

Marine Corps Base (MCB) Camp Lejeune Restoration Advisory Board (RAB) Meeting Minutes

MEETING DATE:	November 15, 2023		
LOCATION:	Coastal Carolina Community College, Business Technology Building, Jacksonvi North Carolina		
ATTENDEES:	Laura Spung/MCB Camp Lejeune David Towler/MCB Camp Lejeune Jennifer Tufts/EPA Laura Bader/RAB Co-Chair Rob Johnson/RAB member Thomas Mattison/RAB member	Ben Francisco/NAVFAC Laarni Cooper/NAVFAC Matt Louth/CH2M Monica Fulkerson/CH2M Angela Moore/NCDEQ Jessica Pearson/MCB Camp Lejeune	
FROM:	Monica Fulkerson/CH2M		
DATE:	December 11, 2023		

I. Welcome and Introductions

Ms. Spung began the meeting, introduced the team, and explained the purpose of the RAB.

II. Site 88 Interim Remedial Action Completion Report

Objective: The purpose of this agenda item is to present a background summary of Site 88, present the Interim Remedial Action Completion Report, and provide a schedule for ongoing activities.

Overview: A presentation was reviewed by Ms. Fulkerson.

An overview of Site 88 was presented. Site 88 is the former dry cleaning facility (Former Building 25) and consists of volatile organic compounds (VOCs) in groundwater. Investigations began in 1995 with an underground storage tank removal. Various investigations and studies were conducted between 1999 and 2017, including source area pilot studies, supplemental site investigation, Remedial Investigation, soil mixing removal actions, groundwater pilot studies, vapor intrusion investigations, vapor intrusion mitigation system (VIMS) installation, site-wide groundwater sampling, a tracer study and a sewer ventilation pilot study. Between 2018 and 2019, the Feasibility Study, Proposed Plan, and Record of Decision were completed. Between 2020 and 2022, the Remedial Design was completed, and the Remedial Action was implemented.

Site 88 was divided into three zones to facilitate investigation, studies, and removal actions. Zone 1 is the initial source area, with relatively high concentrations in groundwater at 5 to 60 feet below ground surface (bgs). Zone 2 is located downgradient of Zone 1, with elevated concentrations from 40 to 180 feet bgs. Zone 3 is the downgradient portion of plume, with lower concentrations limited to 40 to 60 feet bgs. The constituents of concern (COCs) for groundwater are tetrachloroethene (PCE), trichloroethene (TCE), cis-1,2-dichloroethene (DCE), and vinyl chloride. COCs for soil gas are PCE, TCE, and VC.

The Remedial Action Objectives (RABs) for Site 88 are as follows:

- 1. Restore groundwater quality to meet North Carolina Department of Environmental Quality (NCDEQ) and federal primary drinking water standards based on the classification of the aquifer as a potential source of drinking water under 15A North Carolina Administrative Code 02L.0201.
- 2. Reduce groundwater contaminant source mass to the maximum extent practicable within a reasonable timeframe to inhibit migration of COCs to the New River.
- 3. Prevent human ingestion of and contact with groundwater containing COCs at concentrations above North Carolina Groundwater Quality Standards (NCGWQS) or federal maximum contaminant levels (MCLs), whichever is more stringent.
- 4. Prevent exposure to COCs in groundwater and soil gas during construction, and through the vapor intrusion (VI) pathway that could result in unacceptable risk to human health.
- 5. Restrict intrusive activities and prevent residential use near soil mixing treatment area.

The remedy selected in the Record of Decision (ROD) was enhanced reductive dechlorination (ERD) via vertical injection wells in Zone 1, in situ chemical oxidation (ISCO) via horizontal injection wells and recirculation in Zone 2, biobarrier via vertical injection wells in Zone 3, continued operation of VIMS for vapor intrusion, long-term monitoring (LTM)/monitored natural attenuation (MNA), and land use controls (LUCs).

In Zone 1, 21 surficial aquifer and 78 upper Castle Hayne (UCH) aquifer injection wells were installed between September 2018 and January 2019. An initial round of emulsified vegetable oil (EVO) injections were completed between February 2019 and June 2019. During this injection event, 25,795 gallons of EVO solution were injected into the surficial aquifer and 530,878 gallons of EVO solution were injected into the surficial aquifer and 530,878 gallons of EVO solution were injected into the surficial aquifer and 530,878 gallons of EVO solution were injected into the UCH aquifer. Reducing conditions were observed in both aquifers after the injection event and concentrations of parent products decreased while daughter products increased, indicating ERD was occurring. A second round of EVO injections was conducted between March and July 2021. Challenges were encountered with daylighting at storm sewer outfall. A total of 7,201 gallons of EVO solution were injected in the UCH aquifer, representing approximately 25% of target EVO injection dose and 171,633 gallons of EVO solution were injected in the UCH aquifer, representing approximately 64% of target EVO injection dose. The compromised storm sewers were repaired in May and June 2023. Semi-annual performance monitoring is ongoing.

