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## Two Innovative Approaches to Implementing Green and Sustainable Remediation (GSR) Best Management Practices (BMPs) per ASTM E2893-16



April 18, 2019

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# Agenda

- Review ASTM E2893-16: Standard Guide for Greener Cleanups Process
- Present Case Study #1 :
  - Travis Air Force Base
- Present Case Study #2 :
  - Marine Corps Base Camp Lejeune
- Review Lessons Learned

## TECHNICAL MEMORANDUM

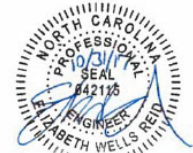
### Greener Cleanup Self Declaration, Marine Corps Base Camp Lejeune and Marine Corps Air Station New River, North Carolina

PREPARED FOR: Marine Corp Base Camp Lejeune and  
Marine Corps Air Station New River

PREPARED BY: CH2M HILL, Inc.

DATE: October 31, 2017

CONTRACT: CTO-WE10 Clean 9000  
Contract N62470-16-D-9000  
NC Engineering License No. F-0699



#### 1 Introduction

This technical memorandum was prepared to document that Marine Corps Base (MCB) Camp Lejeune and Marine Corps Air Station (MCAS) New River's Installation Restoration Program (IRP), Military Munitions Response Program (MMRP), and Solid Waste Management Unit (SWMU) sites are in conformance with the *Standard Guide for Greener Cleanups* (ASTM International, 2016), which allows MCB Camp Lejeune to self-declare that these programs implement greener cleanup practices. As defined in American Society for Testing and Materials (ASTM) E2893-16, greener cleanup self-declaration is complete once this technical memorandum has been made available to the public.

#### 2 General Information

**User's name and organization:** Charity Delaney and Thomas Richard; MCB Camp Lejeune — Environmental Management Division (EMD)

**Date:** October 18, 2017

**Property Name:** MCB Camp Lejeune and MCAS New River

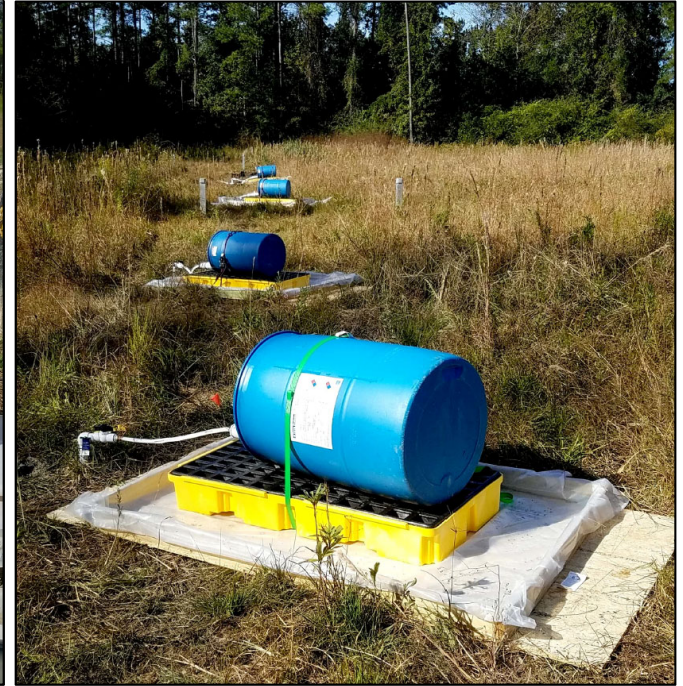
**Site Location:** Camp Lejeune, Onslow County, North Carolina

**USEPA ID:** NC6170022580

**Cleanup programs:** CERCLA; RCRA

**Lead oversight agencies:** United States Environmental Protection Agency (USEPA) and North Carolina Department of Environmental Quality (NCDEQ)

