Farm C (from a reviewed report) and Tank Farm B (NAVFAC list). Both were included as separate units for the review. | Recommended actions from the 2011 GW report include continued GW monitoring. | Review of the semi-annual GW report (2011). | Local | Subsurface Soil: total petroleum hydrocarbons<br>GW: 1-methylnaphthalene, 2-methylnaphthalene, benzene, naphthalene, total PAH | The facility is enclosed by a security fence. Since the initial recovery of 13,000 gallons of mixed JP-5 fuel and water, manual bailing and recovery of free product has been regularly performed. The horizontal and vertical extent of soil and GW contamination at the site has been defined. Two soil contaminant areas exist at the site. One is located in an area south of the UST, and the other is located northeast of the tanks where sludge was buried in 1968. The soil contaminant plume to the south of the USTs is located around the release area. The sludge burial area has been established as a NFA site as long as it remains undisturbed. A sensitive receptor of contamination is a drainage ditch located immediately south of the release. A trench has been opened from the excavation pit created to repair the line break to this ditch and free product was observed flowing into the ditch and off the site into a marshy area to the northwest. An absorbent boom was placed across the ditch where it flows off-site to impede off-site migration. A substantial reduction in plume size and level of petroleum contaminants in the GW (from 1993 to 1996) indicated that natural attenuation processes are active at the site and are an effective contaminant reduction mechanism. The contaminant plume does not appear to be migrating, nor are their significant fluctuations in the monitored constituent concentrations as of 2011. | 1993. ABB Environmental. Contamination Assessment for Tank Farm C. MCAS Beaufort, SC. 1 October.<br><br>1995. ABB Environmental. Final Draft Corrective Action Plan for Tank Farm C. MCAS Beaufort, SC. Draft Acting as Final. 1 June.<br><br>2001. U.S. Army Corps of Engineers. Final Baseline Sampling Event 3 for Tank Farm C. MCAS Beaufort, SC. 1 January.<br><br>2011. U.S. Army Corps of Engineers. Semi-Annual Groundwater Sampling Report for Tank Farm C Sampling Event August 2011. MCAS Beaufort, SC. 5 December. |
| UST 15 - Hangar 414 | Hangar 414 is located on Norris Avenue, along the flight line of MCAS. The site contains a large hangar used for storage and maintenance of aircraft, and runway support. Several offices are located along the perimeter of the hangar. In 2003, a drain line was broken during trenching activities releasing a minor amount of petroleum material. The petroleum material was removed using a vacuum truck but due to the appearance of additional petroleum in the vicinity of the release the site was further investigated. It was discovered that three 100,000-gallon and one 50,000-gallon concrete aviation fuel tanks were located in the vicinity of the hangar in the mid-1940's, prior to the hangar being built. It is believed that the contamination at the site is the result of a release from the former tanks and/or their associated piping. | This site underwent sulfate enhanced bioremediation injections in 2016. GW monitoring continues. | Review of sampling and analysis plan report (Tetra Tech, 2012). | Local | GW: benzene, ethyl benzene, toluene<br>Soil: benzene, benzo(a)anthracene, benzo(b)fluoranthene, benzo(k)fluoranthene, ethyl benzene, naphthalene, toluene, xylenes | No potential receptors or human exposure pathways have been identified for the site. No surface waters, confined spaces, GW consumption, or surficial soil exposure were identified at the site. A sewer and water line that is present north of the Hangar 414 is considered upgradient, and buried too shallow to act as a conduit for contaminated GW. The overall decline in BTEX levels within the plume, from 2005 to 2007, suggest that the site is being remediated through natural attenuation processes. The hydrocarbon plume is not expanding or migrating. It should be noted, however, that there is only a limited amount of trend and indicator parameter data available at this time. | 2004. Advent Environmental. Completion Report for Tier 1 Assessment for Hangar 414. MCAS Beaufort, SC. 1 July.<br><br>2005. Advent Environmental. Tier 2 Assessment of Hangar 414. MCAS Beaufort, SC. 1 September.<br><br>2008. Tetra Tech. Preliminary Data Summary for Underground Storage Assessment at Underground Storage Tank 15 Hangar 414. MCAS Beaufort, SC. 1 June.<br><br>2012. Tetra Tech. Sampling and Analysis Plan for Underground Storage Tank 15 Hangar 414. MCAS Beaufort, SC. 1 March. |
| UST 554 | Installed in 1993. 2000 gallon heating oil tank. | Active | Identified in NAVFAC Figure, Table, or List (See Appendix 2) | Local | No Information Available | Risk Rational based on information found in the source Figure. | "Current UST Locations: MCAS Beaufort." Figure Provided by NMCPHC. Date Unknown. PDF File. |
| UST 600 | Installed in 1993. 2000 gallon diesel tank. | Active | Identified in NAVFAC Figure, Table, or List (See Appendix 2) | Local | No Information Available | Risk Rational based on information found in the source Figure. | "Current UST Locations: MCAS Beaufort." Figure Provided by NMCPHC. Date Unknown. PDF File. |

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| UST 629A | 10,000-gallon gasoline UST associated with Building 629 (AOC J - MCX Service Station). | See AOC J - MCX Service Station | Identified in Tank Tightness Report (1991, 1992). | Local | See AOC J - MCX Service Station | See AOC J - MCX Service Station | 1991. Sirrine Environmental Consultants. Final Tightness Testing Report for Underground Storage Tanks. MCAS Beaufort, SC. 1 April.<br><br>1992. ABB Environmental Services, Inc. Tank Tightness Report for Underground Storage Tanks. MCAS Beaufort, SC. 1 December. |
| UST 629B | 10,000-gallon unleaded gasoline UST associated with Building 629 (AOC J - MCX Service Station). | See AOC J - MCX Service Station | Identified in Tank Tightness Report (1991, 1992). | Local | See AOC J - MCX Service Station | - See AOC J - MCX Service Station | 1991. Sirrine Environmental Consultants. Final Tightness Testing Report for Underground Storage Tanks. MCAS Beaufort, SC. 1 April.<br><br>1992. ABB Environmental Services, Inc. Tank Tightness Report for Underground Storage Tanks. MCAS Beaufort, SC. 1 December. |
| UST 629C | 10,000-gallon unleaded gasoline UST associated with Building 629 (AOC J - MCX Service Station). | See AOC J - MCX Service Station | Identified in Tank Tightness Report (1991, 1992). | Local | See AOC J - MCX Service Station | See AOC J - MCX Service Station | 1991. Sirrine Environmental Consultants. Final Tightness Testing Report for Underground Storage Tanks. MCAS Beaufort, SC. 1 April.<br><br>1992. ABB Environmental Services, Inc. Tank Tightness Report for Underground Storage Tanks. MCAS Beaufort, SC. 1 December. |
| UST 770 | 6000 gallon gasoline tank (Mogas) installed in 1993. Associated with the Station Fuels Site (Release 5). | See Station Fuels Site (Release 5) | Identified in Tank Tightness Report (1991, 1992). | Local | See Station Fuels Site (Release 5) | See Station Fuels Site (Release 5) | 1991. Sirrine Environmental Consultants. Final Tightness Testing Report for Underground Storage Tanks. MCAS Beaufort, SC. 1 April.<br><br>1992. ABB Environmental Services, Inc. Tank Tightness Report for Underground Storage Tanks. MCAS Beaufort, SC. 1 December. |
| UST 771 | 6000 gallon diesel tank installed in 1993. Associated with the Station Fuels Site (Release 5). Removed February 2001. | See Station Fuels Site (Release 5) | Identified in Tank Tightness Report (1991, 1992). | Local | See Station Fuels Site (Release 5) | See Station Fuels Site (Release 5) | 1991. Sirrine Environmental Consultants. Final Tightness Testing Report for Underground Storage Tanks. MCAS Beaufort, SC. 1 April.<br><br>1992. ABB Environmental Services, Inc. Tank Tightness Report for Underground Storage Tanks. MCAS Beaufort, SC. 1 December. |

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| UST 872 | Associated with Jet Engine Test Cell (Building 603). 10,000-gallon steel tanks which normally contain jet fuel (JP-5). Located in the vicinity of the intersection of Capers Street and R.C. West Road and to the northeast of Building 604. | NFA | Identified in Tank Tightness Report (1991, 1992). | Local | None Identified | NFA | 1991. Sirrine Environmental Consultants. Final Tightness Testing Report for Underground Storage Tanks. MCAS Beaufort, SC. 1 April.<br><br>1992. ABB Environmental Services, Inc. Tank Tightness Report for Underground Storage Tanks. MCAS Beaufort, SC. 1 December. |
| UST 873 | Associated with Jet Engine Test Cell (Building 603); 10,000-gallon steel tanks that normally contain jet fuel (JP-5). Located in the vicinity of the intersection of Capers Street and R.C. West Road and to the northeast of Building 604. | NFA | Identified in Tank Tightness Report (1991, 1992). | Local | No Information Available | No release to the environment was identified during the PHR. | 1991. Sirrine Environmental Consultants. Final Tightness Testing Report for Underground Storage Tanks. MCAS Beaufort, SC. 1 April.<br><br>1992. ABB Environmental Services, Inc. Tank Tightness Report for Underground Storage Tanks. MCAS Beaufort, SC. 1 December.<br><br>1997. SC DHEC. Letter stating No Additional Remedial Actions and/or Contaminant Characterizations Warranted from Paul Bristol of SC DHEC Bureau of Water to United States Marine Corps Air Station Beaufort Command Officer A. G. Howard. 22 December. |
| UST 903 | 10,000-gallon JP-5 tank associated with the Station Fuels Site (Release 5). Located in the Day Tanks Area northeast of Simpson Street. Operated by Station Fuels. | See Station Fuels Site (Release 5) | Identified in Tank Tightness Report (1991, 1992). | Local | See Station Fuels Site (Release 5) | See Station Fuels Site (Release 5) | 1991. Sirrine Environmental Consultants. Final Tightness Testing Report for Underground Storage Tanks. MCAS Beaufort, SC. 1 April.<br><br>1992. ABB Environmental Services, Inc. Tank Tightness Report for Underground Storage Tanks. MCAS Beaufort, SC. 1 December. |
| UST 1040A | 550-gallon gasoline tank installed in 1983. Located east of building 1040. | NFA | Identified in Tank Tightness Report (1992). | Local | No Information Available | No release to the environment was identified during the PHR. | 1992. ABB Environmental Services, Inc. Tank Tightness Report for Underground Storage Tanks. MCAS Beaufort, SC. 1 December |
| UST 1040B | Installed in 1983. 550-gallon diesel fuel tank. Located east of building 1040. | NFA | Identified in Tank Tightness Report (1992). | Local | No Information Available | No release to the environment was identified during the PHR. | 1992. ABB Environmental Services, Inc. Tank Tightness Report for Underground Storage Tanks. MCAS Beaufort, SC. 1 December |

| Name of Site | Site Description | Current Status or Recommended Actions | Source of Status | Risk Classification | Constituents of Concern or Potential Concern | Risk Rational/Additional Site Information | Source of Primary Documents Used in the Evaluation |
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| UST 1269 | 2,000 JP-5 tank installed in 2003. | Active | Identified in NAVFAC Figure, Table, or List | Local | No Information Available | Risk Rational based on information found in the source Figure. | "Current UST Locations: MCAS Beaufort." Figure Provided by NMCPHC. Date Unknown. PDF File. |
| UST 1283A | 12,000 gallon gasoline tank installed in 2003. | Active | Identified in NAVFAC Figure, Table, or List | Local | No Information Available | Risk Rational based on information found in the source Figure. | "Current UST Locations: MCAS Beaufort." Figure Provided by NMCPHC. Date Unknown. PDF File. |
| UST 1283B | 12,000 gallon gasoline tank installed in 2003 | Active | Identified in NAVFAC Figure, Table, or List | Local | No Information Available | Risk Rational based on information found in the source Figure. | "Current UST Locations: MCAS Beaufort." Figure Provided by NMCPHC. Date Unknown. PDF File. |

**Table 2: Public Health Review of MCRD Parris Island Sites - Includes Site 45 and Beaufort Naval Hospital Housing**

| Name of Site on Parris Island | Site Description | Current Status or Recommended Actions | Source of Status | Risk Classification | Constituents of Concern or Potential Concern | Risk Rational/Additional Site Information | Source of Primary Documents Used in the Evaluation |
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| Site 1 - Incinerator Landfill | The site is an unlined 10 acre landfill located in the northeast section of Horse Island, surrounded by salt marshes and tidal creeks that received the majority of the solid waste generated on the facility from 1921 to 1959. Between 1959 and 1965, solid waste was disposed at this site. Landfill operations terminated. | 2015 Five year review confirmed remedy protectiveness still effective. LTM ongoing. No action needed. Land use control remedial action complete in 2008. | 2015a. Resolution Consultants. Draft Five Year Review for Operable Units 1, 3, and 5 MCRD Parris Island, SC. May. | Local | Human Health COPCs:<br>GW: Inorganics, SVOCs, VOCs<br>Sediment: Inorganics<br>soil-to-groundwater, Pesticides/PCBs, SVOCs<br>Surface Soil: Inorganics, Pesticides/PCBs, SVOCs<br>Surface Water: Inorganics, SVOCs<br><br>Ecological COPCs:<br>Fish: Inorganics, SVOCs | Considered a local risk due to land use controls and the GW monitoring being conducted to ensure contamination is not migrating offsite. Protectiveness Statement: The remedy at Site 1 (and Site 41) is protective of human health and the environment. Sediment excavation/consolidation, waste consolidation, capping, marsh grass restoration, and the installation of revetments eliminate direct contact and contaminant migration pathways. GW monitoring ensures contamination is not migrating offsite. The Navy implemented land use controls to prevent disturbance of waste and unacceptable soil and GW exposures. | 2006a. Tetra Tech. Record of Decision for Site 1 Incinerator Landfill and Site 41 Former Incinerator. MCRD Parris Island, SC. |
| Site 2 / SWMU 2 - Borrow Pit Landfill | The site is located in the central portion of Horse Island, in the north section of the facility, approximately 2,000 ft southwest of the Incinerator Landfill (Site 1). It is bordered by salt marshes and tidal creeks. This was the primary landfill after operations terminated at Site 1 and Site 3, from 1966 to 1968. | NFA. No regulatory actions have been undertaken at Site 2. | 2006b. Tetra Tech. Record of Decision for Site 2 Borrow Pit Landfill and Site 15 Dirt Roads McCord Parris Island SC. | Local | Human Health COPCs:<br>GW: Inorganics, VOCs<br>Fish Tissue: SVOCs<br>Surface Water: SVOCs<br><br>Ecological COPCs:<br>GW: Inorganics, SVOCs,<br>Sediment: Inorganics, VOCs<br>Surface Soil: Inorganics, VOCS<br>Surface Water: Inorganics, SVOCs, VOCs | Considered a local risk due to the location of the site and the improbability of exposure to a large number of people on-base. | 2006b. Tetra Tech. Record of Decision for Site 2 Borrow Pit Landfill and Site 15 Dirt Roads. MCRD Parris Island, SC. |
| Site 3 / SWMU 3 - Causeway Landfill | The site is located in the north section of the facility and is a two-lane road, consisting of alternate layers of solid waste and fill dirt constructed across a tidal marsh of the Broad River. The causeway connects Horse Island to Parris Island and is approximately 4,000 ft long and 10 ft high (above the water surface). Landfill operations terminated. | 2015 Five year review confirmed remedy protectiveness still effective. LTM ongoing. No action needed. | 2015a. Resolution Consultants. Draft Five Year Review for Operable Units 1, 3, and 5 MCRD Parris Island, SC. May. | Local | Human Health COCs:<br>Fish Tissue: Pesticides, PCBs, Metals<br>Sediment: Inorganics (arsenic), Organics<br>Surface Water: PAHs, Metals<br>Surface soil/Surface Water/Sediment: Arsenic, cPAHs, Organics (PAHs), PCBs | Considered a local risk due to land use controls and the GW monitoring being conducted to ensure contamination is not migrating offsite. Protectiveness Statement: The remedy at Site 3 is protective of human health and the environment. The cover components of the remedy eliminated direct contact with waste, soil, and sediment and minimized migration of contamination to environmental media. GW monitoring ensures contamination is not migrating offsite. The Navy has implemented land use controls to prevent disturbance of wastes, unacceptable soil and GW exposures, and ingestion of fish. | 2015a. Resolution Consultants. Draft Five Year Review for Operable Units 1, 3, and 5 MCRD Parris Island, SC. May. |
| Site 4 / SWMU 4 - Dredge Spoils Fire Training w/SWMU 13 | The site is located approximately 600 ft northeast of Cuba Street and Ballast Creek junction in the east section of the facility. The site is bordered by a creek to the north, and wooded area to the southwest and southeast. This site was used to contain fuels during fire-fighting training exercises from the 1940s to 1960s. The nearest resident to this site is 2,000 ft to the north. No daycare facilities or schools are located within 200 ft of the site. | Active investigation with Site 13C and UXO 2 | 2010b. Tetra Tech. SI Confirmation Sampling Report for Sites 4, 5, 7, 9, 13, 16, 27, 35. | Local | None Identified | Considered a local risk because soil and sediment detections were below background values. GW detections were below federal MCLs. | 2010b. Tetra Tech. SI Confirmation Sampling Report for Sites 4, 5, 7, 9, 13, 16, 27, 35. MCRD Parris Island, SC. |
| Site 5 / SWMU 5 - Former Paint Shop Disposal Area | The site is a river bank with dried paint waste that was disposed of by Site 14 Outfall 358, and is located at the edge of the Beaufort River, adjacent to Building 160A in the northeast section of the facility. The waste was generated at Building 177 and poured directly onto the river bank. The area was approximately 30 ft long and five ft wide along the embankment. Outfall 358 drains this site. | Phase II RI recommended to identify source material that could cause impacts to soil and GW that migrate, in turn impacting sediment along the shoreline. VI not of concern. | 2012a. Tetra Tech. PA and SI Report for Site 14 Storm Water Outfalls MCRD Parris Island SC. | Data Gap | Human Health COCs:<br>GW Direct Contact: Inorganics<br>Sediment: Metals, Pesticides<br>Storm Water: Pesticides<br>Subsurface Soil: Carcinogenic PAHs | Considered a data gap because the source material needs to be identified to determine the impacts to the soil and GW that may migrate and impact sediment along the shoreline.<br><br>"A Phase II RI is recommended to support the assumption that migration of contaminants identified in Site 5 groundwater and soil are not impacting the sediments along the shoreline at Site 5 to identify source material. Sediment and surface water data collected from Outfall 358 will be used in evaluation of Site 5. No further sediment and storm water data will be collected as part of Site 14 (Tetra Tech 2012a).<br><br>Outfall 358 is a process area outfall and located on the northeast side of the MCRD Parris Island. | 2012a. Tetra Tech. Preliminary Assessment and Site Inspection Report for Site 14 Storm Water Outfalls. MCRD Parris Island, SC. J13 1 October. |
| Site 6 / SWMU 6 - Former Automotive Hobby Shop Spill Area | The site consists of a 500-gallon, steel underground storage tank and the surrounding soil area. The tank is located in the southeast section of the facility. The tank was part of the Hobby Shop, which was primarily used for military personnel car maintenance. The tank opening was surrounded by sand fill to absorb spillage. | State UST Program | 2010 Five Year Review Report MCRD Parris Island, SC - Site Chronology Table. | Local | None Identified | Considered a local risk due to the location of the site. The site is monitored under the State UST Program. | 2010. NAVFAC. Southern Division. Five Year Review Report. MCRD Parris Island, SC. September. |
| Site 7 / SWMU 7 - Page Field Fire Training Pit | The site is located at the south end of Henderson Street at Page Field, in the central section of the facility. The site was constructed on a concrete pad that was the apron of the former runway, and is approximately 25 ft in diameter with an asphalt cover and cinder-block berm. According to the IAS, the site was abandoned in 1976 after facility personnel discovered that the site leaked an estimated 50 gallons of waste flammables to surrounding soils. | Under Investigation | 2010b. Tetra Tech. Site Investigation/ Confirmatory Sampling for Sites 4, 5, 7, 9 13, 16, 27, 35. | Local | None Identified | Considered a local risk due to the location of the site and the improbability of exposure to a large number of people on-base. Soil sample results were nondetect except for petroleum contaminants, which will be excavated and disposed. MWs were resampled in 2004 indicated MNA was occurring before migrating offsite. Determined this site was a case for clean closure following removal of petroleum contaminated soil. Buried fuel lines determined not to be an issue. Due to concrete lining and soil type below grade, the vertical movement of contaminants into the underlying aquifer is unlikely. Also, because of the small amount of contamination, it was determined that the contaminants could not travel 1,600 ft to the nearest surface water body. | 2010b. Tetra Tech. Site Investigation/Confirmatory Sampling Report for Sites 4, 5, 7, 9 13, 16, 27, 35. MCRD Parris Island, SC. |
| Site 8 / 8A & 8B-PCB Spill Areas | 8A: In 1984, a PCB spill occurred on a grass-covered area adjacent to Building 111 in the northeast section of the facility. The spill reportedly occurred when contractors were removing three 35-gallon drums of transformer oil from Building 111. The quantity of the spill was not provided in the available file material.<br><br>8B: In 1983, a PCB spill occurred on an asphalt pad adjacent to Building 450 in the northeast section of the facility. The spill reportedly occurred during PCB transformer removal operations. After the transformer was transferred from the building to the pad, transformer removal personnel noted that the transformer was leaking. The transformer was relocated to another section of the area and covered with plastic sheeting and bermed with an unspecified material. Outfall 405 drains Site 8B. | NFA | 2012a. Tetra Tech. PA and SI Report for Site 14 Storm Water Outfalls MCRD Parris Island SC (Potential associated outfall from Site 14). | Local | Human Health COPCs:<br>Sediment: PAHs, Pesticides<br>Stormwater: Pesticides | Considered a local risk because both spills were in a localized area that would restrict exposure to a large number of people. Data collected from Outfall 405 will be evaluated during the upcoming PA/SI at Site 8B (Tetra Tech 2012a). | 2012a. Tetra Tech. Preliminary Assessment and Site Inspection Report for Site 14 Storm Water Outfalls. MCRD Parris Island, SC. October. (Potential associated outfall from Site 14). |