Within the treatment are of the surficial aquifer, as indicated by performance monitoring results at MW02, PCE and VC above ARG by 1 order-of-magnitude and exhibit a stable trend. After the September 2021 injection event, the total molar mass has been reduced by 49 percent. Additionally, LactOil injections resulted in ERD, as indicated by water quality parameters and geochemistry favorable for reductive degradation pathways.

Within the UCH aquifer, cis-1,2-DCE and VC remained above active remediation goals (ARGs) at MW05IW, MW30IW, and RABITTMW1 in August 2022. PCE and TCE exhibited decreasing trends and cis-1,2-DCE and VC are stable to decreasing. Similar to the surficial aquifer, LactOil injections resulted in ERD, as indicated by water quality parameters and geochemistry favorable for reductive degradation pathways.

Based on the information presented, including remedy construction, injection, and performance monitoring, completion has been demonstrated in Zone 1.

Mr. Mattison asked how much money has been spent on Site 88 as a whole and how effective treatment has been. The amount of funding dollars spent at Site 88 were not readily available at this meeting but will be looked into by the team. Mr. Mattison asked if this is an ongoing issue at other dry cleaners or if the industry has learned from past mistakes. Mr. Louth explained that the dry cleaning industry has improved and implemented best practices and that Jacobs has presented on the remedial approach at

industry events to share cleanup lessons learned. Mr. Mattison also commented that it has taken nearly 30 years for this site to get to this phase. Mr. Francisco explained that the investigation and remediation process takes a long time because the site is so large and complicated. Mr. Louth also stated that timeframes are dependent upon availability of funding.

In Zone 2, 9 horizontal directionally drilled (HDD) injection wells were installed between July and December 2020 and 5 vertical extraction wells were installed between November and December 2020. Conveyance trenching and system installation was completed in April 2021. Permanganate injection and recirculation was completed in two phases. Phase 1 was conducted from May through November 2021 and included the injection of 1,091,646 pounds of sodium permanganate into 6 of 10 HDD injection wells, followed by the recirculation of 13,824,426 gallons of water. Phase 2 was conducted from March through June 2022 and included the injection of 780,329 pounds of sodium permanganate into the remaining 4 HDD injection wells, followed by the recirculation of 9,874,288 gallons of water. Semi-annual performance monitoring is ongoing.

Performance monitoring data indicates that 72 percent reduction in total molar COCs in treatment area following the first injection event, indicating that ISCO treatment is working. PCE, TCE, cis-1,2-DC, and VC concentrations exceeded ARGs. Additional monitoring is needed to evaluate trends and mass reductions. At MW56IW, located within 35 feet of an injection well was the location of the maximum PCE concentration in 2021 (120,000 J μ g/L). Permanganate was observed in this well in February/March 2022 and it was not sampled. Then, in August 2022, PCE dropped to 9,200 μ g/L, a 92% reduction. This example suggests that chemical oxidation is occurring as intended.

Based on the information presented, including remedy construction, injection, and performance monitoring, completion has been demonstrated in Zone 2.

In Zone 3, 10 UCH aquifer injection wells were installed between December 2018 and January 2019 to supplement 4 previously installed injection wells. An initial round of injections conducted in April 2019, during which 75,596 gallons of EVO solution were injected. A second round of injections was conducted between April and June 2021, during which 122,282 gallons of EVO solution were injected. Semi-annual performance monitoring is ongoing.

Zone 3 performance monitoring suggests that the biobarrier is functioning as designed. TCE, cis-1,2-DCE, and VC are above the current groundwater standard within the biobarrier and reinjection may be needed to maintain its effectiveness. TCE and VC above current groundwater standards beyond the biobarrier, indicating that treated groundwater has not yet migrated downgradient. Geochemical conditions upgradient, within, and downgradient of the biobarrier are favorable for reductive dechlorination.

Based on the information presented, including remedy construction, injection, and performance monitoring, completion has been demonstrated in Zone 3.

Operation and maintenance of VIMS is ongoing at Buildings 3, 3B, 37, 43 and HP57 (Note: Building 3 and 3B were damaged in Hurricane Florence and were demolished). LUCs were implemented in September 2020 and LTM was initiated in November 2019. MNA will begin after active treatment is completed. Based on this information, completion has been demonstrated for the VIMS, LUCs, and MNA components of the remedy.

Additional rounds of injection will be required in Zones 1, 2, and 3. For Zones 1 and 2, treatment applications are expected approximately every two years until ARGs have been met or multiple lines of evidence of MNA are observed. ARGs are COC concentrations that will attenuate to MCLs within 100 years. Substrate injections at Zone 3 are expected to be required every 2 years until COC concentrations are protective of downgradient receptors and aquifer conditions suggest further enhancements are not

required. Performance monitoring is being conducted semi-annually to evaluate the active remedies. Following active treatment, MNA will be implemented until each groundwater COC is at or below cleanup levels for 4 consecutive monitoring events. Once groundwater concentrations are below cleanup levels, soil gas concentrations are expected to be below concentrations likely to result in a complete VI pathway. At that time, confirmation soil gas samples will be collected. Quarterly visual site inspections are conducted to monitor LUCs and Five-Year Reviews will be conducted to ensure the remedy continues to provide adequate protection of human health and the environment.