#### 3 Site Status Information



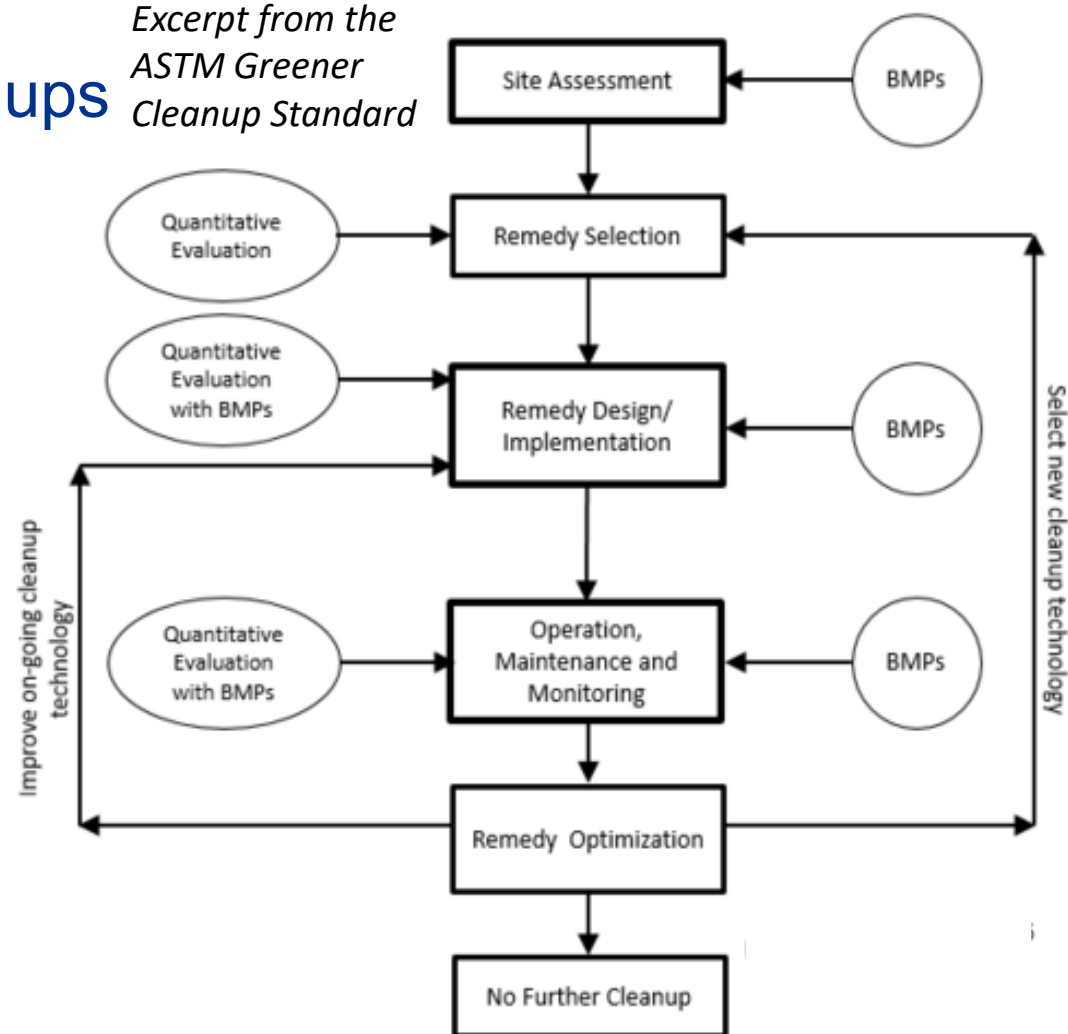
## ASTM E2893-16 “A Standard Guide for Greener Cleanups”

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# Overview of ASTM E2893-16: Standard Guide for Greener Cleanups

- The act of cleanup creates its own environmental impacts
  - Energy requirements
  - Air pollution
  - Water use
  - Material production/waste disposal
  - Land and ecosystem impacts
- Standard provides a process and 114 best management practices (BMPs)

*Excerpt from the  
ASTM Greener  
Cleanup Standard*



# Overview of ASTM E2893-16: Standard Guide for Greener Cleanups

## BMP Process

1. Opportunity Assessment
2. Prioritization
3. Selection
4. Implementation
5. Documentation

# Overview of ASTM E2893-16: Standard Guide for Greener Cleanups

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## Opportunity Assessment

- Review 114 listed BMPs
- Organized by category
  - Buildings
  - Materials
  - Power
  - Residual Waste
  - Vehicles
- Identify applicable BMPs

# Overview of ASTM E2893-16: Standard Guide for Greener Cleanups

## BMP Process

1. Opportunity Assessment
- 2. Prioritization**
3. Selection
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## Prioritization

- Based on ability to reduce footprint
- Professional judgement
  - Supported by quantitative evaluation, if appropriate