| Name of Site on Parris Island | Site Description | Current Status or Recommended Actions | Source of Status | Risk Classification | Constituents of Concern or Potential Concern | Risk Rational/Additional Site Information | Source of Primary Documents Used in the Evaluation |
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| Site 9 / SWMU 8 - Paint Waste Storage (AOC C) | In 1984, a site cleanup was performed, and 6 inches of surface soil were removed. Since 1984, wastes have not been stored at this site. Prior to 1984, the site was an unpaved area situated between Building N277 and Building 895 in the northeast section of the facility. The area was approximately 20 ft by 60 ft and was used to store containers of paint wastes after disposal activities at the Borrow Pit Landfill (Site 2) terminated. Paint wastes generated from on-site painting activities were contained in 20-to-30-gallon containers and staged at this site. No residents are located within 2,000 ft SSW, and no day care facilities or schools are within 200 ft. of the site. Outfalls 405, 408, 457 drain this site. | RI/FS complete. RAOs and cleanup goals presented for soil and GW. Proceed to FFS. | 2014 Tetra Tech FS for sites 9, 16, 27, 55. | Data Gap | Human Health COCs:<br>Surface Soil: Inorganics, Pesticides/PCBs, SVOCs<br>GW: Inorganics, Pesticides/PCBs<br>Sediment: PCBs, Metals<br>Surface Soils: cPAHs<br><br>Human Health COPCs:<br>Sediment: Pesticides, PAHs<br>Stormwater: Pesticides | Considered a data gap because the Navy is working on a cleanup plan to present to the public. The site is 2,000 ft from residential areas, and 200 ft from day care facilities or schools. Adjacent sites: 9, 16, 27, 55. To support clean closure of the site - an extended SI with a FFS will be completed, contaminated soils will be excavated and disposed of, piezometers will be installed to determine GW flow and pesticide impacts to GW. Issues may be addressed at this site based on sampling results from nearby Site 55.<br><br>Additional information on Outfall 408 because it drains Site 9:<br>"Based on the CSMs of Sites 9, 16, 46, 47, and 49, a CERCLA related release would most likely result in paint waste and pesticides. When making a comparison of the 4,4'-DDD ecological/background exceedances (28 µg/kg) to what is observed at other PAOs where pesticides are not CSM related, 4,4'-DDD values at Outfall 408 are similar or lower than those in Outfall 106 (89 µg/kg), Outfall 555 (89 to 530 µg/kg), Outfall 592 (24 and 54 µg/kg), Outfall 608DNF (32 and 59 µg/kg), and Outfall 881 (380 µg/kg)" (TetraTech 2012a).<br><br>"Additionally, when comparing results for total DDT at Outfall 457 (72 µg/kg) to RAOs without pesticides in their CSM, Outfall 106 (200 and 140 µg/kg), Outfall 555 (120 to 710 µg/kg), Outfall 592 (56 and 65 µg/kg), Outfall 608DNF (62 and 130 µg/kg), Outfall 636B (57 and 76 µg/kg), and Outfall 881 (130 and 530 µg/kg) had exceedances similar to or greater than what was observed at Outfall 457. It is believed that pesticides in the sediment at Outfall 408 are not a result of a CERCLA release, rather a result of historic pesticide use at MCRD Parris Island. Based on the results of the ecological risk screening, statistical evaluation, human health criteria comparison, data review, and the CSMs of the sites that Outfall 457 drains, further investigation may be required" (Tetra Tech 2012a). | 2014. Tetra Tech. Feasibility Study Report For Site 9 Former Paint Waste Storage Area, Site 16 Pesticide Rinsate Area, Site 27 Motor Transportation Facility and Site 55 Fiber Optic Vault. MCRD Parris Island, SC. 1 October. |
| Site 10 / AOC C - Gasoline Spill Area | In 1983, approximately 97 gallons of gasoline spilled in the vicinity of Building 170 in the northeast section of the facility. The spill reportedly occurred when an in-ground day tank overflowed during filling operations. The gasoline flowed from the tank area onto a grass-covered area, forming small pools. Reportedly, the contaminated soil was removed. Approximately 50, 55-gallon drums of contaminated soil were removed and shipped off base for disposal as hazardous waste. | Active investigation | 2016. USEPA. Approval Letter from Lila Llamas of the USEPA to NAVFAC MIDLANT Commanding Officer Jose Parra for the No Further Investigation determination to remove Outfall 305 for the Site 14 Evaluation and add to Site 10 Evaluation. 15 December. | Local | None Identified | Considered a local risk due to the location of the site. | 2005. NAVFAC. Five Year Review Report. MCRD Parris Island, SC. September.<br><br>2014. SC DHEC . Meredith Amick, letter to Dan Owens and Tim Harrington. MCRD Parris Island, SC. 10 June.<br><br>2016. SC DHEC. Approval Letter of Change Pages for No Further Investigation Determination Site 14 and Referral Letter Site 14, Storm Water Outfalls from SC DHEC to NAVFAC MIDLANT Commanding Officer Jose Parra. 13 December.<br><br>2016. Resolution Consultants. Letter for Change Pages for No Further Investigation Determination and Referral Letter Site 14, Storm Water Outfalls, MCRD Parris Island, SC from Dave Warern of Resolution Consultants to Ms. Lila Llamas of the USEPA. 5 December.<br><br>2016. USEPA. Approval Letter from Lila Llamas of the USEPA to NAVFAC MIDLANT Commanding Officer Jose Parra for the No Further Investigation determination to remove Outfall 305 for the Site 14 Evaluation. 15 December. |
| Site 11 / SWMU 9 - Former MCX Service Station Spill Area | The site was associated with a gasoline station that was closed in 1984. The gasoline station was adjacent to Building 404 in the northeast section of the facility and consisted of a soil area surrounding an inlet to an underground waste oil tank. In 1983, contaminated soil was placed in 50, 55-gallon drums and shipped off-site for disposal as hazardous waste. | NFA | 2005. NAVFAC. Five Year Review Report MCRD Parris Island SC (Public Document) Table 3. | Local | None Identified | Considered a local risk due to the location of the site and NFA status. | 2005. NAVFAC. Five Year Review Report. MCRD Parris Island, SC. September. |
| Site 12 / SWMU 10 - Jericho Island | The site covers an area approximately 100 ft by 250 ft along the central part of the southern edge of Jericho Island, in the northwest section of the facility. The waste piles are as high as five ft and as wide as 30 ft. Disposal of waste at this site occurred from 1955 to 1968 when MCRD Parris Island purchased the property to extend the impact zone safety area needed down range of the small arms firing ranges. | 2015 Five year review confirmed remedy protectiveness still effective. LTM ongoing. No action needed. Land use control remedial action complete in 2008. | 2015a. Resolution Consultants. Draft Five Year Review for Operable Units 1, 3, and 5 MCRD Parris Island, SC. May. | Local | GW: Inorganics, PAHs, VOCs, SVOCs,<br>Surface Soils: PAHs, Pesticides/PCBs, SVOCs, VOCs | Considered a local risk due to the location of the site and the improbability of exposure to a large number of people on-base. Protectiveness Statement: The remedy at Site 10 is protective of human health and the environment. The removal components of the remedy eliminated direct contact and contaminant migration pathways. The Navy has implemented land use controls to prevent unacceptable GW exposure. | 2015a. Resolution Consultants. Draft Five Year Review for Operable Units 1, 3, and 5. MCRD Parris Island, SC. May. |
| Site 13A / SWMU 11 - Inert Disposal, Horse Island (Disposal Area A) | The site is located on the south side of Horse Island, in the north section of the facility. The landfill was permitted by the state in 1979 for disposal of cellulosic wastes. This landfill consists of a 1,000-foot by 2,000-foot area on 50 acres of land. | NFA | 2005. NAVFAC. Five Year Review Report MCRD Parris Island SC (Public Document) Table 3. | Local | None Identified | Considered a local risk due to the location of the site and the improbability of exposure to a large number of people on-base. | 2005. NAVFAC. Five Year Review Report. MCRD Parris Island, SC. September. |
| Site 13B / SWMU 12 - Inert Disposal, Elliot's Beach (Disposal Area B) | The site is located near Elliot's Beach in the southeast section of the facility. This site was permitted by the state and operated from 1976 to 1979. | NFA | 2005. NAVFAC. Five Year Review Report MCRD Parris Island SC (Public Document) Table 3. | Local | None Identified | Considered a local risk due to the location of the site and the improbability of exposure to a large number of people on-base. Unit was closed under state supervision in 1979. | 2005. NAVFAC. Five Year Review Report. MCRD Parris Island, SC. September. |
| Site 13C / SWMU 13 - Inert Disposal Dredge Spoils Area C | The site is located at the Dredge Spoils Area Fire Training Pit (Site 4). Since 1976, approximately 100,000 cubic yards of marine dredge spoils have been disposed of over the Dredge Spoils Fire Training Pit. | Active investigation | 2010b. Tetra Tech. SI Confirmation Sampling Report for Sites 4, 5, 7, 9, 13, 16, 27, 35. | Local | None Identified | Considered a local risk due to the location of the site and the improbability of exposure to a large number of people on-base. Metals detected in surface soil did not exceed SSLs in sediment; therefore, sediment in adjacent creek have not been adversely affected by soil erosion. GW in the surficial aquifer would not be used as a drinking water source. Metal in surface water samples did not exceed ESVs; therefore GW has not been affected from an ecological perspective. | 2010b. Tetra Tech. SI Confirmation Sampling Report for Sites 4, 5, 7, 9, 13, 16, 27, 35. MCRD Parris Island, SC. |