In accordance with Sections 113 and 117 of CERCLA, the Navy provided a public comment period for the Site 88 Proposed Plan from June 1 through July 2, 2018. A public meeting to present the Proposed Plan was held on June 13, 2018 at Coastal Carolina Community College. Public notice of the meeting and availability of documents was placed in The Globe and The Jacksonville Daily News newspapers on May 31, 2018 and June 1, 2018, respectively. The notice was also posted on the MCB Camp Lejeune Facebook page on June 8, 2018. No comments requiring amendment to the Proposed Plan were received. Public notice for the ROD was issued in The Globe and The Jacksonville Daily News newspapers on June 20, 2019 and June 22, 2019, respectively.

The cost for the Remedial Action in Zone 1 was \$513,000, which is 12 percent less than the estimated price of \$582,000. The cost for the Remedial Action in Zone 2 was \$9,030,000, which was 14 percent less than the estimated price of \$10,460,000. The cost for the Remedial Action in Zone 3 was \$162,000, which is 5.5 percent more than the estimated price of \$154,000.

The Interim Remedial Action Completion Report was certified by Colonel Adolfo Garcia Jr on October 10, 2023.

Looking ahead, a Substrate Distribution Pilot Study will begin in April 2024 in Zone 1; a second injection/recirculation event is scheduled for 2025 in Zone 2; and a third injection is scheduled for March 2024 in Zone 3. VIMS and LTM are ongoing and performance monitoring is conducted semi-annually.

III. 2023 Basewide Accomplishments and Fiscal Year 2024 Goals

Objective: The purpose of this agenda item is to present 2023 accomplishments, including sampling metrics for January to June 2023, and to review Fiscal Year (FY) 2024 goals.

Overview: A presentation was reviewed by Mr. Louth.

Field investigation activities included collecting over 275 samples, consisting of 249 groundwater samples, 3 soil samples, 1 porewater sample, 4 surface water samples, 3 sediment samples, 3 sewer vapor samples, 10 soil gas (subslab or exterior) samples, and 3 air (indoor and outdoor) samples.

Munitions response investigation activities included conducting munitions surface clearance over a 129acre area at Site UXO-28, which identified and removed 51 munition items, including 1 MEC item and 50 MPPEH items; conducting a munitions intrusive investigation within approximately 2 acres at Site UXO-29, which identified and removed 215 munitions items, including 80 MEC items and 135 MPPEHs items; and conducting a munitions surface clearance within approximately 7 acres of Site UXO-30, which identified and removed 1 munitions item, an MPPEH item – M29 practice rifle grenade.

Activities associated with remedy implementation and studies included inspecting and managing over 4,200 acres of LUCs; maintaining and monitoring 2 vapor intrusion mitigation systems; operating over 13,900 hours of air sparging at Sites 35, 73,82, and 89; treating over 60 million gallons of water through the treatment plant at Site 82, as well as treating over 1.8 million gallons of water in subgrade geochemical bioreactors at Site 82; and treating 24,000 gallons of water in Site 93 SBGRs.

Fifteen documents were finalized, with highlights including the Site 88 IRACR, the Site 96 Remedial Design, the Site 78 FS Amendment, the Waste Management Plan Update, 4 long-term monitoring documents and the Site 82 Radiological Site Investigation Report.

From a sustainability perspective, efforts were made to minimize waste and optimize resource use. For example, over 525 gallons of aqueous waste was eliminated through the application of passive sampling at over 110 wells and estimating approximately 5 gallons saved per well. More than 24,000 gallons of water was treated exclusively using solar power, with an estimated savings of 20 kilowatts per hour. In addition, 3,440 pounds of metallic debris was recycled, including 2,160 pounds at Site UXO-28, 1,020 pounds at Site UXO-29, and 260 pounds at Site UXO-30.

During this time period, 3 RAB meetings were held: February 2023, May 2023, and August 2023. One public meeting was completed for the Site UXO-30 Proposed Plan (August 2023). Two Partnering meetings were conducted, one in February 2023 and one in June 2023. Two success stories were posted on the Marine Corps Base Camp Lejeune Facebook page: one in February 2022 announcing the Secretary of the Navy Award and one in May 2022 to explain PFAS investigations.

The Partnering Team won EPA's 2023 National Notable Achievement Award: Federal Facilities Excellence in Partnering Team of the Year!

In FY 2024, the Installation Restoration Program intends to finalize the Site 41 PFAS Data Gap report, finalize 8 PFAS Remedial Investigation work plans and initiate field activities, complete Site 111 PFAS Remedial Investigation activities, finalize the Site 96 Interim Remedial Action Completion Report, finalize the Operable Unit 2 (Site 6 & 82) Soil LUCIP Update, finalize the Site 82 Air Sparge Pilot Study report, and finalize Site 89 Engineering Evaluation/Cost Analysis. The Military Munitions Response Program intends to finalize the Site UXO-28 Feasibility Study and prepare the Proposed Plan for a public meeting, finalize the Site UXO-30 Record of Decision and prepare the Remedial Design, and finalize the Site UXO-31 Remedial Investigation Work Plan and initiate field activities.