# Overview of ASTM E2893-16: Standard Guide for Greener Cleanups

## BMP Process

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## Selection

- Based on potential footprint reductions
- Considers typical comparison criteria
- Reasons for exclusion
  - Technology screened out
  - Inability to meet project requirements
  - Negative effect on core element
  - Less impact with standard approach

# Overview of ASTM E2893-16: Standard Guide for Greener Cleanups

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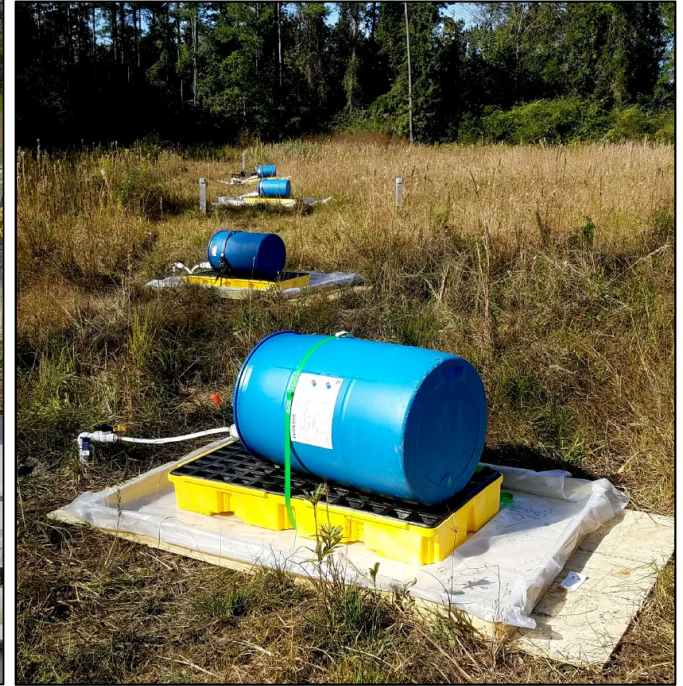
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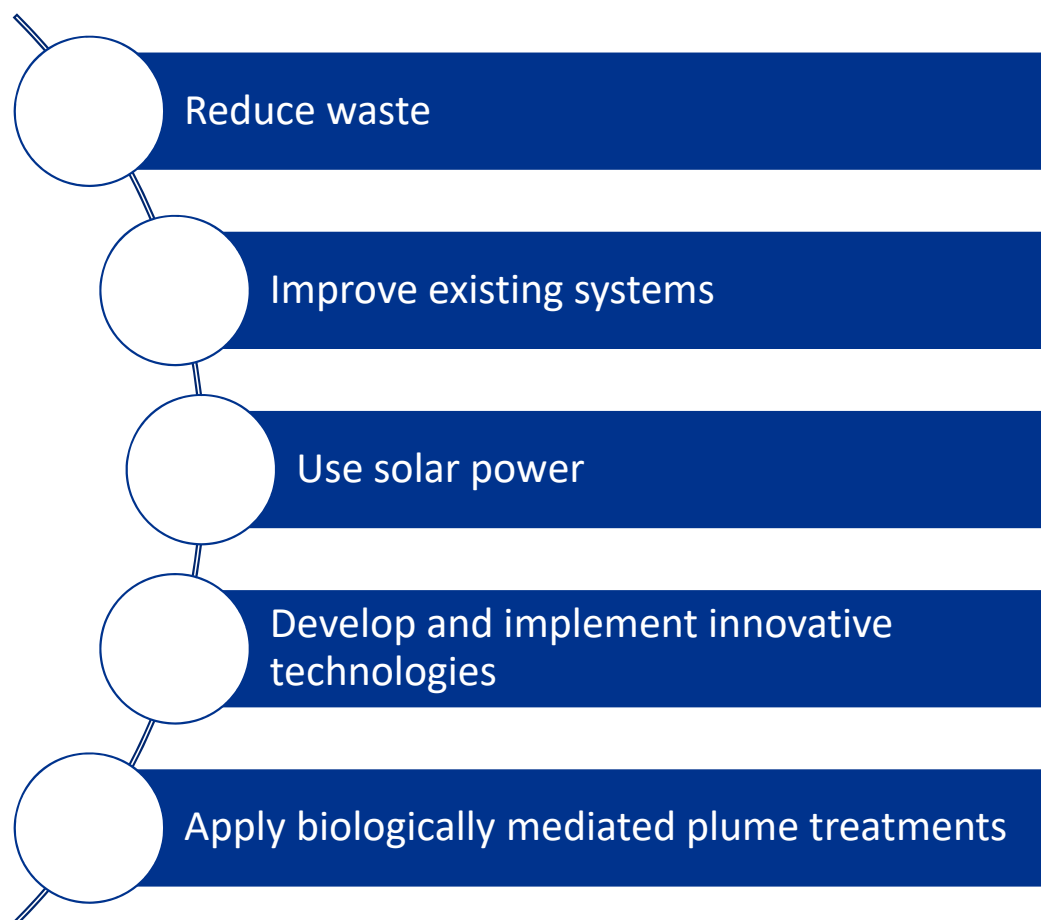
## Travis Air Force Base Innovative Site-Specific BMPs