| Name of Site on Parris Island | Site Description | Current Status or Recommended Actions | Source of Status | Risk Classification | Constituents of Concern or Potential Concern | Risk Rational/Additional Site Information | Source of Primary Documents Used in the Evaluation |
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| Site 14 / SWMU 14 - Storm Sewer Outfalls | This complex storm sewer system, with approximately 100 outfalls that empty into the marshes along the perimeter of Parris Island, consists of drainage swales, culverts, storm water pipes and subsequent outfalls that discharge surface runoff into surrounding streams, marshes, ponds, and rivers. Pipes of varying sizes and materials of construction are located below ground throughout the facility. Stormwater consists primarily of runoff contaminated with small amounts of wastes from the following sources: garages and other shops; dispensary/dental clinic, photo lab, steam plant, and cooling tower. These various wastes were disposed of in the storm sewers from at least 1918 to 1985. The large number of outfall points located throughout and around Parris Island minimize the potential for accumulation of contaminants at any one point. Accumulation of contaminants would also be inhibited by the twice daily tidal actions and severe storms that occur annually (Tetra Tech 2012). | NFA for storm water and sediment is recommended as a result of the Site 14 PA/SI findings at Outfall 881. Site 14 is part of the Site 45 LTM Proposed Plan. In addition, Outfall 305 will be further investigated as part of Site 10. | 2012a. Tetra Tech PA and SI Report for Site 14 Storm Water Outfalls MCRD Parris Island SC.<br>2014 Approval Letter from SC DHEC to NAVFAC re: Approval of PA/SI Report for Site 14.<br>2016. SC DHEC, Resolution Consultants, and USEPA approval letters for Outfall 305 to be further investigated as part of Site 10. | Local | Human Health COPCs:<br>Sediment: Inorganics, PAHs, PCBs, Pesticides<br>Stormwater: Inorganics, PAHs, Pesticides | Considered a regional risk due potential exposure to a larger number of people on-base (Site 14 is a facility wide network of >100 outfalls). Outfall 881 included with Site 14 has an NFA status for storm water and sediment as a result of the PA/SI findings associated with Site 45 (dry cleaning waste). In June 2014, the SC DHEC approved the NFI of storm water and sediment as a result of the Site 14 PA/SI findings although Site 14 is on the Site 45 LTM Proposed Plan for the remedial alternatives for GW migration. Manhole and outfall location monitoring will be submitted with the GW data annually until injections cease. | Storm Water Outfalls. MCRD Parris Island, SC. 1 October.<br><br>2014. SC DHEC . Meredith Amick, letter to Dan Owens and Tim Harrington. MCRD Parris Island, SC. 10 June.<br><br>2016. SC DHEC. Approval Letter of Change Pages for No Further Investigation Determination Site 14 and Referral Letter Site 14, Storm Water Outfalls from SC DHEC to NAVFAC MIDLANT Commanding Officer Jose Parra. 13 December.<br><br>2016. Resolution Consultants. Letter for Change Pages for No Further Investigation Determination and Referral Letter Site 14, Storm Water Outfalls, MCRD Parris Island, SC from Dave Warern of Resolution Consultants to Ms. Lila Llamas of the USEPA. 5 December.<br><br>2016. USEPA. Approval Letter from Lila Llamas of the USEPA to NAVFAC MIDLANT Commanding Officer Jose Parra for the No Further Investigation determination to remove Outfall 305 for the Site 14 Evaluation. 15 December. |
| Site 15 / SWMU 15 - Dirt Roads with Site 2 | The site consists of gravel/dirt roads that the facility routinely sprayed with oils to reduce dust. In the 1940's, a majority of the roads were paved over with asphalt. The roads that most recently received oils are a 1.5 mile section of dirt road that accesses Elliot's Beach, and the approximately 0.5 mile road that accesses the Inert Disposal Area B (Site 13B). | NFA | 2006b. Tetra Tech. Record of Decision for Site 2 Borrow Pit Landfill and Site 15 Dirt Roads. MCRD Parris Island, SC. | Local | Human Health COPCs:<br>GW: Inorganics, SVOCs, VOCs<br>Sediment: Inorganics, VOCs<br>Surface Soil: Inorganics, VOCS<br>Surface Water: Inorganics, SVOCs, VOCs<br>(Site 15: no COPCs were detected in the soil or sediment, so no quantitative risks were calculated for human health) | Considered a local risk due to the location of the site and the improbability of exposure to a large number of people on-base. | 2006b. Tetra Tech. Record of Decision for Site 2 Borrow Pit Landfill and Site 15 Dirt Roads. MCRD Parris Island, SC. |
| Site 16 / SWMU 16 - Pesticide Rinsate Disposal Area | The site consists of a bare soil area (approximately 150 square feet) historically used for disposal of pesticide rinsate located next to the Quonset Hut (building N-282) in the northeast section of the facility from 1950-1978. An estimated 5-10 gallons were disposed of each week. This site has a high GW table and is potentially influenced by tide fluctuations. No residents are located within 2,000 ft SSW, and no day care facilities or schools are within 200 ft of the site. Outfalls 405, 408, and 457 drain this site. | RI/FS complete. RAOs and cleanup goals presented for soil and GW. Proceed to Proposed Plan of Pre-Remedial Design Investigation. | 2014 Tetra Tech FS for sites 9, 16, 27, 55. | Local | Human Health COCs:<br>Surface Soil: Inorganics, Pesticides/PCBs, SVOCs<br>GW: Inorganics, Pesticides/PCBs, SVOCs<br><br>Human Health COPCs:<br>Sediment: PAHs, PCBs, Pesticides<br>Stormwater: Pesticides, Metals | Considered a local risk due to the location of the site and the improbability of exposure to a large number of people on-base. Adjacent sites: 9, 16, 27, 55. To support clean closure of the site, an extended SI with a FFS will be completed, contaminated soils will be excavated and disposed of, piezometers will be installed to determine GW flow and pesticide impacts to GW. Issues may be addressed at this site based on sampling results from nearby Site 55.<br><br>OUTFALL 408 Info: Based on the CSMs of Sites 9, 16, 46, 47, and 49, a CERCLA related release would most likely result in paint waste and pesticides. When making a comparison of the 4,4'-DDD ecological/background exceedances (23 µg/kg) to what is observed at other PAOs where pesticides are not CSM related, 4,4'-DDD values at Outfall 408 are similar or lower than those in Outfall 106 (89 µg/kg), Outfall 555 (89 to 530 µg/kg), Outfall 592 (24 and 54 µg/kg), Outfall 608DNF (32 and 59 µg/kg), and Outfall 881 (380 µg/kg). Additionally, when comparing results for total DDT at Outfall 457 (72 µg/kg) to PAOs without pesticides in their CSM, Outfall 106 (200 and 140 µg/kg), Outfall 555 (120 to 710 µg/kg), Outfall 592 (56 and 65 µg/kg), Outfall 608DNF (62 and 130 µg/kg), Outfall 636B (57 and 76 µg/kg), and Outfall 881 (130 and 530 µg/kg) had exceedances similar to or greater than what was observed at Outfall 457. It is believed that pesticides in the sediment at Outfall 408 are not a result of a CERCLA release, rather a result of historic pesticide use at MCRD Parris Island. Based on the results of the ecological risk screening, statistical evaluation, human health criteria comparison, data review, and the CSMs of the sites that Outfall 457 drains, further investigation may be required. Data collected from Outfalls 405, 408, and 457 will be used during the development of LTM Plans for Sites 9, 16, 27 and 55, if LTM is required by the decision document (Tetra Tech 2012a).<br><br>Previous investigations in the area of the four sites included the IAS in 1986 (Sites 9 and 16), an RI VS in 1988 (Site 16), an RFA, which included a file review and VSI in 1990 (Sites 9, 16, and 27); Relative Site Ranking efforts in 1995 (Sites 9 and 27); SI/CS in 1999 (Site 9, 16 and 27); Soil and GW Field Screening in 2002 (Site 55); and a GW Investigation in 2003 (Site 55). | 1986. Dames & Moore. Initial Assessment Study of Marine Corps Recruit Depot, Parris Island, SC. September.<br><br>2014. Tetra Tech. Feasibility Study Report for Site 9 Former Paint Waste Storage Area, Site 16 Pesticide Rinsate Area, Site 27 Motor Transportation Facility and Site 55 Fiber Optic Vault MCRD Parris Island SC. October. |
| Site 17 / SWMU 17 - Page Field Tanks (AS-16) | The site consists of four 25,000-gallon steel, horizontal tanks (10 ft in diameter and 40 ft long) located at Page Field. The tanks were installed at grade, then soil was mounded over them. | State UST Program | 1990 Remedial Investigation Verification Step Report with Transmittal Letter McClelland Engineers. | Local | None Identified | Considered a local risk due to the location of the site and the improbability of exposure to a large number of people on-base. The site is monitored under the State UST Program. | 1990. McClelland Engineers. Remedial Investigation Verification Step Report with Transmittal Letter. MCRD Parris Island, SC. |
| Site 18 / SWMU 18 - Page Field Tanks (AS-17) | The site consists of USTs located at Page Field. The tanks have a capacity of 50,000 gallons and are constructed of pre-cast concrete. | State UST Program | 1990 Remedial Investigation Verification Step Report with Transmittal Letter McClelland Engineers. | Local | None Identified | Considered a local risk due to the location of the site and the improbability of exposure to a large number of people on-base. The site is monitored under the State UST Program. | 1990. McClelland Engineers. Remedial Investigation Verification Step Report with Transmittal Letter. MCRD Parris Island, SC. |

| Name of Site on Parris Island | Site Description | Current Status or Recommended Actions | Source of Status | Risk Classification | Constituents of Concern or Potential Concern | Risk Rational/Additional Site Information | Source of Primary Documents Used in the Evaluation |
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| Site 19 / AOC D - Former MCX Service Station UST | The site consists of the MCX Service Station UST that was formerly identified as Building 850 in the northeast section of the facility. The building was demolished in 1985. Four 5,000-gallon underground gasoline tanks remain at this location. These tanks are in the immediate vicinity of the MCX Service Station Spill Area. | NFA | 1990 Remedial Investigation Verification Step Report with Transmittal Letter McClelland Engineers. | Local | None Identified | Considered a local risk due to the location of the site, the improbability of exposure to a large number of people on-base, and the NFA status. | 1990. McClelland Engineers. Remedial Investigation Verification Step Report with Transmittal Letter. MCRD Parris Island, SC. |
| SWMU 19 - Diesel Wash Pad | The site consists of two concrete pads approximately 20 ft by 15 ft located at the Diesel Shop next to building 864 in the northeast section of the facility. Catch basins, approximately two ft by two ft, receive wastewater from the pad. Wash water is discharged to the Sanitary Sewer System (Site 42) via the oil/water separator. | NFA | 2005. NAVFAC. Five Year Review Report MCRD Parris Island SC (Public Comment) Table 3. | Local | None Identified | Considered a local risk due to the location of the site and the improbability of exposure to a large number of people on-base. | 2005. NAVFAC. Five Year Review Report. MCRD Parris Island, SC. September. |
| SWMU 20 - Power Station Oil/Water Separator | The site consists of an oil/water separator located along the Beaufort River at the Power Plant in the northeast section of the facility. The site receives runoff from the No. 6 fuel unloading area (approximately 30 ft long and 10 ft wide) and the secondary containment for the No. 6 fuel oil tanks. | NFA | 2005. NAVFAC. Five Year Review Report MCRD Parris Island SC (Public Comment) Table 3. | Local | None Identified | Considered a local risk due to the location of the site and the improbability of exposure to a large number of people on-base. | 2005. NAVFAC. Five Year Review Report. MCRD Parris Island, SC. September. |
| Site 21 -Weapons Power Plant Oil/Water Separator | The site consists of an oil/water separator located in the west section of the facility. The site receives runoff from the No. 6 fuel oil unloading area (approximately 30 ft long and 10 ft wide) and the secondary containment for the No. 6 fuel oil tank. | Data gap. Closure sampling will be conducted to provide data to advance to RI/FS. | 2010. NAVFAC. Five Year Review Report MCRD Parris Island SC (Public Comment) Table 3. | Data Gap | None Identified | Considered a data gap because closure sampling needs to be conducted to proceed to RI/FS. | 2010. NAVFAC. Five Year Review Report. MCRD Parris Island, SC. September. |
| SWMU 22 -Motor Pool Car Wash | The site consists of a wash pad that is approximately 20 ft long and 15 ft wide located at the Motor Pool, Building 155, in the northeast section of the facility. A small drain in the center of the concrete pad is connected to the oil/water separator situated approximately 50 yards northeast of the pad. The oil/water separator is made of concrete, and has a capacity of approximately 500 gallons. | NFA | 2005. NAVFAC. Five Year Review Report MCRD Parris Island SC (Public Comment) Table 3. | Local | None Identified | Considered a local risk due to the location of the site and the improbability of exposure to a large number of people on-base. | 2005. NAVFAC. Five Year Review Report. MCRD Parris Island, SC. September. |
| SWMU 23 -Indoor Dental Lab Satellite Accumulation Area (SAA) | The site is a small metal cabinet located inside the Dental Clinic. The cabinet is three ft tall by 3.5 ft wide by three ft deep and receives beryllium dust. Wastes are stored in 25-gallon plastic carboys. | NFA | 2005. NAVFAC. Five Year Review Report MCRD Parris Island SC (Public Comment) Table 3. | Local | None Identified | Considered a local risk due to the location of the site and the improbability of exposure to a large number of people on-base. | 2005. NAVFAC. Five Year Review Report. MCRD Parris Island, SC. September. |
| SWMU 24 -Dental Lab SAA | The site is a small metal storage shed used for storing medical waste generated at the Dental Clinic. Waste is contained in cardboard boxes located directly adjacent to the shed and then transferred off-site to the hospital, which is located at the MCAS in Beaufort. | NFA | 2005. NAVFAC. Five Year Review Report MCRD Parris Island SC (Public Comment) Table 3. | Local | None Identified | Considered a local risk due to the location of the site and the improbability of exposure to a large number of people on-base. | 2005. NAVFAC. Five Year Review Report. MCRD Parris Island, SC. September. |
| SWMU 25 -Paint Shop SAA | The site is located in Building N-281 in the northeast section of the facility on a concrete floor that appeared in good condition. | NFA | 2005. NAVFAC. Five Year Review Report MCRD Parris Island SC (Public Comment) Table 3. | Local | None Identified | Considered a local risk due to the location of the site and the improbability of exposure to a large number of people on-base. | 2005. NAVFAC. Five Year Review Report. MCRD Parris Island, SC. September. |
| SWMU 26 -Pesticide Shop SAA | The site consists of pesticide drum containers located on a concrete pad. The pad is a portion of a concrete loading dock located next to Building 401 in the northeast section of the facility. | NFA | 2005. NAVFAC. Five Year Review Report MCRD Parris Island SC (Public Comment) Table 3. | Local | None Identified | Considered a local risk due to the location of the site and the improbability of exposure to a large number of people on-base. | 2005. NAVFAC. Five Year Review Report. MCRD Parris Island, SC. September. |
| Site 27 / SWMU 27 - Equipment Parade Deck | The site consists of an asphalt pad approximately 1,000 sq. ft, located in the northeast section of the facility. Salvage items were staged at the asphalt pad, which is approximately one acre in size. Outfall 405 drains this site. | RI/FS complete. RAOs and cleanup goals presented for soil and GW. Proceed to FFS. | 2014 Tetra Tech FS for sites 9, 16, 27, 55. | Data Gap | Human Health COCs:<br>GW: Inorganics, Pesticides/PCBs, SVOCs, VOCs<br>Subsurface Soil: Inorganics, Pesticides/PCBs<br>Surface Soil: Inorganics, Pesticides/PCBs, SVOCs<br><br>Human Health COPCs:<br>Sediment: PAHs, Pesticides<br>Storm Water: Pesticides | Considered a data gap because the Navy is working on presenting a cleanup plan to the public.<br>Adjacent sites: 9, 16, 27, 55. To support clean closure of the site - an extended SI with a FFS will be completed, contaminated soils will be excavated and disposed of, and piezometers will be installed to determine GW flow and pesticide impacts to GW. Issues may be addressed at this site based on sampling results from nearby Site 55 Data collected from Outfalls 405, 408, and 457 used during the development of LTM Plans for Sites 9, 16, 27 and 55, if LTM is required by the decision document (Tetra Tech 2012b). Previous investigations in the area of the four sites included: the IAS in 1986 (Sites 9 and 16), an RI VS in 1988 (Site 16), an RFA, which included a file review and VSI in 1990 (Sites 9, 16, and 27), Relative Site Ranking efforts in 1995 (Sites 9 and 27), SI/CS in 1999 (Site 9, 16 and 27), Soil and GW Field Screening in 2002 (Site 55), and a GW Investigation in 2003 (Site 55). | 2014. Tetra Tech. FS for sites 9, 16, 27, 55. MCRD Parris Island, SC. |
| SWMU 28 -Power Plant SAA | The site is a small concrete pad located outdoors next to the Power Station Oil/Water Separator (Site 20) in the northeast section of the facility. The pad is approximately 10 ft by 10 ft and appeared to be cracked and severely stained. This site is approximately 75 ft from a channel that extends to the Beaufort River. | State UST Program | 2005. NAVFAC. Five Year Review Report MCRD Parris Island SC (Public Comment) Table 3. | Local | None Identified | Considered a local risk due to the location of the site and the improbability of exposure to a large number of people on-base.<br>The site is monitored under the State UST Program. | 2005. NAVFAC. Five Year Review Report. MCRD Parris Island, SC. September. |