Mr. Johnson asked if we knew what was happening at the off-Base dry-cleaning facility, acknowledging that it is not related to the work being done here. Mr. Louth responded that thermal treatment has been initiated.

IV. RAB Business

The next RAB meeting is planned for February 21, 2024. Mr. Mattison requested that a site tour be planned for 2024.



CAMP LEJEUNE HOME OF EXPEDITIONARY FORCES IN READINESS

Site 88 Interim Remedial Action Completion Report

MCB Camp Lejeune Restoration Advisory Board Meeting November 15, 2023











Objectives

- Review Site 88 Background
- Present Interim Remedial Action Completion Report
 - Remedial Action Objectives
 - Remedial Action and
 Demonstration of Completion
 - Ongoing Activities
 - Community Involvement
 - Cost
 - Certification Statement
- Provide Schedule



Site 88 Background

- Former Dry Cleaning Facility (Former Building 25)
 - Volatile organic compounds (VOCs) in groundwater



 Underground Storage Tank Removal 1995 Focused Remedial Investigation 1998 Source Area Pilot Studies 1999 2001 Supplemental Site Investigation 2003 2004 Remedial Investigation 2007 Soil Mixing Removal Actions, 2006-**Groundwater Pilot Studies** 2010 Vapor Intrusion Investigation, Phase I Limited Site Assessment, Site-wide 2011 **Groundwater Sampling** Vapor Intrusion Mitigation System 2012 Installation **Baseline Geophysical Mapping, Site-wide Groundwater Sampling** 2014 Tracer Study, Sewer Ventilation Pilot 2015 Study 2017 Feasibility Study, Proposed Plan, Record 2018 of Decision, Treatability Studies 2019 Remedial Design, Remedial Action 2020 2022

Site 88 Background

- Site divided into three zones to facilitate investigation, studies, and removal actions
 - Zone 1: Initial source area, relatively high concentrations in groundwater at 5 to 60 feet below ground surface (bgs)
 - Zone 2: Downgradient of Zone 1, elevated concentrations from 40 to 180 feet bgs
 - Zone 3: Downgradient portion of plume, with lower concentrations limited to 40 to 60 feet bgs



Interim Remedial Action Completion Report

- 1. Restore groundwater quality to meet North Carolina Department of Environmental Quality (NCDEQ) and federal primary drinking water standards based on the classification of the aquifer as a potential source of drinking water under 15A North Carolina Administrative Code 02L.0201.
- 2. Reduce groundwater contaminant source mass to the maximum extent practicable within a reasonable timeframe to inhibit migration of COCs to the New River.
- 3. Prevent human ingestion of and contact with groundwater containing COCs at concentrations above North Carolina Groundwater Quality Standards (NCGWQS) or federal maximum contaminant levels (MCLs), whichever is more stringent.
- 4. Prevent exposure to COCs in groundwater and soil gas during construction, and through the vapor intrusion (VI) pathway that could result in unacceptable risk to human health.
- 5. Restrict intrusive activities and prevent residential use near soil mixing treatment area.

Remedial Actions

- Remedy Selected in Record of Decision (ROD)
 - Zone 1: Enhanced reductive dechlorination (ERD) via vertical injection wells
 - Zone 2: In situ chemical oxidation (ISCO) via horizontal injection wells and recirculation
 - Zone 3: Biobarrier via vertical injection wells
 - Vapor Intrusion: Continued operation of vapor intrusion mitigation systems (VIMS)
 - Long-term monitoring (LTM)/monitored natural attenuation (MNA) and land use controls (LUCs)



Remedial Action: Zone 1

- 21 surficial aquifer and 78 upper Castle Hayne (UCH) aquifer injection wells were installed between September 2018 and January 2019
- Initial round of emulsified vegetable oil (EVO) injections were completed between February 2019 and June 2019
 - 25,795 gallons of EVO solution were injected into the surficial aquifer
 - 530,878 gallons of EVO solution were injected into the UCH aquifer
 - Reducing conditions were observed in both aquifers after the injection event and concentrations of parent products decreased while daughter products increased, indicating ERD was occurring



Zone 1 ERD via Vertical Injection Wells



Injection Assembly

Injection Assembly

Zone 1 ERD via Vertical Injection Wells

- Second round of EVO injections between March and July 2021
 - Challenges encountered with daylighting at storm sewer outfall
 - 7,201 gallons of EVO solution were injected into the surficial aquifer, approximately 25% of target EVO injection dose
 - 171,633 gallons of EVO solution were injected in the UCH aquifer, approximately 64% of target EVO injection dose
 - Compromised storm sewers repaired in May and June 2023
- Semi-annual performance monitoring



Pressurized Injection at Wellhead



11



Gravity-fed Injection Setup

Zone 1 Performance Monitoring

- Surficial Aquifer
 - Within Treatment Area (MW02):
 - PCE and VC above ARG by 1 order-ofmagnitude
 - Stable trend
 - After September 2021 injection, total molar mass reduced by 49 percent
 - LactOil injections resulted in ERD
 - Water quality parameters and geochemistry favorable for reductive pathway