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## Travis Air Force Base

- Active military facility
  - 6,000 acres in Northern California
- Implementing GSR BMPs since 2008
  - Developed 5 key goals
- Self Declaration Completed in 2016
  - First DOD Facility to complete the declaration

## Travis AFB's Five Key GSR Goals



# Goal: Develop and implement innovative *in situ* source area technologies

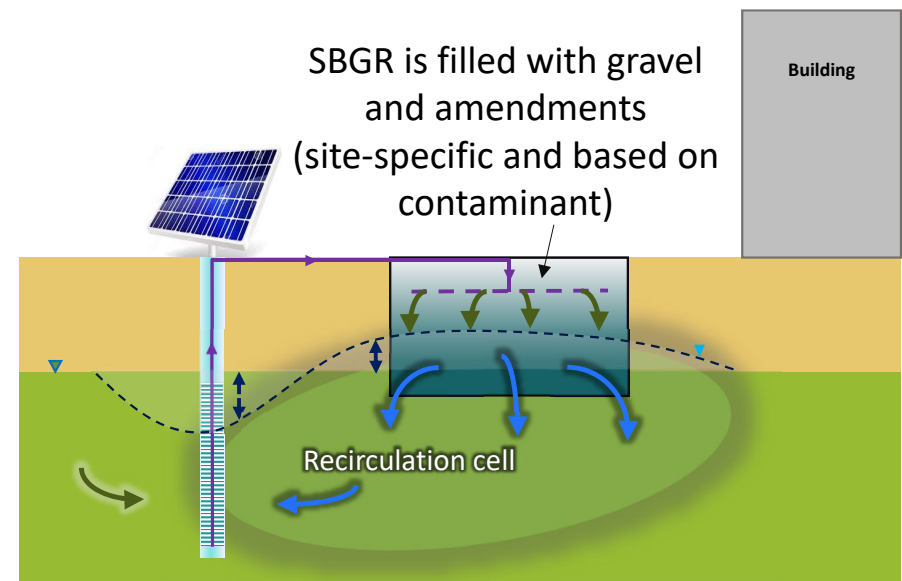
- Subgrade bio-geochemical reactor (SBGR)
  - Originally tested at Travis AFB
  - Currently 6 in operation at Travis AFB and >20 around the world, to treat fuel or chlorinated solvent source areas
    - Site-specific configurations
    - Contaminant-specific amendments
    - Use solar powered pumps



Source Area Excavation/Backfill



Infiltration Pipe Installation



# Goal: Reduce waste and consumption of refined products, while maximizing use of locally sourced and recycled materials

- SBGR

- 800 gallons of used fryer oil
- 20 CYs recycled drywall (diverted from landfill)
- 1,000 CYs of locally sourced gravel and mulch