| Name of Site on Parris Island | Site Description | Current Status or Recommended Actions | Source of Status | Risk Classification | Constituents of Concern or Potential Concern | Risk Rational/Additional Site Information | Source of Primary Documents Used in the Evaluation |
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| SWMU 29 -Indoor Motor Pool SAA | The site is located inside the Motor Pool in the northeast section of the facility. Five 55-gallon drums are located along the interior east wall of the Motor Pool for shop-generated waste. The drums are transferred to the Hazardous Waste Storage Building (Site 36). | NFA | 2005. NAVFAC. Five Year Review Report MCRD Parris Island SC (Public Comment) Table 3. | Local | None Identified | Considered a local risk due to the location of the site and the improbability of exposure to a large number of people on-base. | 2005. NAVFAC. Five Year Review Report. MCRD Parris Island, SC. September. |
| SWMU 30 -Empty Drum Storage Area | The site consists of empty drums staged outdoors in the vicinity of Building 867 in the northeast section of the facility. The drums are elevated above the soil by wooden pallets. The empty, unrinsed drums are stored at this location until transferred off-site by GSX for salvage. | NFA | 2005. NAVFAC. Five Year Review Report MCRD Parris Island SC (Public Comment) Table 3. | Local | None Identified | Considered a local risk due to the location of the site and the improbability of exposure to a large number of people on-base. | 2005. NAVFAC. Five Year Review Report. MCRD Parris Island, SC. September. |
| SWMU 31 -Weapons Power Plant SAA | The site consists of a temporary storage area located on the back side of the Weapons Power Plant. The drum storage area is situated on a small brick pad next to the building. The drums are transferred to the Hazardous Waste Storage Building (Site 36). | NFA | 2005. NAVFAC. Five Year Review Report MCRD Parris Island SC (Public Comment) Table 3. | Local | None Identified | Considered a local risk due to the location of the site and the improbability of exposure to a large number of people on-base. | 2005. NAVFAC. Five Year Review Report. MCRD Parris Island, SC. September. |
| Site 32 / SWMU 32 - Laundry SAA with SWMU 45 | The site is associated with the Laundry SSA (Site 45) and consists of the laundry/Dry Cleaning Shop located in Building 193 at the junction of Panama Street and Samoa Street. 55 gallon drums are staged in the vicinity of the dry cleaning machines on concrete floors that appeared in good condition. Stains were noted on the floor. | Requires further investigation. | 2010. NAVFAC. Five Year Review Report MCRD Parris Island SC (Public Comment) Table 3. | Data Gap | None Identified | Considered a data gap because the site is included in the list of sites that require further investigation in the site management plan. The site is in the annual update of the 2005 Federal Facilities Agreement[1]. | 2010. NAVFAC. Five Year Review Report. MCRD Parris Island, SC. September. |
| SWMU 33 -Outdoor Motor Pool SAA | The site receives waste oil from vehicle maintenance activities conducted at the Motor Pool. The site is located along the exterior west wall of the Motor Pool in the northeast section of the facility. Waste oil is hand-carried to the site and poured into the drums via a rain-proof funnel. The drums are transferred to the Hazardous Waste Storage Building (Site 36). | NFA | 2005. NAVFAC. Five Year Review Report MCRD Parris Island SC (Public Comment) Table 3. | Local | None Identified | Considered a local risk due to the location of the site and the improbability of exposure to a large number of people on-base. | 2005. NAVFAC. Five Year Review Report. MCRD Parris Island, SC. September. |
| SWMU 34 -Motor Pool Waste Oil AST | The site consists of a former tank located at the Motor Pool in the northeast section of the facility. The tank was previously located at the Outdoor Motor Pool SAA (Site 33). The tank was moved to an area behind the motor pool building. | NFA | 2005. NAVFAC. Five Year Review Report MCRD Parris Island SC (Public Comment) Table 3. | Local | None Identified | Considered a local risk due to the location of the site and the improbability of exposure to a large number of people on-base. | 2005. NAVFAC. Five Year Review Report. MCRD Parris Island, SC. September. |
| Site 35 / SWMU 35 - DRMO | The site consists of a yard that is approximately three acres, located on Horse Island in the north section of the facility. The yard is surrounded by a chain-link fence. Approximately 80 percent is paved with asphalt, except the southwest corner which manages scrap metal. The site also stored lead-acid batteries. | 2010, the site is considered an active RCRA unit due to a less than 90 day storage area located within the site. Storage area will not be closed until MCRD closure. | 2010b. Tetra Tech. SI Confirmation Sampling Report for Site 4, 5, 7, 9, 13, 16, 27, 35. | Local | Soil: Inorganics, PCBs, Pesticides, SVOCs, VOCs (Identified, but do not pose a risk to human health) | Considered a local risk due to the location of the site and the improbability of exposure to a large number of people on-base. Industrial setting. Human health not affected, ecological receptors not affected. Soil sample results indicate that past storage of lead-acid batteries has not impacted site soil. | 2010b. Tetra Tech. SI Confirmation Sampling Report for Site 4, 5, 7, 9, 13, 16, 27, 35. MCRD Parris Island, SC. |
| SWMU 36 - Hazardous Waste Storage Building | The site consists of a corrugated metal shed located within Building 895 on Boki Street near Malacon Drive in the northeast section of the facility. The floor of the site is concrete coated with a sealant. Secondary containment is provided by the concrete foundation of the shed. The storage area is approximately 30 ft by 40 ft. with drums containing hazardous waste stored on pallets. | State RCRA Closure Program | 2005. NAVFAC. Five Year Review Report MCRD Parris Island SC (Public Comment) Table 3. | Local | None Identified | Considered a local risk due to the location of the site and the improbability of exposure to a large number of people on-base. This site is in the State RCRA Closure Program. | 2005. NAVFAC. Five Year Review Report. MCRD Parris Island, SC. September. |
| SWMU 37 -Overflow Storage Pad | The site consists of a concrete pad approximately 25 ft long by 10 ft wide, surrounded by a fence, and located at the west end of building 895 (Hazardous Waste Storage Building). The site occasionally stores paint waste normally managed by the Paint Waste SAA (Site 25) and overflow from the Hazardous Waste Storage Building (Site 36). | NFA | 2005. NAVFAC. Five Year Review Report MCRD Parris Island SC (Public Comment) Table 3. | Local | None Identified | Considered a local risk due to the location of the site and the improbability of exposure to a large number of people on-base. | 2005. NAVFAC. Five Year Review Report. MCRD Parris Island, SC. September. |
| SWMU 38 -Waste Oil UST | The site is a 500-gallon steel tank located at the diesel shop in the northeast section of the facility. According to the IAS study, this site received paint wastes from the Paint Waste Storage Area (Site 9). | State UST Program | 2005. NAVFAC. Five Year Review Report MCRD Parris Island SC (Public Comment) Table 3. | Local | None Identified | Considered a local risk due to the location of the site and the improbability of exposure to a large number of people on-base. The site is monitored under the State UST Program. | 2005. NAVFAC. Five Year Review Report. MCRD Parris Island, SC. September. |
| Site 39 / SWMU 39 - Electrolyte Basin | The site consists of a slate basin approximately 30 inches wide by 24 inches deep that is used to collect expired or weak battery acid from batteries utilized by the Motor Pool. The site is located inside the Motor Pool battery storage room in the northeast section of the facility. The basin is connected to the Sanitary Sewer System (Site 42), via three-inch high-density plastic pipes. Outfalls 106, 567, and 592 drain this site. | PA/SI recommended based on outfall from Site 14 (from Outfalls 106 and 592). | 2012a. Tetra Tech. PA and SI Report for Site 14 Storm Water Outfalls MCRD Parris Island SC. | Data Gap | Human Health COPCs: Sediment: Metals, PAHs, Pesticides/PCBs | Considered a data gap because further investigation will be performed at this site. At Outfall 567, which drains Site 39 (Electrolyte Basin), no ecological COPCs were identified in sediment or storm water and no exceedances of human health criteria and background levels were observed. However, based on the results from other outfalls (106 and 592) that drain Site 39, further investigation may be required (Tetra Tech 2012a). | 2012a. Tetra Tech. Preliminary Assessment and Site Inspection Report for Site 14 Storm Water Outfalls. MCRD Parris Island, SC. 1 October. |
| SWMU 40 - Wastewater Treatment Plant | The site consists of a treatment plant located along the Beaufort River in the northeast section of the facility. The site is a three-million gallon capacity, standard-rate trickle filter system. | NFA | 2005. NAVFAC. Five Year Review Report MCRD Parris Island SC (Public Comment) Table 3. | Local | None Identified | Considered a local risk due to the location of the site and the improbability of exposure to a large number of people on-base. | 2005. NAVFAC. Five Year Review Report. MCRD Parris Island, SC. September. |

| Name of Site on Parris Island | Site Description | Current Status or Recommended Actions | Source of Status | Risk Classification | Constituents of Concern or Potential Concern | Risk Rational/Additional Site Information | Source of Primary Documents Used in the Evaluation |
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| Site 41 / SWMU 41 - Former Incinerator | The site consists of a former incinerator located adjacent to the Incinerator Landfill (Site 1) on Horse Island, in the north section of the facility. The former site consisted of a brick chamber approximately 43 ft long by 34 ft tall by 20 ft wide with a hole in the top of the chamber. | 2015 Five year review confirmed remedy protectiveness still effective. No action needed. | 2015a. Resolution Consultants. Draft Five Year Review for Operable Units 1, 3, and 5 MCRD Parris Island, SC. May. | Local | Human Health COCs:<br>Fish: Inorganics, SVOCs<br>GW: Inorganics, SVOCs, VOCs<br>Sediment: PAHs, Pesticides<br>Surface Soil: Inorganics, PAHs, Pesticides/PCBs, SVOCs<br>Surface Water: Inorganics, SVOCs | Considered a local risk due to the location of the site and the improbability of exposure to a large number of people on-base. | 2015a. Resolution Consultants. Draft Five Year Review for Operable Units 1, 3, and 5. MCRD Parris Island, SC. May.<br><br>2006a. Tetra Tech. Record of Decision for Site 1 Incinerator Landfill and Site 41 Former Incinerator. MCRD Parris Island, SC. |
| SWMU 42 -Sanitary Sewer System | The site consists of a sanitary sewer system with various sized pipes and construction materials located below ground throughout Parris Island. The system transfers wastewater to the Sanitary Wastewater Treatment Plant (Site 40) prior to discharge to the Beaufort River. The site receives wastewater from oil/water separators in addition to domestic sources. | NFA | 2005. NAVFAC. Five Year Review Report MCRD Parris Island SC (Public Comment) Table 3. | Local | None Identified | Considered a local risk due to the location of the site and the improbability of exposure to a large number of people on-base. | 2005. NAVFAC. Five Year Review Report. MCRD Parris Island, SC. September. |
| SWMU 43 -Motor Pool Waste Oil UST | The site consists of a below ground steel storage tank located near the Outdoor Motor Pool SAA (Site 33) in the northeast section of the facility. The tank capacity is approximately 500 gallons. The site received waste oil from activities conducted at the Motor Pool. | State UST Program | 2005. NAVAC. Five Year Review Report MCRD Parris Island SC (Public Comment) Table 3. | Local | None Identified | Considered a local risk due to the location of the site and the improbability of exposure to a large number of people on-base. The site is monitored under the State UST Program. | 2005. NAVFAC. Five Year Review Report. MCRD Parris Island, SC. September. |
| SWMU 44 - Dumpsters | The site consists of metal roll-off boxes that are approximately seven ft tall by five ft wide by 10 ft long. The sites are located throughout the facility. | NFA | 2005. NAVFAC. Five Year Review Report MCRD Parris Island SC (Public Comment) Table 3. | Local | None Identified | Considered a local risk due to the location of the site and the improbability of exposure to a large number of people on-base. | 2005. NAVFAC. Five Year Review Report. MCRD Parris Island, SC. September. |
| Site 45 / SWMU 45 - Former MWR Dry Cleaning Facility | The site is a former dry cleaning facility located in the Main Post area of MCRD Parris Island. Four above-ground storage tanks were put into place in 1988 along the northern side of the building after the removal of an underground storage system. In March 1994, one tank was overfilled with PCE, and an unknown quantity of PCE was spilled into the concrete catch basin and released into soil near the above ground storage tanks in the northern portion of Site 45. The overflow PCE was not collected at the time of the spill and heavy rainfall washed the contaminant onto the surrounding soil. Contaminated soils were excavated. A new dry cleaning facility was constructed in 1997, and operations were switched to a non-hazardous hydrocarbon-based cleaner in place of PCE. In early 2001, the main building, solvent tanks, and other structures were demolished. Four above ground storage tanks located along the northern side of the building (within a concrete catch basin for overflow during tank filling) were removed. In 2005, a second groundwater plume of chlorinated solvents was discovered near the location of the new dry cleaning facility. The two plumes of contaminated groundwater are intermingled and are reportedly migrating into the storm water system, discharging via a site 45 outfall (Outfall 881). Outfall 881 drains this site. Currently, the site is mostly a vacant lot covered with mowed grass and a few isolated shrubs and trees. | Data collected from Site 14 outfalls will be used during the development of Site 45 LTM Plan. | 2004 Tetra Tech RI/RCRA RFI Report for Site 45 Former MWR Dry Cleaning Facility, MCRD Parris Island, SC.<br><br>2012a. Tetra Tech. PA and SI Report for Site 14 Storm Water Outfalls MCRD Parris Island SC. | Regional | Human Health COCs:<br>GW: 1,1-DCE, cis-1,2-DCE, PCE, TCE, Vinyl chloride<br>Human Health COPCs:<br>GW: Chlorinated VOCs, PCE and daughter products<br>Sediment: Inorganics, PAHs<br>Soil:Arsenic, Chlorinated VOCs, PAHs, PCE releases<br>Storm Water: Inorganics<br><br>Ecological COPCs:<br>Sediment: PAHs, Pesticides | Considered a regional risk due to potential exposure to a larger number of people on-base (Outfall from Site 14). "Since the ecological COPCs identified in the ecological risk screening and human health criteria/background exceedances do not include any of the Site 45 COCs, no further investigation is recommended at Outfall 881. It is believed that the PAHs and pesticides observed in sediments at Outfall 881 are a result of the vast area that the outfall and associated piping actually drain and are attributed to anthropogenic source (paved areas, automobiles, and historic pesticide application)" (TetraTech 2012a).<br><br>"Data collected from Outfall 881 will be used during the development of the Site 45 LTM Plan, if LTM is required by the decision document" (Tetra Tech 2012a). | 2004 Tetra Tech RI/RCRA RFI Report for Site 45 Former MWR Dry Cleaning Facility, MCRD Parris Island, SC.<br><br>2012a. TetraTech. Preliminary Assessment and Site Inspection Report for Site 14 Storm Water Outfalls. MCRD Parris Island, SC. 1 October. |
| Site 46 / SWMU 46 - Hobby Shop | Outfalls 408, 457, 601, 608DNF and 636B drain sites 46, 47, and 49. | PA/SI recommended based on outfalls from Site 14. | 2012a. Tetra Tech. PA and SI Report for Site 14 Storm Water Outfalls MCRD Parris Island SC. | Regional | Human Health COPCs:<br>Sediment: Inorganics, PAHs, PCBs, Pesticides<br>Stormwater: Metals | Considered a regional risk due to potential exposure to a larger number of people on-base (due to outfall from Site 14).<br>OUTFALL 408 Info:<br><br>"Based on the CSMs of Sites 9, 16, 46, 47, and 49, a CERCLA related release would most likely result in paint waste and pesticides. When making a comparison of the 4,4'-DDD ecological/background exceedances (28 µg/kg) to what is observed at other PAOs where pesticides are not CSM related, 4,4'-DDD values at Outfall 408 are similar or lower than those in Outfall 106 (89 µg/kg), Outfall 555 (89 to 530 µg/kg), Outfall 592 (24 and 54 µg/kg), Outfall 608DNF (32 and 59 µg/kg), and Outfall 881 (380 µg/kg)" (TetraTech 2012b).<br><br>"Additionally, when comparing results for total DDT at Outfall 457 (72 µg/kg) to PAOs without pesticides in their CSM, Outfall 106 (200 and 140 µg/kg), Outfall 555 (120 to 710 µg/kg), Outfall 592 (56 and 65 µg/kg), Outfall 608DNF (62 and 130 µg/kg), Outfall 636B (57 and 76 µg/kg), and Outfall 881 (130 and 530 µg/kg) had exceedances similar to or greater than what was observed at Outfall 457. It is believed that pesticides in the sediment at Outfall 408 are not a result of a CERCLA release, rather a result of historic pesticide use at MCRD Parris Island. Based on the results of the ecological risk screening, statistical evaluation, human health criteria comparison, data review, and the CSMs of the sites that Outfall 457 drains, further investigation may be required" (Tetra Tech 2012b). | 2012a. TetraTech. Preliminary Assessment and Site Inspection Report for Site 14 Storm Water Outfalls. MCRD Parris Island, SC. 1 October. |

| Name of Site on Parris Island | Site Description | Current Status or Recommended Actions | Source of Status | Risk Classification | Constituents of Concern or Potential Concern | Risk Rational/Additional Site Information | Source of Primary Documents Used in the Evaluation |
|---|---|---|---|---|---|---|---|
| Site 47 / SWMU 47 - Old Photo Shop | Outfalls 408, 457, 601, 608DNF and 636B drain sites 46, 47, and 49. | PA/SI recommended based on outfalls from Site 14. | 2012a. Tetra Tech. PA and SI Report for Site 14 Storm Water Outfalls MCRD Parris Island SC. | Regional | Human Health COPCs: Sediments: Inorganics, PAHs, Pesticides<br>Stormwater: Metals, PAHs | Considered a regional risk due to potential exposure to a larger number of people on-base (due to outfall from Site 14).<br>OUTFALL 408 Info:<br><br>"Based on the CSMs of Sites 9, 16, 46, 47, and 49, a CERCLA related release would most likely result in paint waste and pesticides. When making a comparison of the 4,4'-DDD ecological/background exceedances (28 µg/kg) to what is observed at other PAOs where pesticides are not CSM related, 4,4'-DDD values at Outfall 408 are similar or lower than those in Outfall 106 (89 µg/kg), Outfall 555 (89 to 530 µg/kg), Outfall 592 (24 and 54 µg/kg), Outfall 608DNF (32 and 59 µg/kg), and Outfall 881 (380 µg/kg)" (TetraTech 2012b).<br><br>"Additionally, when comparing results for total DDT at Outfall 457 (72 µg/kg) to PAOs without pesticides in their CSM, Outfall 106 (200 and 140 µg/kg), Outfall 555 (120 to 710 µg/kg), Outfall 592 (56 and 65 µg/kg), Outfall 608DNF (62 and 130 µg/kg), Outfall 636B (57 and 76 µg/kg), and Outfall 881 (130 and 530 µg/kg) had exceedances similar to or greater than what was observed at Outfall 457. It is believed that pesticides in the sediment at Outfall 408 are not a result of a CERCLA release, rather a result of historic pesticide use at MCRD Parris Island. Based on the results of the ecological risk screening, statistical evaluation, human health criteria comparison, data review, and the CSMs of the sites that Outfall 457 drains, further investigation may be required" (Tetra Tech 2012b). | 2012a. Tetra Tech. Preliminary Assessment and Site Inspection Report for Site 14 Storm Water Outfalls MCRD Parris Island SC. 1 October. |
| Site 48 / SWMU 48 - Existing Photo Shop | Drains to outfall 106 and outfalls 567 and 592. | PA/SI recommended based on outfalls from Site 14 (Outfalls 106 and 592). | 2012a. Tetra Tech. PA and SI Report for Site 14 Storm Water Outfalls MCRD Parris Island SC. | Regional | Human Health COPCs: Sediment: Metals, PAHs, Pesticides/PCBs | Considered a regional risk due potential exposure to a larger number of people on-base (due to outfall from Site 14).<br><br>"PA/SI is recommended to determine outfall sources of Site 14 Outfalls 106 and 592" (Tetra Tech 2012a). | 2012a. TetraTech. Preliminary Assessment and Site Inspection Report for Site 14 Storm Water Outfalls. MCRD Parris Island, SC. 1 October. |
| Site 49 / SWMU 49 - DRMO | Defense Reutilization and Marketing Office. Outfalls 408, 457, 601, 608DNF and 636B drain sites 46, 47, and 49. | PA/SI required. | 2012a. Tetra Tech. PA and SI Report for Site 14 Storm Water Outfalls MCRD Parris Island SC. | Regional | Human Health COPCs: Sediments: Inorganics, PAHs, Pesticides<br>Stormwater: Metals, PAHs | Considered a regional risk due to potential exposure to a larger number of people on-base (due to outfall from Site 14).<br>OUTFALL 408 Info:<br><br>"Based on the CSMs of Sites 9, 16, 46, 47, and 49, a CERCLA related release would most likely result in paint waste and pesticides. When making a comparison of the 4,4'-DDD ecological/background exceedances (28 µg/kg) to what is observed at other PAOs where pesticides are not CSM related, 4,4'-DDD values at Outfall 408 are similar or lower than those in Outfall 106 (89 µg/kg), Outfall 555 (89 to 530 µg/kg), Outfall 592 (24 and 54 µg/kg), Outfall 608DNF (32 and 59 µg/kg), and Outfall 881 (380 µg/kg)" (TetraTech 2012b).<br><br>"Additionally, when comparing results for total DDT at Outfall 457 (72 µg/kg) to PAOs without pesticides in their CSM, Outfall 106 (200 and 140 µg/kg), Outfall 555 (120 to 710 µg/kg), Outfall 592 (56 and 65 µg/kg), Outfall 608DNF (62 and 130 µg/kg), Outfall 636B (57 and 76 µg/kg), and Outfall 881 (130 and 530 µg/kg) had exceedances similar to or greater than what was observed at Outfall 457. It is believed that pesticides in the sediment at Outfall 408 are not a result of a CERCLA release, rather a result of historic pesticide use at MCRD Parris Island. Based on the results of the ecological risk screening, statistical evaluation, human health criteria comparison, data review, and the CSMs of the sites that Outfall 457 drains, further investigation may be required" (Tetra Tech 2012b). | 2012a. TetraTech. Preliminary Assessment and Site Inspection Report for Site 14 Storm Water Outfalls. MCRD Parris Island, SC. 1 October. |
| Site 50 / SWMU 50 - Hue City Range Waste Munitions Disposal Site | MCRD Parris Island has operational ranges, including small arms ranges and training areas. Site 50 was discovered in 2004 when small caliber ordnance in soil was discovered during re-gradin operations conducted in February 2004. A large cache of small arms ammunition identified as rifle ammunition (caliber 30-06) originally manufactured in 1918 by Remington Firearms Company was unearthed on the Hue City Range. Excavation ws conducted to gather as muc hof the ammunition as possible from the area. Approximately 9,000 rounds of ammunition were removed from the soil, placed in ammunition cans, and secured in a conex box adjacent to the Khe Sanh Range (Solutions to Environmental Problems, Inc. 2004). | Investigation and Removal of Small Caliber Ordnance conducted. | 2004. Solutions to Environmental problems, Inc. Draft Project Report Investigation and Removal of Small Caliber Ordnance, Hue City Range, Parris Island, South Carolina. November. 2010. NAVFAC. Five Year Review Report MCRD Parris Island SC (Public Comment) Table 3. | Regional | COPCs: Metals, including lead, associated with ammunitions | Considered a regional risk due to potential direct contact exposure to lead among a large number of people who use the range. Site 50 will be addressed when the range closes (NAVFAC 2010). Uptake of metals into shellfish in adjacent waterways has previously been evaluated by an ATSDR Public Health Assessment and found not to be a public health hazard. | 1996. Agency for Toxic Substances and Disease Registry. Public Health Assessment. MCRD Parris Island, SC.<br><br>2004. Solutions to Environmental problems, Inc. Draft Project Report Investigation and Removal of Small Caliber Ordnance, Hue City Range, Parris Island, South Carolina. November.<br><br>2010. NAVFAC. Five Year Review Report. MCRD Parris Island, SC. September. |
| Site 51 / SWMU 51 - Daylight Infiltration Courses | No Information Available | NFA | 2005. NAVFAC. Five Year Review Report MCRD Parris Island SC (Public Comment) Table 3. | Local | None Identified | Considered a local risk due to the location of the site and the improbability of exposure to a large number of people on-base. | 2005. NAVFAC. Five Year Review Report. MCRD Parris Island, SC. September. |
| Site 52 / SWMU 52 - Old Weapons Cleaning Areas | Possible location of site identified south of Kyushu St (Figure 5-1; Tetra Tech 2012a). | Site requires further investigation per the 2008 Site Management Plan. PA required. | 2010. NAVFAC. Five Year Review Report MCRD Parris Island SC (Public Comment) Table 3. | Local | None Identified | Considered a local risk due to the location of the site and the improbability of exposure to a large number of people on-base. | 2010. NAVFAC. Five Year Review Report. MCRD Parris Island, SC. September. |
| Site 53 / SWMU 53 - Debris near Causeway | This site was identified as a site in 2001. Trash removed in 2004. | Site requires further investigation per the 2008 Site Management Plan. Team to determine path forward. | 2010. NAVFAC. Five Year Review Report MCRD Parris Island SC (Public Comment) Table 3. | Local | None Identified | Considered a local risk due to the location of the site and the improbability of exposure to a large number of people on-base. | 2010. NAVFAC. Five Year Review Report. MCRD Parris Island, SC. September. |