Zone 1 Performance Monitoring

- UCH Aquifer
 - Cis-1,2-DCE and VC remain above ARGs at MW05IW. MW30IW. RABITTMW1 in August 2022
 - PCE and TCE decreasing
 - Cis-1,2-DCE and VC are stable to decreasing
 - LactOil injections resulted in ERD
 - Water quality parameters and geochemistry favorable for reductive pathway



Zone 1 Demonstration of Completion

Remedy Component	Construction	Injection	Performance	Completion Demonstrated
ERD via vertical injection wells	The injection wells were constructed from September 2018 to January 2019	First round of injections was conducted between February 11, 2019 to June 2, 2019 as a treatability study. The second round of injections was conducted from March 3, 2021 to July 25, 2021.	Performance monitoring has been ongoing since November 2019 as part of LTM program. Based on the most recent results, the total molar mass of COCs is reducing and conditions remain favorable for reductive dechlorination.	Yes

Remedial Action: Zone 2

Zone 2 ISCO via Horizontal Injection Wells and Recirculation

- Horizontal Directional Drilling (HDD)
 - 9 injection wells installed
 - July December 2020
- Vertical Drilling
 - 5 extraction wells installed
 - November December 2020
- Conveyance Trenching and System
 Installation
 - Completed in April 2021





Zone 2 ISCO via Horizontal Injection Wells and Recirculation

- Phase 1(May through November 2021)
 - 1,091,646 pounds of sodium permanganate were injected into 6 of 10 HDD injection wells
 - Recirculated 13,824,426 gallons of water
- Phase 2 (March through June 2022)
 - 780,329 pounds of sodium permanganate were injected into remaining 4 HDD injection wells
 - Recirculated 9,874,288 gallons of water
- Semi-annual performance monitoring





Piping and Manifold Water Test



Permanganate Tanker and Water Tanks with Piping to Injection Wells



Permanganate Concentration Quality Control

Zone 2 Performance Monitoring

- 72% reduction in total molar COCs in treatment area following first injection event
 - ISCO treatment is working
- PCE, TCE, cis-1,2-DC, or VC concentrations exceeded ARGs
- Additional monitoring needed to evaluate trends and mass reductions







Zone 2 Performance Monitoring

At MW56IW:

- Location of maximum PCE concentrations in 2021 (120,000 J µg/L)
- Permanganate was observed in Feb/March 2022; was not sampled
- In Aug 2022, PCE dropped to 9,200 µg/L, a 92% reduction
- Suggests that chemical oxidation is occurring as intended





Zone 2 Demonstration of Completion

Remedy Component	Construction	Injection	Performance	Completion Demonstrated
ISCO via HDD injection wells	Horizontal wells were installed from July 30, 2020 to December 11, 2020. Vertical wells were installed in December 2020. Recirculation infrastructure was installed between March 1 and April 7, 2021.	The first round of injections was conducted from May 4 to November 11, 2021, and from March 7 to June 28, 2022.	Performance monitoring has been ongoing since November 2020 as part of LTM program. Injection and recirculation activities were ongoing at the time of the most recent performance monitoring event. Remedy effectiveness will be evaluated based on data collected during subsequent events.	Yes

Remedial Action: Zone 3

Zone 3 Biobarrier via Vertical Injection Wells

- 10 UCH aquifer injection wells were installed between December 2018 and January 2019 to supplement 4 previously installed injection wells
- Initial round of injections conducted in April 2019
 - 75,596 gallons of EVO solution were injected
- Second round of injections conducted between April and June 2021
 - 122,282 gallons of EVO solution
- Semi-annual performance monitoring





Zone 3 Biobarrier via Vertical Injection Wells



Flowrate Measurements from Manifold



Injection Setup and Manifold



Injections at Wellhead

Zone 3 Performance Monitoring

- Biobarrier functioning as designed
 - TCE, cis-1,2-DCE, and VC are above the current groundwater standard within the biobarrier
 - Reinjection may be needed to maintain effectiveness
- TCE and VC above current GW standard beyond biobarrier
 - Treated GW has not yet migrated downgradient
- Geochemical conditions upgradient, within, and downgradient of biobarrier favorable for reductive dechlorination



Zone 3 Demonstration of Completion

Remedy Component	Construction	Injection	Performance	Completion Demonstrated
Biobarrier via vertical injection wells	The injection wells were constructed from December 2018 to January 2019.	The first round of injections was conducted from April 2, 2019 to April 17, 2019 as a treatability study. The second round of injections was conducted from April 13 to June 22, 2021.	Performance monitoring has been ongoing since November 2019 as part of LTM program. Based on the most recent results, the biobarrier is functioning as designed, treating groundwater as it flows through.	Yes

Remedial Action: VIMS, LUCs, and MNA

VIMS, LUCs, and MNA

- Operation and maintenance of VIMS is ongoing
 - Buildings 3*, 3B*, 37, 43 and HP57
- LUCs implemented in September 2020
- LTM initiated in November 2019
 - MNA begins after active treatment is completed

*Buildings 3 and 3B were damaged in Hurricane Florence and were demolished.