- EVO

- Transported by rail
- Totes recycled after use

- Local landfills selected

- Local staff used



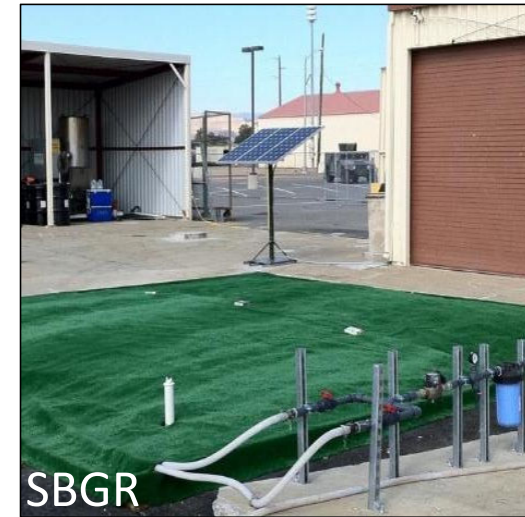
# Travis AFB Summary

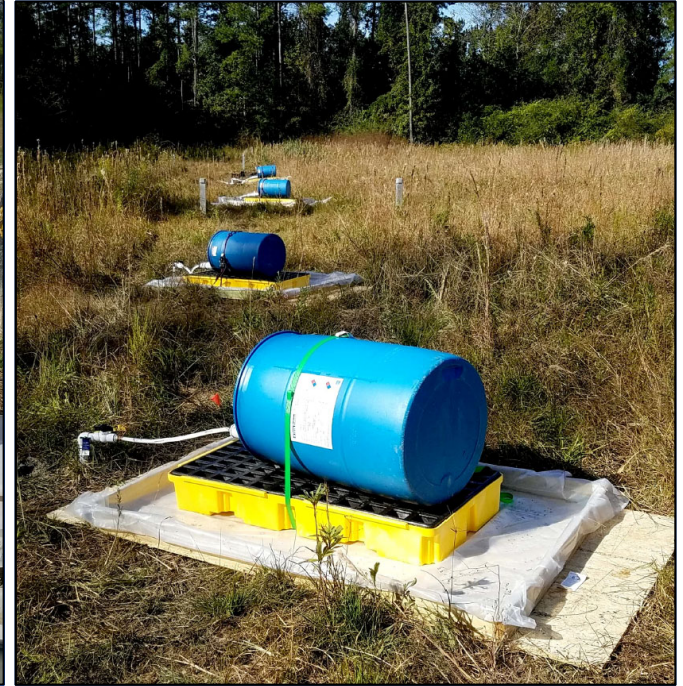
- Process:

- Established Team
- Set site-specific goals
- Documented results

- Results:

- Cheaper: Reduced maintenance costs by \$200,000/year
- Greener: Reduced GHG emissions by 930 tons/year
- Faster: Reduced cleanup timeframe by decades at 10 sites
- Effective: Up to 99 percent reduction of source area concentrations



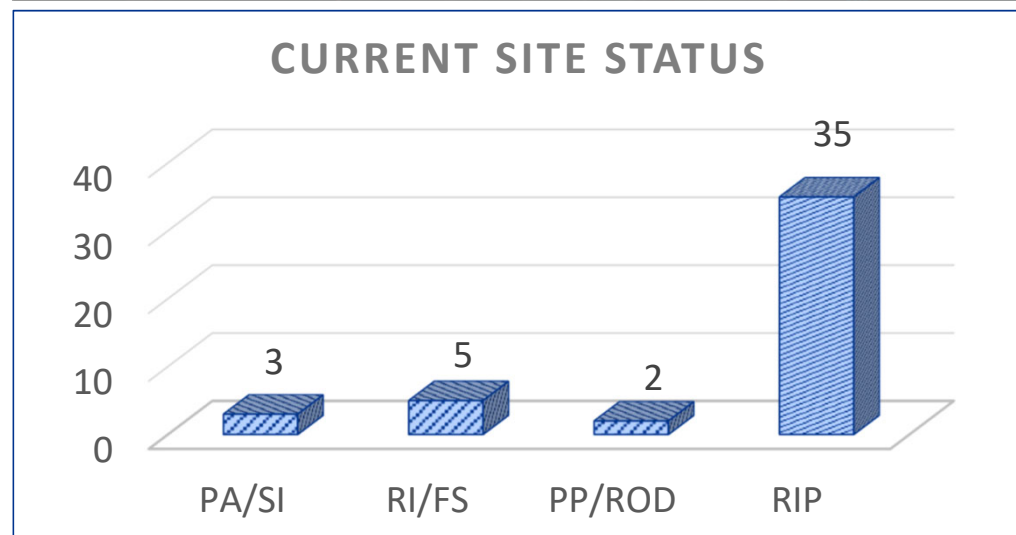


## Marine Corps Base Camp Lejeune Leveraged the Power of Scale

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# MCB Camp Lejeune

- Second largest Marine Corps Base in the USA
  - ~236 square miles
  - 45 active environmental sites
- Self Declaration Completed in 2017
  - 18 BMPs included in self declaration
  - BMPs continue to be applied during all phases of work