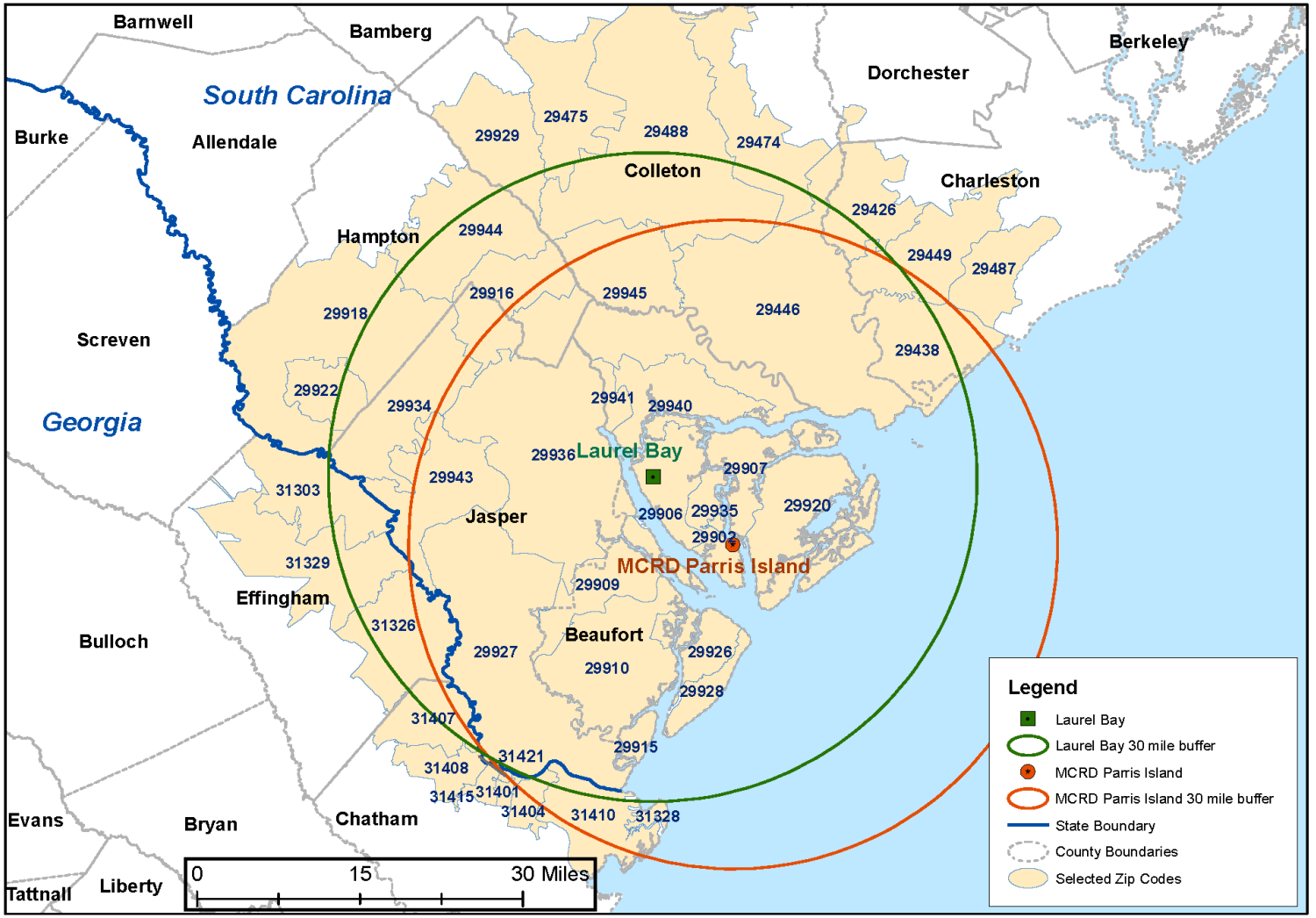
| Name of Site on Parris Island | Site Description | Current Status or Recommended Actions | Source of Status | Risk Classification | Constituents of Concern or Potential Concern | Risk Rational/Additional Site Information | Source of Primary Documents Used in the Evaluation |
|---|---|---|---|---|---|---|---|
| Site 54 / SWMU 54 - Old Waste Water Treatment Plant | This site was identified as a site in 2002. Demolition and confirmation sampling was conducted in 2004. | Site requires further investigation per the 2008 Site Management Plan. | 2012a. Tetra Tech. PA and SI Report for Site 14 Storm Water Outfalls MCRD Parris Island SC. | Regional | Human Health COPCs:<br>Sediment: Inorganics, PAHs, Pesticides, VOCs<br>Stormwater: Pesticides | Considered a regional risk due potential exposure to a larger number of people on-base (due to outfall from Site 14). Process area outfall number 555 associated with this site was found to be flowing indicating possible industrial and residential waste water discharge (Tetra Tech 2012a; Table 4-3). Note: Stormwater should not include pesticides per the 2012 TetraTech investigation of outfall 555.<br><br>"A Remedial Investigation (RI) is recommended at Site 54 based on the Outfall 555 results" (Tetra Tech 2012a). Marsh area to be investigated with Site 14. | 2012a. TetraTech. Preliminary Assessment and Site Inspection Report for Site 14 Storm Water Outfalls. MCRD Parris Island, SC. 1 October. |
| Site 55 / SWMU 55 - Fiber Optic Vault | The site consists of the Fiber Optic Vault which is located in the northwestern portion of MCRD Parris Island. The vault is located approximately 20 ft east of Atsugi Street, 100 ft southwest of Building 401, and 140 ft northwest of Building 405. The vault is comprised of pre-cast concrete with inner dimensions of 12 ft long, six ft wide, and seven ft deep. In September 2001, following installation of the vault, petroleum hydrocarbons and water were observed within the vault. | RI/FS complete. RAOs and cleanup goals presented for soil and GW. Proceed to FFS. | 2014 Tetra Tech FS for sites 9, 16, 27, 55. | Local | Human Health COCs:<br>GW: Inorganics, Pesticides/PCBs, SVOCs, VOCs<br>Surface Soil: Inorganics, Pesticides/PCBs, SVOCs<br><br>Human Health COPCs:<br>Sediment: PAHs, Pesticides<br>Stormwater: Pesticides | Considered a local risk due to the location of the site and the improbability of exposure to a large number of people on-base. Adjacent sites: 9, 16, 27, 55. To support clean closure of the site - an extended SI with a FFS will be completed, contaminated soils will be excavated and disposed of, and piezometers will be installed to determine GW flow and pesticide impacts to GW. Issues may be addressed at this site based on sampling results from nearby Site 55. Data collected from Outfalls 405, 408, and 457 will be used during the development of LTM Plans for Sites 9, 16, 27 and 55, if LTM is required by the decision document (Tetra Tech 2012b). Previous investigations in the area of the four sites included the IAS in 1986 (Sites 9 and 16), an RI VS in 1988 (Site 16), an RFA, which included a file review and VSI in 1990 (Sites 9, 16, and 27); Relative Site Ranking efforts in 1995 (Sites 9 and 27); SI/CS in 1999 (Site 9, 16 and 27); Soil and GW Field Screening in 2002 (Site 55); and a GW Investigation in 2003 (Site 55). | 2014. Tetra Tech. FS for sites 9, 16, 27, 55. MCRD Parris Island, SC. |
| **Beaufort Naval Hospital Housing Sites** | | | | | | | |
| 111 - 116 Ballard Circle USTs | USTs located at 111, 112, 113, 114, 115, and 116 Ballard Circle in the Beaufort Naval Hospital housing area. | Certificate of Disposal for each UST. | SC DHEC Underground Storage Tank Assessment for 111 - 116 Ballard Circle, Naval Hospital Housing Area, MCAS Beaufort, SC. June 2015. | Not Applicable | No Information Available | No indication of vapor intrusion concerns determined from available information. US Water Recovery manifest dated 3/18/2015 included non-hazardous, non-regulated waste water for 112, 113, and 116 Ballard Circle, and manifest dated 3/23/2015 included non-hazardous, non-regulated waste water for 111 Ballard Circle. | 2015. SC DHEC. Underground Storage Tank Assessment Report for 111 - 116 Ballard Circle, Naval Hospital Housing Area. MCAS Beaufort, SC. June.<br><br>2002. CH2MHill Constructors, Inc. Project Completion Report for the Underground Storage Tank Location and Survey at the Naval Hospital Beaufort (Revision 01). Port Royal, SC. December. |
| 118 - 122 Caron Circle USTs | USTs located at 118, 119, 120, 121, and 122 Caron Circle in the Beaufort Naval Hospital housing area. | Certificate of Disposal for each UST. | SC DHEC Underground Storage Tank Assessment for 118 - 122 Caron Circle, Naval Hospital Housing Area, MCAS Beaufort, SC. May 2015. | Not Applicable | No Information Available | No indication of vapor intrusion concerns determined from available information. US Water Recovery manifest dated 3/23/2015 included non-hazardous, non-regulated waste water for 118, 120, and 122 caron Circle. | 2015. SC DHEC. Underground Storage Tank Assessment Report for 118 - 122 Caron Circle, Naval Hospital Housing Area. MCAS Beaufort, SC. May.<br><br>2002. CH2MHill Constructors, Inc. Project Completion Report for the Underground Storage Tank Location and Survey at the Naval Hospital Beaufort (Revision 01). Port Royal, SC. December. |
| 81 - 85 and 140 Harris Road USTs | USTs located at 81, 82, 83, 84, 85, and 140 Harris Road in the Beaufort Naval Hospital housing area. | Certificate of Disposal for each UST. | SC DHEC Underground Storage Tank Assessment for 81 - 85 and 140 Harris Road, Naval Hospital Housing Area, MCAS Beaufort, SC. June 2015. | Not Applicable | No Information Available | No indication of vapor intrusion concerns determined from available information. US Water Recovery manifest dated 3/18/2015 included non-hazardous, non-regulated waste water for 82 and 84 Harris Road, and manifest dated 3/18/2015 included non-hazardous, non-regulated waste water for 85 and 140 Harris Road. | 2015. SC DHEC. Underground Storage Tank Assessment Report for 81 - 85 and 140 Harris Road, Naval Hospital Housing Area. MCAS Beaufort, SC. June.<br><br>2002. CH2MHill Constructors, Inc. Project Completion Report for the Underground Storage Tank Location and Survey at the Naval Hospital Beaufort (Revision 01). Port Royal, SC. December. |
| 101, 124, and 125 McGuire Court USTs | USTs located at 101, 124, and 125 McGuire Court in the Beaufort Naval Hospital housing area. | Certificate of Disposal for each UST. | SC DHEC Underground Storage Tank Assessment for 101, 124, and 125 McGuire Ct, Naval Hospital Housing Area, MCAS Beaufort, SC. June 2015. | Not Applicable | No Information Available | No indication of vapor intrusion concerns determined from available information. US Water Recovery manifest dated 3/23/2015 included non-hazardous, non-regulated waste water for 82 and 84 Harris Road. | 2015. SC DHEC. Underground Storage Tank Assessment Report for 101, 124, and 125 McGuire Court, Naval Hospital Housing Area. MCAS Beaufort, SC. June.<br><br>2002. CH2MHill Constructors, Inc. Project Completion Report for the Underground Storage Tank Location and Survey at the Naval Hospital Beaufort (Revision 01). Port Royal, SC. December. |

| Name of Site on Parris Island | Site Description | Current Status or Recommended Actions | Source of Status | Risk Classification | Constituents of Concern or Potential Concern | Risk Rational/Additional Site Information | Source of Primary Documents Used in the Evaluation |
|---|---|---|---|---|---|---|---|
| 106 - 108 Ray Circle USTs | USTs located at 106, 107, and 108 Ray Circle in the Beaufort Naval Hospital housing area. | Certificate of Disposal for each UST. | SC DHEC Underground Storage Tank Assessment for 106 - 108 Ray Circle, Naval Hospital Housing Area, MCAS Beaufort, SC. June 2015. | Not Applicable | No Information Available | No indication of vapor intrusion concerns determined from available information. | 2015. SC DHEC. Underground Storage Tank Assessment Report for 106 - 108 Ray Circle, Naval Hospital Housing Area. MCAS Beaufort, SC. June.<br><br>2002. CH2MHill Constructors, Inc. Project Completion Report for the Underground Storage Tank Location and Survey at the Naval Hospital Beaufort (Revision 01). Port Royal, SC. December. |
| 102 - 105, 109, 110, 117, and 123 Saunders Road USTs | USTs located at 102, 103, 104, 104, 109, 110, 117, and 123 Sauders Road in the Beaufort Naval Hospital housing area. | Certificate of Disposal for each UST. | SC DHEC Underground Storage Tank Assessment for 102 - 105, 109, 110, 117, and 123 Saunders Road, Naval Hospital Housing Area, MCAS Beaufort, SC. June 2015. | Not Applicable | No Information Available | No indication of vapor intrusion concerns determined from available information. US Water Recovery manifest dated 3/23/2015 included non-hazardous, non-regulated waste water for 103 and 123 Saunders Road, and manifest dated 3/18/2015 included non-hazardous, non-regulated waste for 104, 105, 109, 110, and 117 Saunders Road. | 2015. SC DHEC. Underground Storage Tank Assessment Report for 102 - 105, 109, 110, 117, and 123 Saunders Road, Naval Hospital Housing Area. MCAS Beaufort, SC. June.<br><br>2002. CH2MHill Constructors, Inc. 2002. Project Completion Report for the Underground Storage Tank Location and Survey at the Naval Hospital Beaufort (Revision 01). Port Royal, SC. December. |

# Figures

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## Beneficiary Catchment Area, USMC




The following zip codes are postal offices included within the selected zip code boundaries: 29452, 29901, 29903, 29904, 29905, 29912, 29914, 29921, 29925, 29931, 29938.

Prepared by the EpiData Center Department, Navy and Marine Corps Public Health Center on 14 January 2016.