Building Locations with VIMS



Land Use Controls

VIMS, LUCs, and MNA Demonstration of Completion

Remedy Component	Construction	Performance	Completion Demonstrated
VI: Continued operation of VIMS and sewer ventilation system	The VIMS were installed in 2012 and operation has been ongoing.	 Operation, maintenance, and performance monitoring of VIMS and the sewer ventilation system have been conducted as part of the LTM program since 2021. VIMS continue to depressurize the subslab at Buildings 37, 43, and HP57, mitigating the VI pathway. Buildings 3 and 3B have been demolished. 	Yes
LUCs	The survey plat was filed with Onslow County, North Carolina on September 1, 2020	LUCs are inspected quarterly and will be certified annually to ensure they remain properly implemented, identify any deficiencies, and evaluate how deficiencies or inconsistencies have been addressed. Base Master Planning maintains current groundwater plume data and LUC boundaries in the GIS and all construction projects on-Base go through environmental review	Yes
MNA	Pending achievement of ARGs of	r multiple lines of evidence of MNA are observed.	

Ongoing Activities

Ongoing Activities

- Additional rounds of injection will be required in Zones 1, 2, and 3:
 - For Zones 1 and 2, treatment applications are expected approximately every two years until ARGs have been met or multiple lines of evidence of MNA are observed
 - ARGs are COC concentrations that will attenuate to MCLs within 100 years
 - Substrate injections at Zone 3 are expected to be required every 2 years until COC concentrations are protective of downgradient receptors and aquifer conditions suggest further enhancements are not required
- Performance monitoring is being conducted semiannually to evaluate active remedies
- Following active treatment, MNA will be implemented until each groundwater COC is at or below cleanup levels for 4 consecutive monitoring events

сос	Active Remediation Goalª (µg/L)
PCE	112
TCE	132
cis-1,2-DCE	1,884
VC	61

Ongoing Activities

- Once groundwater concentrations are below cleanup levels, soil gas concentrations are expected to be below concentrations likely to result in a complete VI pathway
 - Confirmation soil gas samples will be collected
- Quarterly visual site inspections will be conducted to monitor LUCs
- Five-Year Reviews will be conducted to ensure the remedy continues to provide adequate protection of human health and the environment

Community Involvement

- In accordance with Sections 113 and 117 of CERCLA, the Navy provided a public comment period for the Site 88 Proposed Plan from June 1 through July 2, 2018
- A public meeting to present the Proposed Plan was held on June 13, 2018 at Coastal Carolina Community College
- Public notice of the meeting and availability of documents was placed in *The Globe* and *The Jacksonville Daily News* newspapers on May 31, 2018 and June 1, 2018, respectively. The notice was also posted on the MCB Camp Lejeune Facebook page on June 8, 2018.
 - No comments requiring amendment to the Proposed Plan were received
- Public notice for the ROD was issued in *The Globe* and *The Jacksonville Daily News* newspapers on June 20, 2019 and June 22, 2019, respectively



THE DAILY NEWS





- The cost for the Remedial Action in Zone 1 was \$513,000
 - 12% less than the estimated price of \$582,000
- The cost for the Remedial Action in Zone 2 was \$9,030,000
 - 14% less than the estimated price of \$10,460,000
- The cost for the Remedial Action in Zone 3 was \$162,000
 - 5.5% more than the estimated price of \$154,000

INTERIM REMEDIAL ACTION COMPLETION REPORT, OPERABLE UNIT 15, SITE 88, MARINE CORPS BASE CAMP LEJEUNE, NORTH CAROLINA

9 Certification Statement

On behalf of the Department of the Navy and United States Marine Corps, I certify that this document demonstrates that the remedy is in place as identified in the Final ROD for Operable Unit 15, Site 88.

GARCIA.ADOLFO. JR.1131206859

Digitally signed by GARCIA.ADOLFO.JR.1131206859 Date: 2023.10.10 20:07:30 -04'00'

A. GARCIA JR. Colonel, U. S. Marine Corps Commander Marine Corps Installations East -Marine Corps Base Camp Lejeune

10-Oct-23	
Date	

Schedule

- Zones 1
 - Substrate Distribution Pilot Study beginning in April 2024
- Zone 2
 - 2nd Injection/Recirculation scheduled for 2025
- Zone 3
 - 3rd Injection scheduled for March 2024
- VIMS and LTM
 - Ongoing
 - Semi-annual performance monitoring



Questions?



2023 Basewide Accomplishments and Fiscal Year 2024 Goals

MCB Camp Lejeune

Restoration Advisory Board Meeting

November 15, 2023









Objectives

Present 2023 accomplishments
Sampling metrics: January-June 2023
Review Fiscal Year (FY) 2024 goals



2023 Accomplishments

Field Investigation Activities

Collected over 275 samples

- 249 groundwater
- 3 soil
- 1 porewater
- 4 surface water
- 3 sediment
- 3 sewer vapor
- 10 soil gas (subslab or exterior)
- 3 air (indoor and outdoor)





Munitions Response Investigation Activities

- Conducted munitions surface clearance over 129-acre area at UXO-28
 - Identified and removed 51 munition items:
 - 1 MEC item
 - 50 MPPEH items
- Conducted munitions intrusive investigation within ~2 acres at UXO-29
 - Identified and removed 215 munitions items:
 - 80 MEC items
 - 135 MPPEHs items
- Conducted a munitions surface clearance within ~7 acres of Site UXO-30
 - Identified and removed 1 munitions item:
 - 1 MPPEH item M29 practice rifle grenade