# BMP: Minimize Waste Generated

- Action:
  - Worked with regulator to remove minimum purge volume requirement
- Impacts
  - All sites
    - Currently ~20 sites with annual monitoring requirements
  - All wells
    - ~400 wells sampled per year
- Results
  - ~2,000 gallons of purge water avoided/year
    - Approximately (40) 55-gallon drums

Annual Reductions		
GHG Emissions (metric tons)	Energy Used (MMBTU)	Cost
↓ 1.1	↓ 15	↓ \$7,000



# BMP: Minimize Waste Generated

- Action:
  - Identified long-term monitoring (LTM) locations to be sampled using no-purge technology
- Impacts
  - ~13 site identified
    - Dependent on analyses required
    - May change from year to year
  - ~300 wells samples per year
    - PDBs, hydrasleeves, and snap samplers
- Results
  - ~1,500 gallons of purge water avoided/year
  - ~15,000 feet of tubing eliminated/year

Annual Reductions		
GHG Emissions (metric tons)	Energy Used (MMBTU)	Cost
↓ 2.4	↓ 36	↓ \$32,000



Hydrasleeve



Snap sampler

# Triggered a Virtuous Cycle

TECHNICAL MEMORANDUM

ch2m

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2 General

User's name:

Environment

Date:

October 31, 2017

Property:

Site Location:

USEPA ID:

Cleanup project:

Lead over:

Department:

3 Site

2017 : Self Declaration

Action:

Completed self-declaration

Documented BMPs historically implemented

Result

Intentional review and application of BMPs during future project work

2018 – Injection Pilot Study #1

Identified new BMP:

Reduce potable water

Action:

Use extracted groundwater instead of water from hydrant during injections

Result:

Reduce potable water consumption by ~30,000 gallons with no additional cost

2019 – Injection Pilot Study #2

Identified challenge:

Historical injections difficult in this area

Opportunity/Action:

Reduce potable water usage AND enhance injections by recirculating groundwater as EVO chase water

Expected Result:

Reduce potable water use by 67,500 gallons AND enhance distribution of injectant

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Agenda

ASTM E2893-16

Travis AFB

MCB Camp Lejeune

Key Take-Aways

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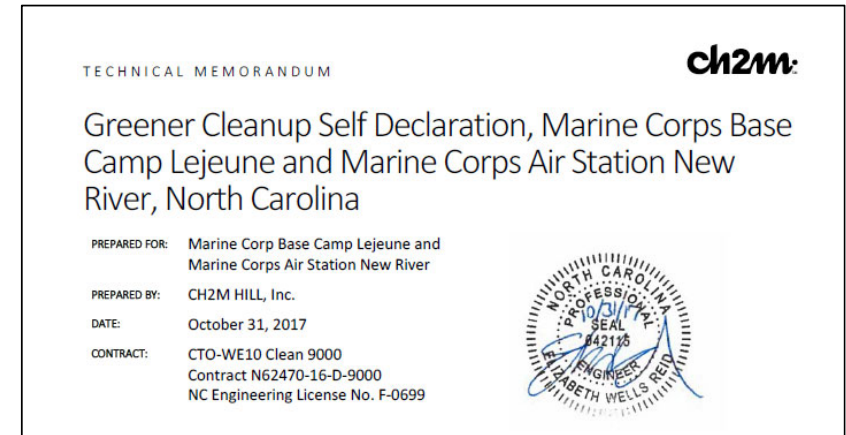
# MCB Camp Lejeune Summary