PIONEER TECHNOLOGIES CORPORATION

Epidemiological Investigation Study Area
Public Health Report
Beaufort County, South Carolina

Figure 1

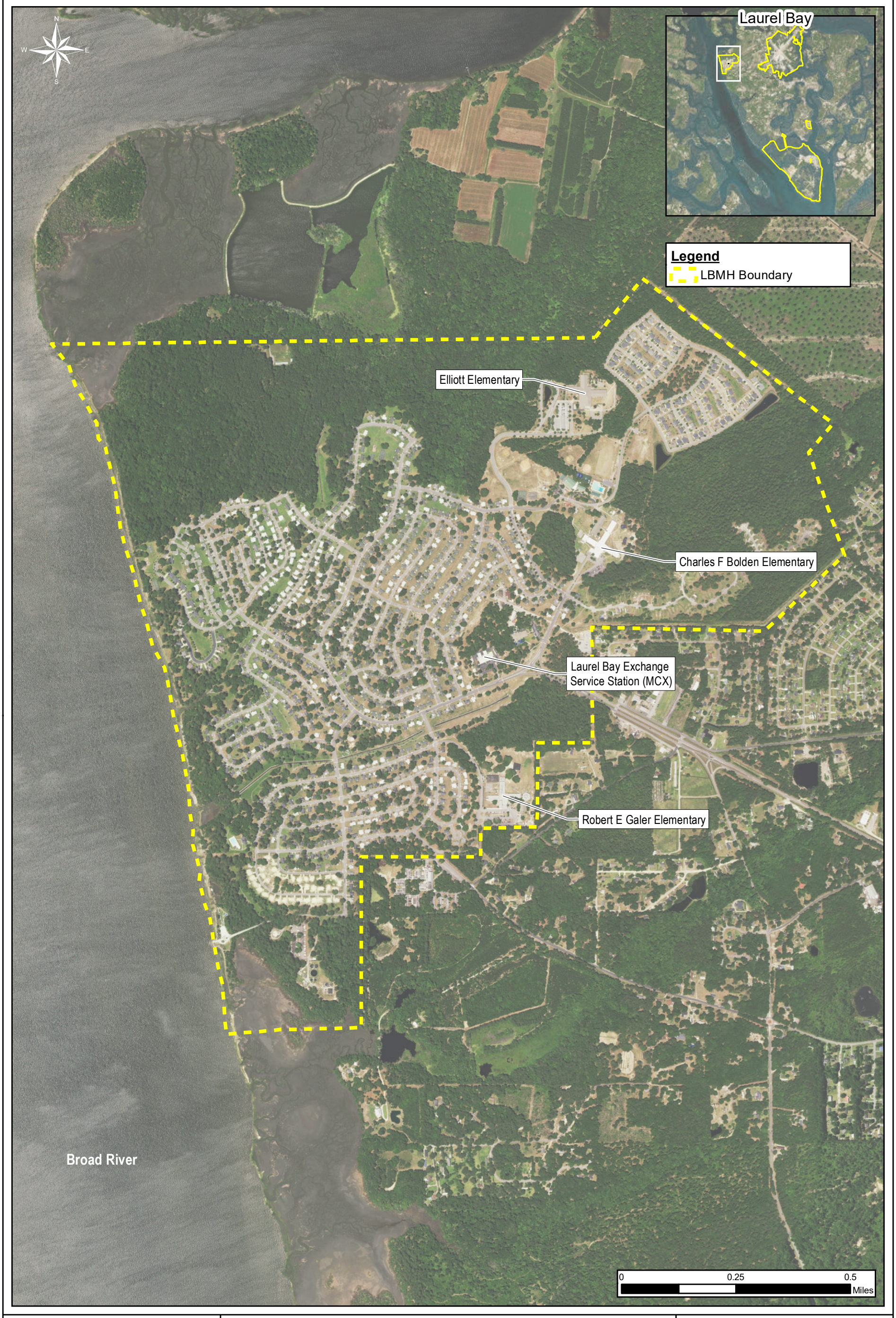



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# Area Locations
# Public Health Review
# Beaufort County, South Carolina

Figure 2

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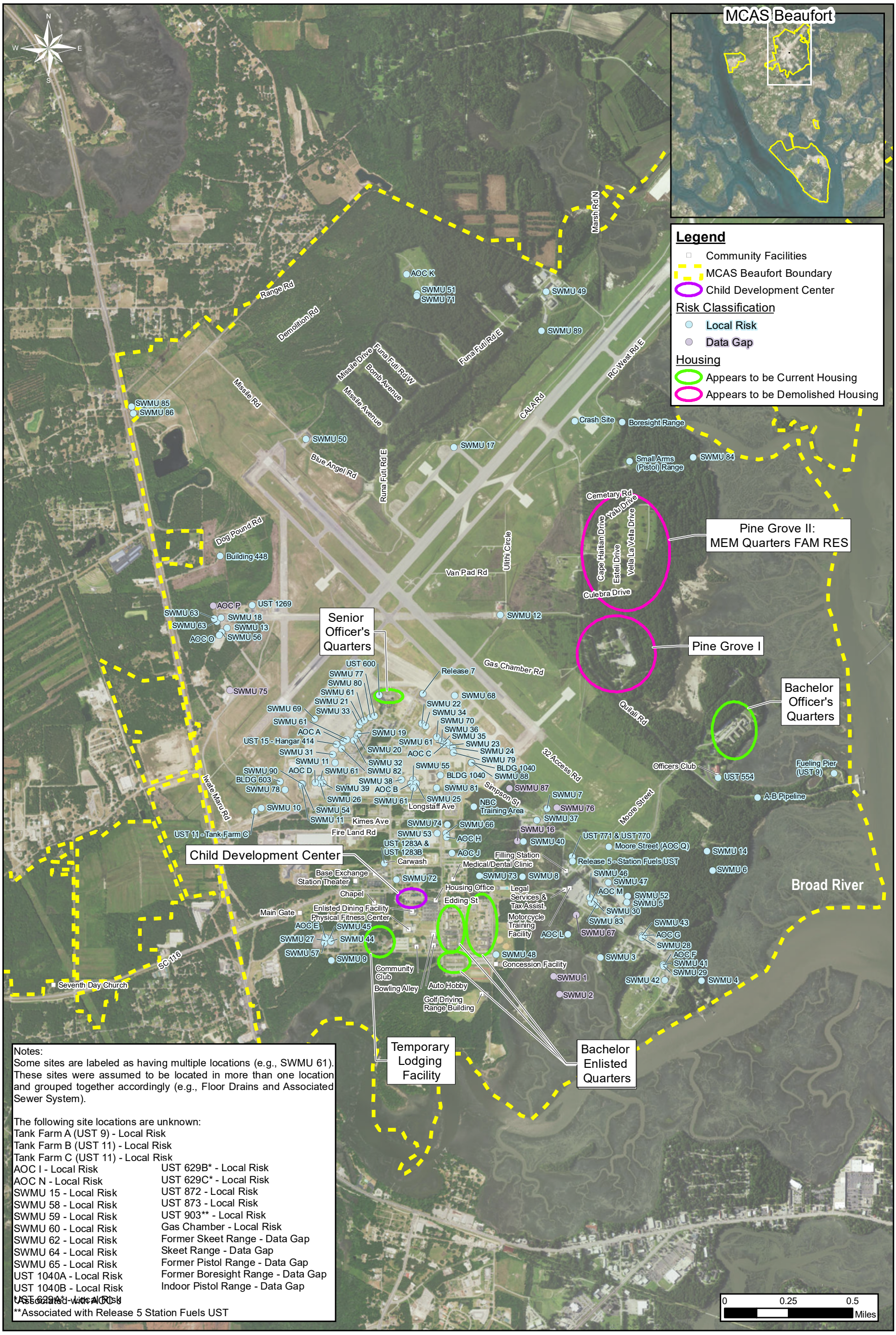



PIONEER TECHNOLOGIES CORPORATION

# LBMH Overview
# Public Health Review
# Beaufort County, South Carolina

Figure 3

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Notes:
Some sites are labeled as having multiple locations (e.g., SWMU 61). These sites were assumed to be located in more than one location and grouped together accordingly (e.g., Floor Drains and Associated Sewer System).

The following site locations are unknown:

Tank Farm A (UST 9) - Local Risk
Tank Farm B (UST 11) - Local Risk
Tank Farm C (UST 11) - Local Risk
AOC I - Local Risk
AOC N - Local Risk
SWMU 15 - Local Risk
SWMU 58 - Local Risk
SWMU 59 - Local Risk
SWMU 60 - Local Risk
SWMU 62 - Local Risk
SWMU 64 - Local Risk
SWMU 65 - Local Risk
UST 1040A - Local Risk
UST 1040B - Local Risk
UST 629A* - Local Risk
UST 629B* - Local Risk
UST 629C* - Local Risk
UST 872 - Local Risk
UST 873 - Local Risk
UST 903** - Local Risk
Gas Chamber - Local Risk
Former Skeet Range - Data Gap
Skeet Range - Data Gap
Former Pistol Range - Data Gap
Former Boresight Range - Data Gap
Indoor Pistol Range - Data Gap

*Associated with AOC O
**Associated with Release 5 Station Fuels UST

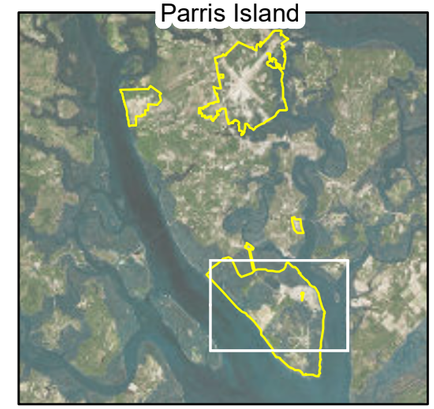
PIONEER TECHNOLOGIES CORPORATION

# MCAS Beaufort Overview
# Public Health Review
# Beaufort County, South Carolina

Figure 4

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**Legend**

Parris Island Boundary

Risk Classification

Local Risk

Regional Risk

Data Gap

Notes:
Site locations are approximate.
260 housing units are located throughout the Island.

The following SWMUs were classified as local risks; however, the locations of the SWMUs are unknown:

| | | |
|---|---|---|
| 22 | 29 | 34 |
| 23 | 31 | 43 |
| 24 | 33 | 44 |

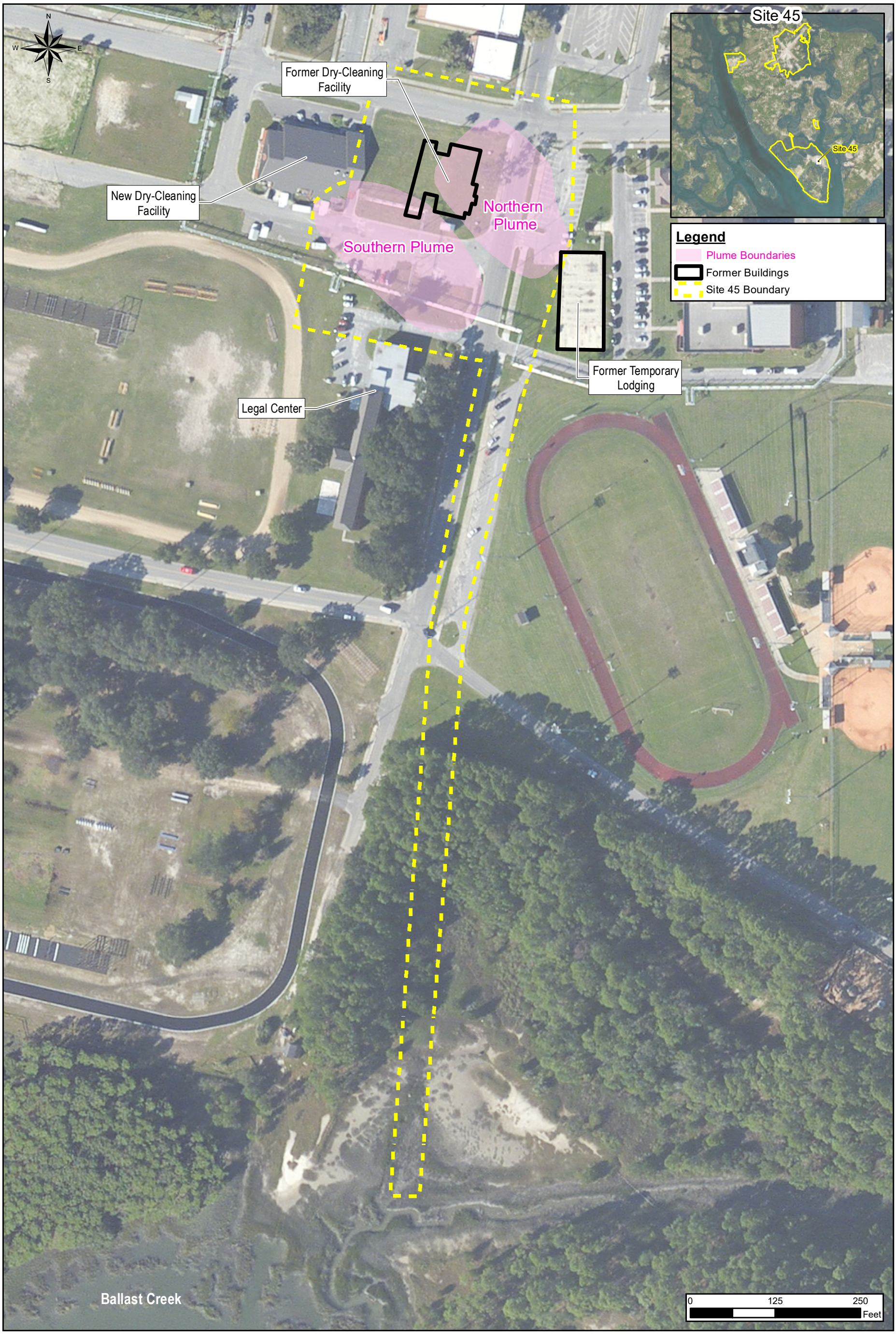
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PIONEER TECHNOLOGIES CORPORATION

# MCRD Parris Island Overview
# Public Health Review
# Beaufort County, South Carolina

Figure 5

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# Site 45 Overview
# Public Health Review
# Beaufort County, South Carolina

Figure 6

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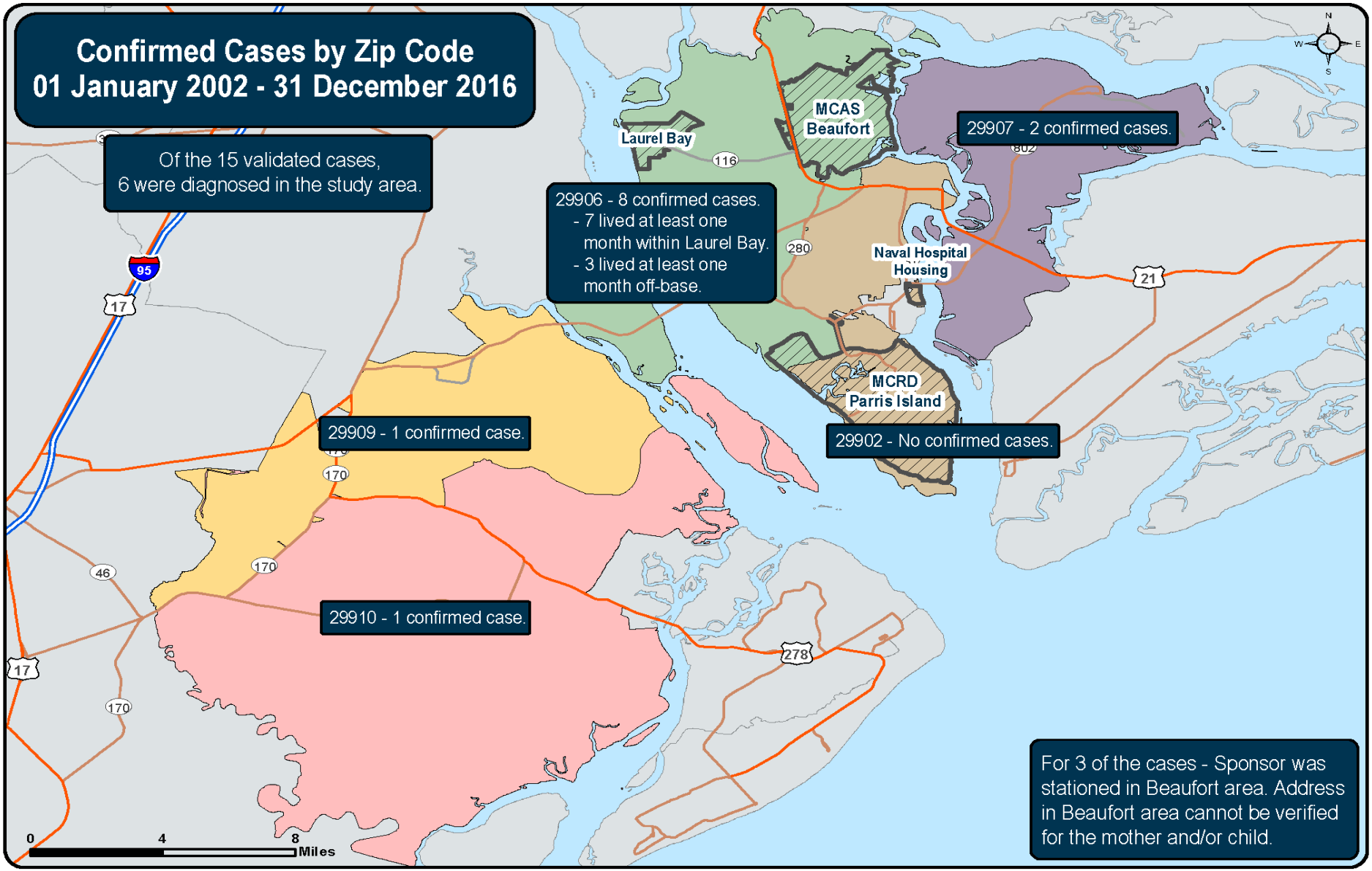



PIONEER TECHNOLOGIES CORPORATION

# NH Beaufort Housing Overview
# Public Health Review
# Beaufort County, South Carolina

Figure 7

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PIONEER TECHNOLOGIES CORPORATION

Confirmed Cases by Zip Code
Public Health Review
Beaufort County, South Carolina

Figure 8

# LAUREL BAY MILITARY HOUSING AREA
# MCAS BEAUFORT
# BEAUFORT, SC

N

0 150 300
Feet

**Legend**

- Soil Concentrations < SCDHEC SLs (No Further Action by SCDHEC)
- IGWA Groundwater Concentrations <SCDHEC SLs (No Further Action by SCDHEC)
- IGWA Groundwater Concentrations <SCDHEC SLs and Confirmed Soil Gas Concentrations <USEPA SLs that have been approved by SCDHEC (No Further Action by SCDHEC)
- PMW Groundwater Concentrations <SCDHEC SLs (No Further Action by SCDHEC)
- Soil Gas Concentrations <USEPA SLs that have been approved by SCDHEC (No VI Further Investigation Required)
- Residences to Be Sampled (Not Classified for VI due to a lack of data)
- Under Investigation for VI
- Area Under Residential Redevelopment
- Property Boundary

Figure 9

L:\work\GIS\Laurel Bay\maps\Open House\Open House SG Overall Map-New Street Addresses-03092017-ALL SOIL GW with Demo VI-Concern.map -03232017.mxd

BASEMAP: GeoFidelis/NIRIS IMAGERY: (c) 2010 Microsoft Corporation and its data suppliers

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# Appendix A

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# Navy and Marine Corps Public Health Center

## Appendix A

## NMCPHC Exposure Pathways Fact Sheet

September 2017

620 John Paul Jones Circle, Suite 1100
Portsmouth, VA 23708-2103

# Exposure Pathways

## What is Exposure?

Exposure is when you come in contact with a material and that material enters your body.