Remedy Implementation and Studies

- Inspected and managed over 4,200 acres of Land use Controls
- Maintained and monitored 2 vapor intrusion mitigation systems
- Operated over 10,000 hours air sparging
 - Site 35
 - Site 73
 - Site 89
- Site 82
 - Treated over 60 million gallons of water through treatment plant
 - Operated air sparge for over 3,900 hours
 - Treated over 1.8 million gallons of water in subgrade geochemical bioreactors
- Treated 24,000 gallons of water in Site 93 SBGRs





Documentation

- Finalized 15 documents
 - Highlights:
 - Site 88 IRACR
 - Site 96 Remedial Design
 - Site 78 FS Amendment
 - Waste Management Plan
 Update
 - 4 long-term monitoring documents
 - Site 82 radiological Site Investigation Report



Naval Facilities Engineering Systems Command Mid-Atlantic Norfolk, Virginia

APPROVED FOR PUBLIC RELEASE: DISTRIB

Final

Interim Remedial Action Completion Report Operable Unit 15, Site 88

Marine Corps Base Camp Lejeune North Carolina

June 2023



Naval Facilities Engineering Systems Command Mid-Atlantic Norfolk, Virginia

Final Remedial Design Site 96, Operable Unit 22

Marine Corps Base Camp Lejeune North Carolina

May 2023



Naval Facilities Engineering Systems Command Mid-Atlantic Norfolk, Virginia

Final

Feasibility Study Amendment Site 78, Operable Unit 1

Marine Corps Base Camp Lejeune North Carolina

January 2023

APPROVED FOR PI

APPROVED FOR PUBLIC RELEASE: DISTRIBUTION UNLIMITED

Sustainability

- Eliminated over 525 gallons of aqueous waste through passive sampling
 - Over 110 wells sampled, estimate of 5 gallons saved per well
- Treated over 24,000 gallons of groundwater using exclusively solar power
 - Estimated savings ranging of 20 kilowatts per hour
- Recycled 3,440 pounds of metallic debris
 - 2,160 lbs at UXO-28
 - 1,020 lbs at UXO-29
 - 260 lbs at UXO-30



Meetings and Outreach

Held 3 RAB meetings

- February 2023
- May 2023
- August 2023
- Completed 1 Public Meeting
 - UXO-30 Proposed Plan (August 2023)
- Conducted 2 Partnering meetings
 - February 2023
 - June 2023
- Posted 2 success stories on Facebook
 - February 2022 Secretary of the Navy Award
 - May 2022 PFAS Investigations

DID YOU KNOW...MCB Camp Lejeune's Environmental Restoration Program has been around since the early 1990s and has been working since then to conduct environmental investigations and cleanup, where needed, in partnership with the Navy, the North Carolina Department of Environmental Quality, and the United States Environmental Protection Agency.

Per- and polyfluoroalkyl substances, commonly known as PFAS, are a family of thousands of different chemicals which have been widely used in industrial and consumer products since the 1950s. The most common activity associated with the historical release of PFAS to the environment at MCB Camp Lejeune is the use of firefighting foam for training and emergency responses. The Marine Corps and the Department of the Navy have developed a proactive policy to address past releases of PFAS at installations nationwide.

PFAS investigations at MCB Camp Lejeune were initiated in 2017 and are ongoing. Results of these investigations are and will continue to be shared at quarterly Restoration Advisory Board meetings.



If you have questions, contact your chain of command or Base Environmental Management Division at (910) 451-9641 or Lejeune IR Program@usmc.mil. Website: http://www.lejeune.marines.mil/OfficesStaff/EnvironmentalMgmt

The partnering team effectively identifies when a disagreement or informal dispute cannot be

Nomination for a National Notable Achievement Award

The U.S. Marine Corp Base Camp Lejeune Partnering Team members value and maintain their

ks effectively to accomplish goals on schedule for granted. Team members take measures to r meeting, such as having open, transparent cumenting consensus statements, providing al for visitors, and focusing on team goals ally beneficial goal is to implement successful ctive, efficient, and cost-effective manner.

uccess is that the Navy, the Base, North (CDEQ) and EPA representatives trust and as the reputation for being a highly functioning in partnering meetings to observe team have candid discussions to solve and maintain positive communication allowing , efficient, and economical way possible.

less costly, sustainable cleanups are example, Camp Lejeune is recognized on the and was highlighted in the Superfund Annual for implementing best management practices ces included installing a new treatment system yards of soil; recycling 7,530 pounds of metal; diation-derived waste; and using digital data and increase efficiency. These best f carbon dioxide emissions.

s of alternative treatment technologies at r and expedite site closure. The Base used nillion gallons of groundwater, injected over as part of a bio barrier replenishment and rs of air sparging. The team also saved more om a closed site.

ts at the site team level. The partnering team ects which costs time and money. Currently nitoring buildings for vapor intrusion. ling dilution attenuation factor. The team the Secretary of Defense. The issue has not yet interim, the team negotiated terms for als and allow cleanup work to continue. The uded in documents that serve as place holders lthough the team members don't always agree s viewpoints, perspectives, and goals are negotiates resolutions that accomplish PA, and advance cleanup to protect human

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the next partnering level. Although team solve issues, sometimes it is not possible for ional or service-wide policy issue. Although mplementation, it recognizes that certain team does not waste extensive time trying to reements personally. Once the team team partnering level, the issue is elevated to level as necessary for prompt resolution.

g relationships with external organizational B), a stakeholder organization that provides amp Lejeune partnering team does a very g RAB meetings and public meetings by the local paper, Camp Lejeune's website mering team provides comprehensive ecision documents, and remedial dic site visits for the RAB so they can

ips with stakeholders. For example, the are in place to ensure protection of human restoration sites. The signage includes h a smart phone so that the public can rea.

est way to increase RAB attendance. The usinesses, an on-Base employee, and a Base t an excellent relationship between the Camp ty. Most interviewees felt that the Base is a nerally positive local perception of the Base.

ationships with other external organizations. es (PFAS) investigation where off-site risk of being contaminated by PFAS. nd sewer authority. The partnering team Department of Health to gather gation before the public was notified that rtual open house was held for the public to gation. The partnering team continues to AS investigation continues near public water

National Notable Achievement Awards 2023 Nomination Form

Select the award below for which you are nominating an individual or team. Use a separate nomination form for each award. Descriptions of awards, eligibility requirements, and evaluation criteria are in the National Notable Achievement Award 2023 Instructions, Descriptions, and Criteria document.

Brownfields

Won EPA 2023

National Notable

Achievement

Award: Federal

Facilities Excellence

in Partnering Team

of the Year!

Brownfields Team Excellence Award ___ Land Revitalization Team Award

Communications, Partnerships and Analysis

- Outstanding Re-Powering Individual or Team Effort
- Community Engagement Award Outstanding Environmental Justice Achievement
- Award Award for Excellence in Using Data or Evidence to
- Improve our Understanding of OLEM Program Effectiveness or Impact

Emergency Management

- ____ Chemical Emergency Preparedness & Planning
- Award (Leadership/Team) Oil Discharge Prevention and Preparedness Award
- Homeland Security Award ____ On-Scene Coordinator Award

- Year Award (Individual)
- Federal Facilities Leadership and Innovation in Cleanup Award (Team)
- Collaboration Team of the Year (Team) _X_Federal Facilities Excellence in Partnering Team of
- Federal Facilities Response Outstanding

RCRA and TSCA PCB Permits and Cleanups

- Outstanding Support of the Development, Implementation, and/or Oversight of EPA's RCRA Base Programs
- Corrective Action Program Goals Award
- Corrective Action Vision, Mission, and Goals Award
- Tribal RCRA Programs

___ Outstanding Approaches to Advance the PCB **Disposal and Cleanup Program**

- RCRA Corrective Action and TSCA PCB Remediation
- Project Manager of the Year RCRA Sustainable Materials Management Program
- __ Individual or Team

RCRA Waste Management

Superfund Individual of the Year

Superfund Team of the Year

Enforcement Team Award

Technical Enforcer Award

Outstanding Prevention Award

Legal Enforcer Award

Underground Storage Tanks

Solid and Hazardous Waste Management EPA Methods Development Community Collaboration and Improvement

Community Involvement Coordinator of the Year

____ Superfund Advancing Innovations and Sustainability

in Cleanup Practice (Individual or Team)

Financial Management Team Award

Superfund Site Remediation Enforcement Awards

Outstanding Cleanup/ Revitalization Award

Regional LUST Site Manager of the Year

Regional Science

___ Individual or Team

(Individual)

Superfund

- Remedial Project Manager of the Year (Individual) Site Assessment Manager of the Year (Individual)

Federal Facilities Response

- Federal Facilities Remedial Project Manager of the
- Federal Facilities Community Involvement
- the Year Award (Team)
- Achievement Award (Individual and Team)

- Outstanding Approaches to Achieve Permitting or
- ____ Outstanding Work towards Achieving the 2030
- ____ Outstanding Regional Efforts to Support State or

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munication challenges are ably managed by ring team, allowing the cleanup program to human health and the environment.

Fiscal Year 2024 Goals

Installation Restoration Program

- Finalize Site 41 PFAS Data Gap report
- Finalize 8 PFAS Remedial Investigation work plans and initiate field activities
- Complete Site 111 PFAS Remedial Investigation activities
- Finalize Site 96 Interim Remedial Action Completion Report
- Finalize Operable Unit 2 (Site 6 & 82) Soil LUCIP Update
- Finalize Site 82 Air Sparge Pilot Study report
- Finalize Site 89 Engineering Evaluation/Cost Analysis

Military Munitions Response Program

- Finalize UXO-28 Feasibility Study and prepare Proposed Plan for public meeting
- Finalize UXO-29 Feasibility Study and prepare Proposed Plan for public meeting
- Finalize UXO-30 Record of Decision and prepare Remedial Design
- Finalize UXO-31 Remedial Investigation Work Plan and initiate field activities

Questions?