## What is an Exposure Pathway?

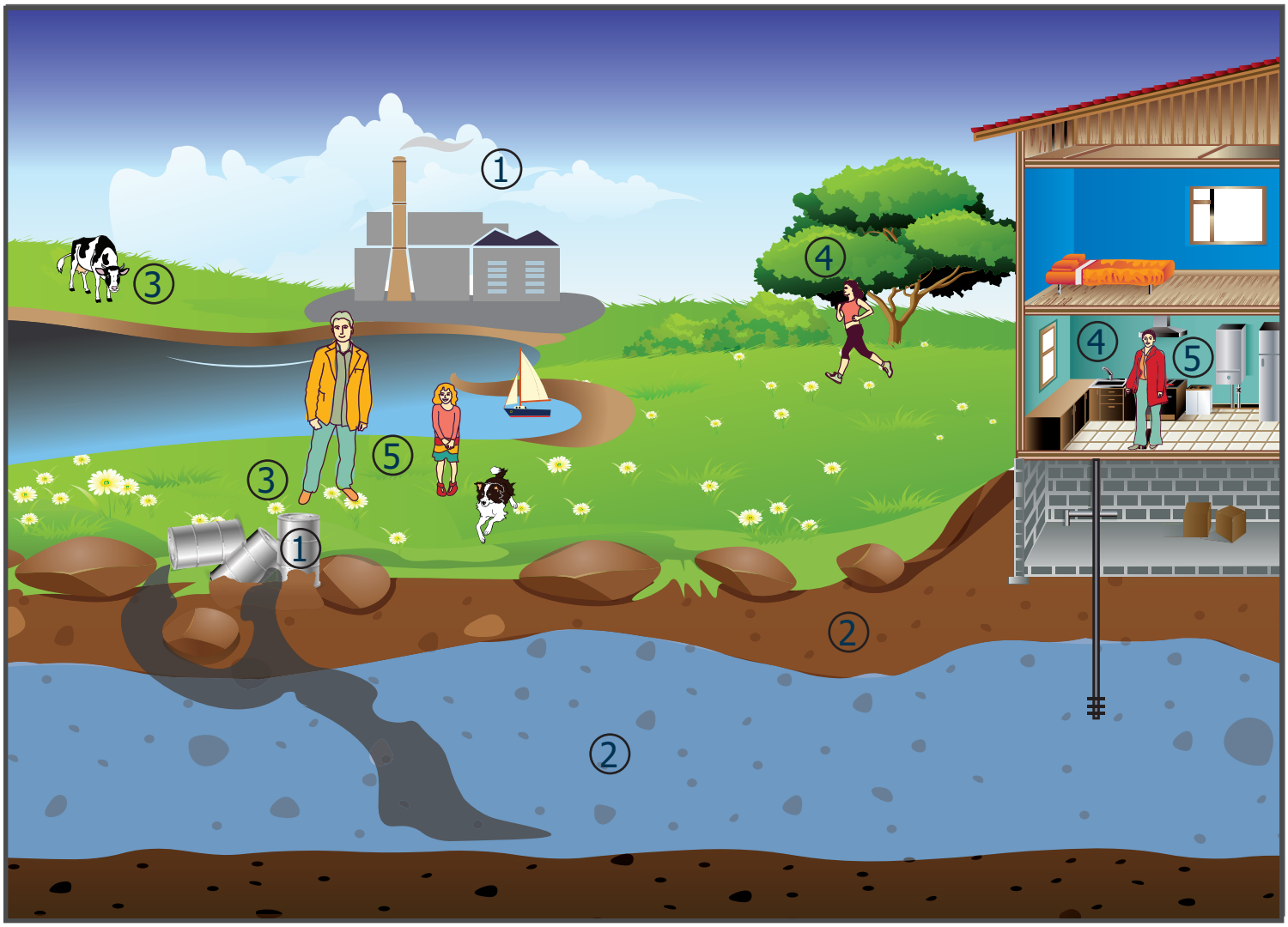
An exposure pathway is the course along which a material in the environment moves from its source and into your body.












## 5 Elements of a Complete Exposure Pathway

| 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|
| Source | Media | Exposure Point | Exposure Route | Receptor/ Population |
| How the material gets in the environment<br><br>» Landfill<br>» Tank<br>» Pond<br>» Creek<br>» Incinerator<br>» Drum<br>» Factory | How a material moves from its source to the point of exposure<br><br>» Soil<br>» Sediment<br>» Animals/Plants<br>» Groundwater<br>» Surface Water<br>» Air | Where people contact the media<br><br>» Residence<br>» Business<br>» Residential Yard<br>» Playground<br>» Campground<br>» Waterway | How the material enters the body<br><br>» Breathing air that contains the material<br>» Eating or drinking something with the material in it<br>» Getting it on your skin or touching something that has the material in it or on it | People who are exposed or potentially exposed<br><br>» Residents<br>» Hunters/ Fishermen<br>» Recreational populations<br>» Visitors<br>» Workers |




## What is a Completed Pathway?

A pathway of exposure is considered completed when all five elements are present. A completed pathway connects the source of the material to people.

An exposure pathway is the way in which a person may come in contact with a material.

## Why is a Completed Pathway of Exposure Important?

A pathway must be completed for exposure to occur. All five elements must be present. If one element is missing the pathway is incomplete and there is no exposure.

## Will Exposure from a Completed Pathway Affect My Health?

Whether or not a person experiences health effects from exposure to materials in the environment depends on a combination of several site-specific factors including:

- Kind of material released
- Amount of material available at the exposure point
- Physical and chemical form of the material
- Environmental conditions
- Length of exposure time

A Completed Pathway will result in exposure and possible health effects and further evaluation. An Incomplete Pathway results in no exposure and no health effects and does not require further evaluation.





Site-specific information about completed exposure pathways is used in both Risk Assessments and Public Health Assessments to determine if a site is safe for humans and/or the plants or animals found on the site.

**NAVY AND MARINE CORPS PUBLIC HEALTH CENTER**
PREVENTION AND PROTECTION START HERE

**Navy and Marine Corps Public Health Center**
NMCPHC Exposure Pathways Fact Sheet
620 John Paul Jones Circle, Suite 1100
Portsmouth, VA 23708-2103
www.nmcphc.med.navy.mil

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# Appendix B

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# Navy and Marine Corps Public Health Center

## Appendix B

## References for Reviewed Documents

September 2017

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# Appendix C

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# Navy and Marine Corps Public Health Center

## Appendix C
## Cancer Clusters and Risk Communication

September 2017

620 John Paul Jones Circle, Suite 1100
Portsmouth, VA 23708-2103

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# Cancer Cluster and Risk Communication

## Cancer Clusters and Public Perceptions

According to the Centers for Disease Control and Prevention (CDC), cancer is the second leading cause of death in the US, with one in four deaths attributable to some form of cancer. Approximately one in two men and one in three women will have some form of cancer in their lifetime. Because cancer is so common, cases might appear to occur with alarming frequency within a community even when the number of cases is within the expected rate for the population. As the US population ages, and as cancer survival rates continue to improve, in any given community, many residents will have had some type of cancer, thus adding to the perception of an excess of cancer cases in a community. Multiple factors affect the likelihood of developing cancer, including age, genetic factors, and such lifestyle behaviors as diet and smoking. Also, a statistically significant excess of cancer cases can occur within a given population without a discernible cause and might be a chance occurrence.

## Definition of a Cluster

Information below is from: CDC. Cancer clusters. Atlanta, GA: US Department of Health and Human Services, CDC; 2012. Available at http://www.cdc.gov/nceh/clusters/about.htm.

The CDC defines a cancer cluster as a greater than expected number of cancer cases that occurs within a group of people in a geographic area over a defined period of time. This definition can be broken down as follows:

- a greater than expected number: Whether the number of observed cases is greater than one typically would observe in a similar setting (e.g., in a cohort of a similar population size and within demographic characteristics) depends on a comparison with the incidence of cancer cases seen normally in the population at issue or in a similar community.
- of cancer cases: The cancer cases are all of the same type. In rare situations, multiple cancer types may be considered when a known exposure (e.g., radiation or a specific chemical) is linked to more than one cancer type or when more than one contaminant or exposure type has been identified.
- that occurs within a group of people: The population in which the cancer cases are occurring is defined by its demographic factors (e.g., race/ethnicity, age, and sex).
- in a geographic area: The geographic boundaries drawn for inclusion of cancer cases and for calculating the expected rate of cancer diagnoses from available data are defined carefully. It is possible to "create" or "obscure" a cluster inadvertently by selection of a specific area.

- over a period of time: The time period chosen for analysis will affect both the total cases observed and the calculation of the expected incidence of cancer in the population.

## Characteristics of Cancer and Clusters

Information below is from the CDC. Morbidity and Mortality Weekly Report (MMWR): Investigating Suspected Cancer Clusters and Responding to Community Concerns: Guidelines from CDC and the Council of State and Territorial Epidemiologists Guidelines; September 27, 2013 / 62(RR08); 1-14. Available at http://www.cdc.gov/mmwr/preview/mmwrhtml/rr6208a1.htm:

- The National Cancer Institute of the National Institutes of Health defines cancer as a term for a group of diseases in which abnormal cells divide without control and can invade nearby tissues. As a group, cancers are very common. Cancers are the second leading cause of death in the US, exceeded only by diseases of the heart and circulatory system. One of every four deaths in the US is attributable to some form of cancer. In 2009, approximately 1.47 million persons in the US received a cancer diagnosis, and approximately 568,000 persons died from cancer.
- Because cancer is common, cases might appear to occur with alarming frequency within a community even when the number of cases is within the expected rate for the population. As the US population ages, and as cancer survival rates continue to improve, in any given community, many residents will have had some type of cancer, thus adding to the perception of an excess of cancer cases in a community. Multiple factors affect the likelihood of developing cancer, including age, genetic factors, and such lifestyle behaviors as diet and smoking. Also, a statistically significant excess of cancer cases can occur within a given population without a discernible cause and might be a chance occurrence.
- Three considerations are important for suspected cancer cluster investigations. First, types of cancers vary in etiologies, predisposing factors, target organs, and rates of occurrence. Second, cancers often are caused by a combination of factors that interact in ways that are not fully understood. Finally, for the majority of cancers, the long latency period (i.e., the time between exposure to a causal agent and the first appearance of symptoms and signs) complicates any attempt to associate cancers occurring at a given time in a community with local environmental contamination. Often decades intervene between the exposures that initiate and promote the cancer process and the development of clinically detectable disease.
- Communicating effectively about the frequency and nature of cancer in explaining suspected cancer clusters can be difficult for public health agencies, and many of the scientific concepts involved (e.g., random fluctuation, statistical significance and latency period) might not be easy to explain to the community. Any number of community

members, friends, or relatives with cancer is alarming and is too many from a personal perspective. When persons are affected personally by a case of cancer, they naturally seek an explanation of the cause of the cancer.

## Cancer Cluster Investigations

- As the 1990 Guidelines noted, finding a causal association between environmental contaminants and cancer is rare in a community cancer cluster setting. Evidence reported by state and local health agencies and federal agencies since 1990 that would suggest otherwise is limited, and most investigations of suspected cancer clusters do not lead to the identification of an associated environmental contaminant.
- State and local health agencies receive approximately 1,000 inquiries per year regarding suspected cancer clusters. The majority of these inquiries can be resolved during the initial response, which consists of the initial contact and follow-up contact with the caller, if needed. The resulting health education can be an important public service. Even if inquiries concern events that meet the statistical criteria for a cancer cluster, investigations of suspected cancer clusters are unlikely to find an associated environmental contaminant. For example, one of the largest suspected cancer clusters investigated by CDC's NCEH and by other agencies concerned cases of childhood leukemia in Fallon, Nevada. Although initial analysis demonstrated a statistically significant ($p<0.05$) increase in the number of cases, subsequent epidemiologic investigations did not identify a statistically significant association with environmental contaminants.
- Suspected cancer clusters that consist of cases of one type of cancer, a rare type of cancer, or a type not identified usually in a certain demographic group are thought to be more likely to have a common cause. Even if these factors are present, the suspected cluster might not be associated with an environmental exposure and in fact might be a chance occurrence. A type of cancer under investigation might not be associated biologically with any environmental contaminants of concern in the community. In other words, a suspected environmental contaminant might not be in the causal pathway for a certain type of cancer. One common but false assumption held by persons not familiar with the scientific study of cancer is that a single environmental contaminant is likely to cause any or all kinds of cancer. Toxicological and epidemiologic studies do not support this assumption. Cancer is not one disease, but rather many different diseases with different causal mechanisms.
- In addition, two statistical issues influence the ability of the health agency to determine an association between the cancer(s) in question and environmental exposures. First, a suspected cancer cluster investigation with a small number of cases (e.g., one that involves a rare cancer type comprising only a few cases) might result in a lack of

statistical power to detect an association. Second, because of the substantial number of cancer patients who might live in a community, a spurious association with an environmental contaminant can occur by chance alone, without the contaminant being a causal factor.

- The health agency should avoid imprecise and post hoc definitions of such concepts as case, population, geographic area, or exposure period because such definitions might bias or limit an investigation. For example, case definitions that include different cancers generally are not useful, unless the environmental contaminant under consideration has been associated with multiple cancer types.
- Latency and change of residence add to the complexity of these investigations. Because of the long latency period associated with cancers, behaviors and exposures that might have contributed to the development of cancer in a person typically occur years to decades before the diagnosis (e.g., malignant mesothelioma, a lung tumor, is associated with asbestos exposure). The latent period between first exposure to asbestos and death from mesothelioma is often 30 years or longer. Latency needs to be considered in an investigation of a suspected cancer cluster because it influences the exposure period relevant to the investigation. If a person with cancer did not live in the suspected cancer cluster area during the relevant exposure period (possibly 20 years previously), then that person's cancer cannot be related to an environmental contaminant of concern or to any exposure in the suspected cancer cluster area. Conversely, the latency period might limit the ability to detect a cancer cluster or identify cancers related to an environmental exposure that occurred in the past. In a mobile population, a cancer cluster resulting from an environmental contamination occurring years or even decades earlier might go undetected because exposed residents have moved away from the community before the cancer develops. Thus, as persons move in and out of different communities, their cumulative exposure profile will change.
- Because investigations rarely demonstrate a clear association with an environmental contaminant, investigations of community-based cancer clusters usually do not provide the resolution communities seek.

## Where can people get more information about cancer clusters?

In addition to state and local health departments and cancer registries, the following agencies may have more information about cancer clusters.

**Agency for Toxic Substances and Disease Registry (ATSDR) Centers for Disease Control and Prevention**
**1–800–232–4636 (1–800–CDC–INFO)**
**http://www.atsdr.cdc.gov**

http://www.atsdr.cdc.gov

The CDC's ATSDR conducts public health assessments of potentially hazardous waste sites, performs health consultations on specific hazardous substances, designs and conducts health surveillance programs, and provides education and training about hazardous substances. Information about public health assessments conducted by ATSDR can be found on the Public Health Assessments and Health Consultations page. Reports can be searched by state or US territory. Contact information for ATSDR regional offices is available online.

**National Center for Environmental Health (NCEH) Centers for Disease Control and Prevention**
**1–800–232–4636 (1–800–CDC–INFO)**

cdcinfo@cdc.gov http://www.cdc.gov/nceh/clusters

The CDC's NCEH works to promote healthy and safe environments and prevent harmful exposures. The NCEH website includes general information about cancer clusters, links to resources, and answers to frequently asked questions.

**National Institute for Occupational Safety and Health (NIOSH) Hazard Evaluation and Technical Assistance Branch**
**Health Hazard Evaluation (HHE) Program**
**Centers for Disease Control and Prevention**
**1-513–841–4382**

HHERequestHelp@cdc.gov http://www.cdc.gov/niosh/hhe

The HHE Program of CDC's NIOSH investigates potentially hazardous working conditions, including suspected cancer clusters. Employees, authorized employee representatives, and employers can request these evaluations. HHE reports are available on the NIOSH website.

**Office of Occupational Medicine**
**Occupational Safety and Health Administration (OSHA)**
**U.S. Department of Labor**
**202–693–2323**

http://www.osha.gov/dts/oom/index.html

OSHA's Office of Occupational Medicine performs workplace-related case evaluations and cluster investigations, including medical record reviews, employee interviews, and medical screening activities.

## Selected References

Centers for Disease Control and Prevention. Investigating Suspected Cancer Clusters and Responding to Community Concerns: Guidelines from CDC and the Council of State and Territorial Epidemiologists. Morbidity and Mortality Weekly Report 2013; 62(RR08):1-14.

[PubMed Abstract]

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# Appendix D

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# Navy and Marine Corps Public Health Center

## Appendix D

## Zip Codes Included in Study Area for Epidemiologic Investigation of Pediatric Cancers

September 2017

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**Appendix A.** Zip Codes Included in Study Area, Epidemiologic Investigation of Pediatric Cancers Associated with MCAS Beaufort and MCRD Parris Island

| Zip Code | Zip Code Type | Primary City | County | State |
|---|---|---|---|---|
| 29901 | PO BOX | Beaufort | Beaufort County | SC |
| 29902 | STANDARD | Beaufort | Beaufort County | SC |
| 29903 | PO BOX | Beaufort | Beaufort County | SC |
| 29904 | PO BOX | Beaufort | Beaufort County | SC |
| 29905 | PO BOX | Beaufort | Beaufort County | SC |
| 29906 | STANDARD | Beaufort | Beaufort County | SC |
| 29907 | STANDARD | Ladys Island | Beaufort County | SC |
| 29909 | STANDARD | Okatie | Beaufort County | SC |
| 29910 | STANDARD | Bluffton | Beaufort County | SC |
| 29914 | PO BOX | Dale | Beaufort County | SC |
| 29915 | STANDARD | Daufuskie Island | Beaufort County | SC |
| 29920 | STANDARD | Saint Helena Island | Beaufort County | SC |
| 29925 | PO BOX | Hilton Head Island | Beaufort County | SC |
| 29926 | STANDARD | Hilton Head Island | Beaufort County | SC |
| 29928 | STANDARD | Hilton Head Island | Beaufort County | SC |
| 29931 | PO BOX | Lobeco | Beaufort County | SC |
| 29935 | STANDARD | Port Royal | Beaufort County | SC |
| 29938 | PO BOX | Hilton Head Island | Beaufort County | SC |
| 29940 | STANDARD | Seabrook | Beaufort County | SC |
| 29941 | STANDARD | Sheldon | Beaufort County | SC |
| 29945 | STANDARD | Yemassee | Beaufort County | SC |
| 29412 | STANDARD | Charleston | Charleston County | SC |
| 29912 | STANDARD | Coosawhatchie | Jasper County | SC |
| 29927 | STANDARD | Hardeeville | Jasper County | SC |
| 29936 | STANDARD | Ridgeland | Jasper County | SC |
| 29943 | STANDARD | Tillman | Jasper County | SC |
| 31322 | STANDARD | Pooler | Chatham County | GA |
| 31328 | STANDARD | Tybee Island | Chatham County | GA |
| 31403 | PO BOX | Savannah | Chatham County | GA |
| 31405 | STANDARD | Savannah | Chatham County | GA |
| 31407 | STANDARD | Savannah | Chatham County | GA |
| 31408 | STANDARD | Savannah | Chatham County | GA |
| 31409 | PO BOX | Savannah | Chatham County | GA |
| 31410 | STANDARD | Savannah | Chatham County | GA |
| 31411 | STANDARD | Savannah | Chatham County | GA |
| 31412 | PO BOX | Savannah | Chatham County | GA |
| 31414 | PO BOX | Savannah | Chatham County | GA |
| 31415 | STANDARD | Savannah | Chatham County | GA |
| 31416 | PO BOX | Savannah | Chatham County | GA |
| 31418 | PO BOX | Savannah | Chatham County | GA |
| 31419 | STANDARD | Savannah | Chatham County | GA |
| 31420 | PO BOX | Savannah | Chatham County | GA |
| 31421 | STANDARD | Savannah | Chatham County | GA |
| 31302 | STANDARD | Bloomingdale | Effingham County | GA |
| 31318 | PO BOX | Meldrim | Effingham County | GA |
| 31326 | STANDARD | Rincon | Effingham County | GA |
| 31329 | STANDARD | Springfield | Effingham County | GA |
| 31401 | STANDARD | Savannah | Chatham County | GA |
| 31402 | PO BOX | Savannah | Chatham County | GA |
| 31404 | STANDARD | Savannah | Chatham County | GA |
| 31406 | STANDARD | Savannah | Chatham County | GA |

# Appendix E

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# Navy and Marine Corps Public Health Center

## Appendix E

## Provider Guidance for Medical Screening for Pediatric Cancers and Adult Cancers Naval Hospital Beaufort

September 2017

620 John Paul Jones Circle, Suite 1100
Portsmouth, VA 23708-2103

10 January 2017

# Provider Guidance for Medical Screening for Pediatric Cancers Naval Hospital Beaufort

## Background

In 2015, a Facebook Group, "*Concerned Military Family United by Pediatric Cancer" (https://www.facebook.com/groups/MilitaryFamilyUnitedbyPediatricCancer/)* voiced concerns regarding pediatric cancer cases, potentially from environmental sources, for military families who have previously (or currently) lived in Laurel Bay Housing, Beaufort, South Carolina. The group has reached out via social media to other military families, to the South Carolina Department of Health & Environmental Control, and to the CDC for further inquiry. Their Facebook page identified the following cancers of concern:

- Acute Lymphocytic Leukemia
- Neuroblastoma
- Wilms Tumor

One of the concerns of this group is whether there are any signs or symptoms to be aware of, and if there are any medical screening tests available for their children.

The perceived, not validated, causal factors for the pediatric cancer cases listed on the Facebook page include:

- Contamination sites around military housing, MCAS Beaufort and MCRD Parris Island
- Underground storage tanks containing residential heating oil at Laurel Bay Housing
- Mold
- Indoor Air Quality
- Drinking Water Contamination
- Groundwater Contamination

***Providers should not answer questions related to environmental risk, ongoing environmental projects, environmental sampling results, or environmental policy. The Navy & Marine Corps Public Health Center (NMCPHC) is conducting a Public Health Review evaluating both environmental exposure pathways and conducting an epidemiological investigation with a report expected in the Spring of 2017. Specific patient questions regarding environmental concerns should be referred to Captain Groover or Capt Sisbarro, MCAS Beaufort PAO at (843) 228-6123.***

Due to the rarity of childhood cancer, and the fact that people are exposed to many chemicals at the same time, it is difficult to determine the contribution of specific chemicals to the risk of developing cancer. Also,

when the number of cases is small (i.e. less than 16 of the same or related cancers with a common etiology), the power of statistical analysis is extremely limited.

The scientific community does not have a complete picture of the potential chemical causes of cancer in children. Regardless, it is important for patients to share their information with their doctor, who can obtain consultations with specialists who care for children with these rare diseases. If necessary, the specialist can guide and interpret any need for screening evaluation based on the specific concerns for the child patient. With parental permission, specific evaluation of concerns and risks can help us best determine the next steps to screen for disease.

## Clinical Approach to Possible Environmental Exposures

Patients with suspected low-dose exposures to chemicals of concern should be evaluated as any other patient. An accurate history, including current symptoms and review of systems, should be obtained. As some of these chemicals are commonly encountered in the environment, a thorough occupational, social, and medical history should carefully explore possible sources of exposure.

The physical examination of patients concerned about exposure(s) should focus on establishing a baseline. Thyroid, lymph nodes, heart, lung, and abdomen comprise the minimum exam; rectal, breast, and even pelvic examination would not be unreasonable, depending on the particular concerns, age, and wishes of the patient or parent. Based on findings from the history and physical examination, further testing may be appropriate. Due to the rarity and complexity of pediatric hematologic disease or malignancy, we do not routinely recommend blood, urine, invasive testing, or screening imaging for children who are otherwise healthy and have normal comprehensive examinations, including growth, nutritional, and neurodevelopmental histories. Testing solely to allay patient (or parent) concerns is generally unhelpful and therefore not typically recommended.

There is no test that can definitively determine if a patient will develop cancer. Negative findings from exhaustive urine and blood testing or whole-body MRI today do not mean the patient will not develop serious disease in the future and may not be adequate to allay all patient concerns. In addition, testing without evidence of disease is likely to result in false positives, leading to further unnecessary and potentially harmful tests and procedures. If findings do indicate that further testing is needed, consultation with a toxicologist, hematologist-oncologist, or other pertinent expert for specific guidance on further evaluation and management is recommended, so that any indicated testing can be accurately interpreted. Treatment should be appropriate for the working diagnoses, if any, determined by the patient encounter.

Like with other potential carcinogens, continuing exposure to a chemical of concern may increase the risk of cancer. Education about avoiding or minimizing future exposures the patient has control of (for example, to avoid smoking and substance abuse, eat a healthy diet, exercise regularly, limit alcohol intake, and faithfully use respirators and gloves at work if required, etc.) is reasonable. ***Once again, until the NMCPHC Report is completed, questions pertaining to installation or housing environmental exposures and actions to minimize***

***those exposures will be difficult for providers to answer and need to be directed to the MCAS point of contact listed below.***

Disposition of patients without abnormal findings should include appropriate immunizations, preventive exams, and instructions to return if signs or symptoms of adverse health effects occur. The U.S. Preventive Services Task Force's Guide to Clinical Preventive Services contains evidence-based recommendations for prevention and early detection of diseases ranging from cancer to mental health conditions. These recommendations can be accessed at: http://www.ahrq.gov/clinic/prevenix.htm.

Providers with additional questions may contact the Naval Medical Center Portsmouth Pediatrics Department via the following methods:

- Consult with an active duty military Pediatric Oncologist for specific questions. CDR Brian Feldman, Pediatric Department Chairman, Pediatric Hematologist-Oncologist, Naval Medical Center Portsmouth is the lead consultant for any additional questions via e-mail or telephone:
    - brian.l.feldman.mil@mail.mil
    - Phone: (757) 953-2960
    - Please advise patients not to contact CAPT Feldman directly or share PHI information via email.

Providers with additional questions for Adult Cancer concerns can contact CDR Heather Tracy, Department Head, Hematology-Oncology, Naval Medical Center San Diego via e-mail or telephone:

    - heather.j.tracy2.mil@mail.mil
    - Phone (619) 532-7327

- The USMC POCs are Capt Groover and Capt Sisbarro at MCAS Beaufort:
    - clayton.groover@usmc.mil
    - Sharon.sisbarro@usmc.mil
    - Phone (843) 228-6123

Additionally, the Pediatric Consultation System has established a new Asynchronous Tele-health System. Please visit https://help.nmcp.med.navy.mil and click the "Request an Account" link at the bottom of the page. Once your account has been created, you may enter your consult. If you have any difficulties or questions, please e-mail: NMCP-HELPassist@med.navy.mil. This can be used to facilitate non-urgent communication with multiple specialists, and can be used to coordinate any specialty consultation visit travel should this be deemed appropriate.

Providers may also contact the NMCPHC's Occupational and Environmental Medicine (OEM) Department at usn.hampton-roads.navmcpubhlthcenpors.list.nmcphc-occ-envmed@mail.mil, or visit the Environmental Health website at http://www.med.navy.mil/sites/nmcphc/environmental-health/Pages/home.aspx.

14 January 2017

# Provider Guidance for Medical Screening for Adult Cancers Naval Hospital Beaufort

## Background

In 2015, a Facebook group, "*Concerned Military Family United by Pediatric Cancer*" (https://www.facebook.com/groups/MilitaryFamilyUnitedbyPediatricCancer/) voiced concerns regarding pediatric cancer cases, potentially caused by environmental sources, in military families who previously (or currently) lived in Laurel Bay Housing, Beaufort, South Carolina. The group reached out via social media to other military families, to the South Carolina Department of Health & Environmental Control, and to the Centers for Disease Control and Prevention (CDC) for further inquiry. The perceived, not validated, causal factors for the pediatric cancer cases listed on the Facebook page include:

- Contamination sites around military housing, MCAS Beaufort, and MCRD Parris Island
- Underground storage tanks (USTs) containing residential heating oil at Laurel Bay Housing
- Mold
- Indoor air quality
- Drinking water contamination
- Groundwater contamination

The recent Facebook video has been viewed thousands of times, and concern has now spread to include adult cancers as potentially being caused by alleged environmental exposures. Medical providers are being asked for advice by concerned patients and their families.

## Current Status

Navy Medicine is providing the Marine Corps with the following support:

- A Navy Pediatric Oncologist is currently caring for some of the pediatric cancer patients.
- The Navy & Marine Corps Public Health Center (NMCPHC) developed and updated guidance for providers about pediatric cancer screening.
- NMCPHC is also conducting a Public Health Review, evaluating environmental exposure pathways (air, water, soil and soil gas) and conducting an epidemiological investigation, with a report expected in the spring of 2017.

Providers should note the perceived causal factors for the adult cancers of concern mentioned in the Facebook group are not specific other than the USTs at Laurel Bay Housing.

## Approach to Patients Concerned about Possible Environmental Exposures

Patients with concerns about environmental exposures should be evaluated as any other patient. An accurate history, including current symptoms and review of systems, should be obtained. As some chemicals of concern are commonly encountered in the environment, a thorough occupational, social, and medical history should carefully explore possible sources of exposure. The physical examination of patients concerned about exposure(s) should focus on establishing a baseline. Thyroid, lymph nodes, heart, lung, and abdomen comprise the minimum exam; rectal, breast, and even pelvic examination would not be unreasonable, depending on the particular concerns, age, and wishes of the patient. Based on findings from the history and physical examination, further testing may be appropriate.

With the information available at this time, we cannot recommend blood, urine, imaging, or invasive testing for adults who are otherwise healthy and have normal examinations. Testing solely to allay patient (or family) concerns is generally unhelpful and therefore typically not recommended. There is no test that can definitively determine if a person will develop cancer. Negative findings from exhaustive urine and blood testing or whole-body MRI today do not mean the patient will not develop serious disease in the future and may not be adequate to allay all patient concerns. In addition, testing without evidence of disease is likely to result in false positives, leading to further unnecessary and potentially harmful tests and procedures.

Patients with concerns about *occupational* exposures should be reassured that the Navy has a robust occupational medical surveillance program. Workers with actual or potential exposures to harmful substances in the workplace are carefully followed for evidence of unexpected or over-exposures.

## Disposition

If history and physical findings do indicate that further testing is needed, consultation with a toxicologist, hematologist-oncologist, or other expert for specific guidance on further evaluation and management is recommended, so that any indicated testing can be accurately interpreted. Treatment should be appropriate for the working diagnoses, if any, determined by the patient encounter.

Disposition of patients without abnormal findings should include instructions to receive appropriate immunizations and preventive exams, and to return if signs or symptoms of adverse health effects occur. The U.S. Preventive Services Task Force's Guide to Clinical Preventive Services contains evidence-based recommendations for prevention and early detection of diseases ranging from cancer to mental health conditions. Those recommendations can be accessed at: http://www.ahrq.gov/clinic/prevenix.htm.

Providing education about healthy behaviors and how patients can avoid or minimize future exposures they have control of (for example, to avoid smoking and substance abuse, eat a healthy diet, exercise regularly, limit alcohol intake, and faithfully use respirators and gloves at work if required, etc.) is reasonable. **However, until the NMCPHC report is completed, questions pertaining to installation or housing environmental exposures and actions to minimize those exposures should be directed to the MCAS point of contact listed below. Providers should not attempt to answer questions regarding environmental risk, ongoing environmental projects, environmental sampling results, or environmental policy.**

Providers with additional questions about adult cancer can contact CDR Heather Tracy, Department Head, Hematology-Oncology, Naval Medical Center San Diego via e-mail or telephone:

- heather.j.tracy2.mil@mail.mil
- Phone (619) 532-7327

Providers may also contact NMCPHC's Occupational and Environmental Medicine (OEM) Department at: usn.hampton-roads.navmcpubhlthcenpors.list.nmcphc-occ-envmed@mail.mil, or visit the Environmental Health website at: http://www.med.navy.mil/sites/nmcphc/environmental-health/Pages/home.aspx

The USMC POC is Capt. Sharon Sisbarro at MCAS Beaufort:

- sharon.sisbarro@usmc.mil
- Phone (843) 228-6123

Additional information for patients regarding chemicals, environmental factors, and other risk factors related to cancers can be found at:

- Agency for Toxic Substances and Disease Registry (ATSDR) website:
  - Chemicals, Cancer and You: https://www.atsdr.cdc.gov/emes/public/docs/Chemicals,%20Cancer,%20and%20You%20FS.pdf
- Centers for Disease Control and Prevention website:
  - About Cancer Clusters: https://www.cdc.gov/nceh/clusters/
  - Guidelines for Investigating Clusters of Health Events: https://www.cdc.gov/mmwr/preview/mmwrhtml/00001797.htm

Additional information about risk communication and medical surveillance in the workplace can be found on the Navy & Marine Corps Public Health Center website:

- Risk Communication: http://www.med.navy.mil/sites/nmcphc/environmental-programs/Pages/risk-communication.aspx
- Medical Surveillance and Certification: http://www.med.navy.mil/sites/nmcphc/occupational-and-environmental-medicine/oemd/Pages/medical-surveillance-certification.aspx