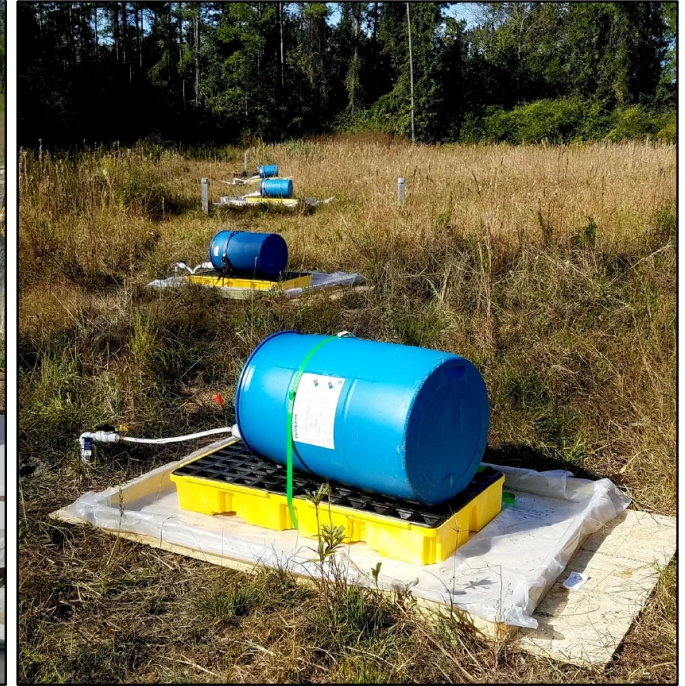
- Process

- Completed the self-declaration retroactively
- Used as a leverage point to apply more BMPs

- Results

- Reduced annual costs and environmental footprints
- Using the “Sustainability Lens” triggered the virtuous cycle
  - Additional reductions in cost and environmental footprint
  - Holistic views and innovative approaches



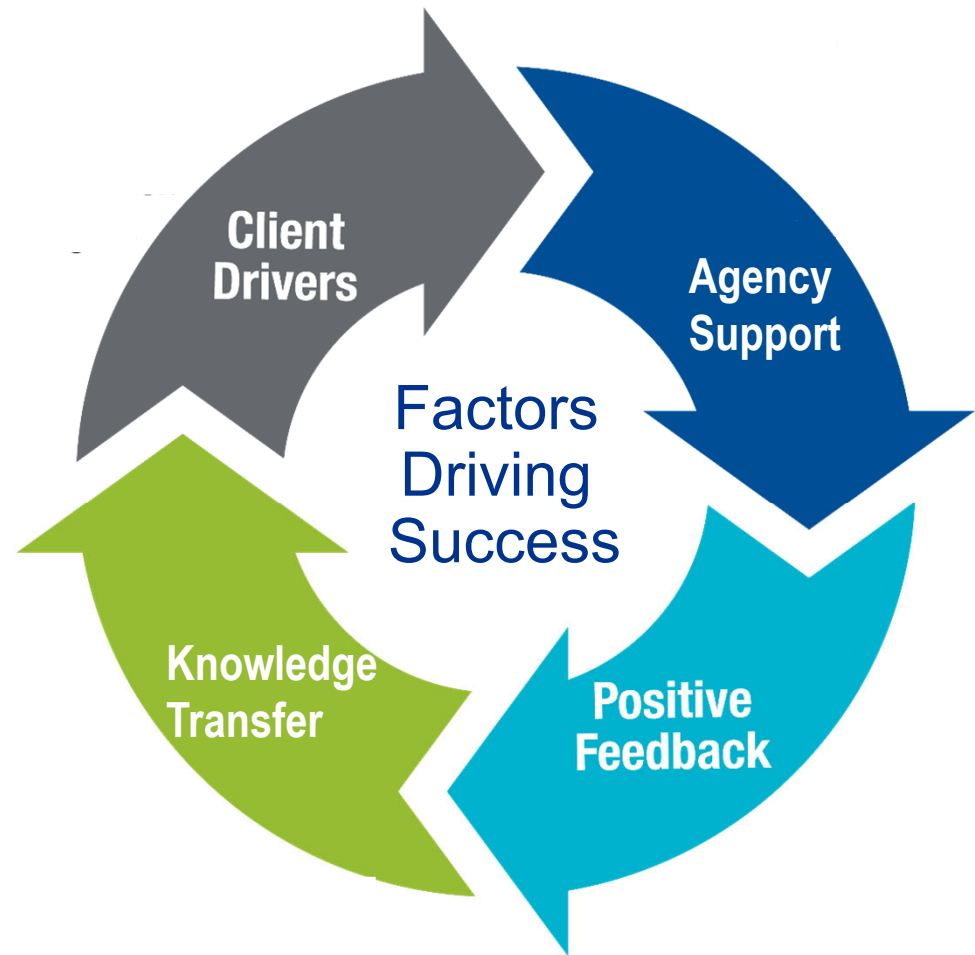


## Lessons Learned

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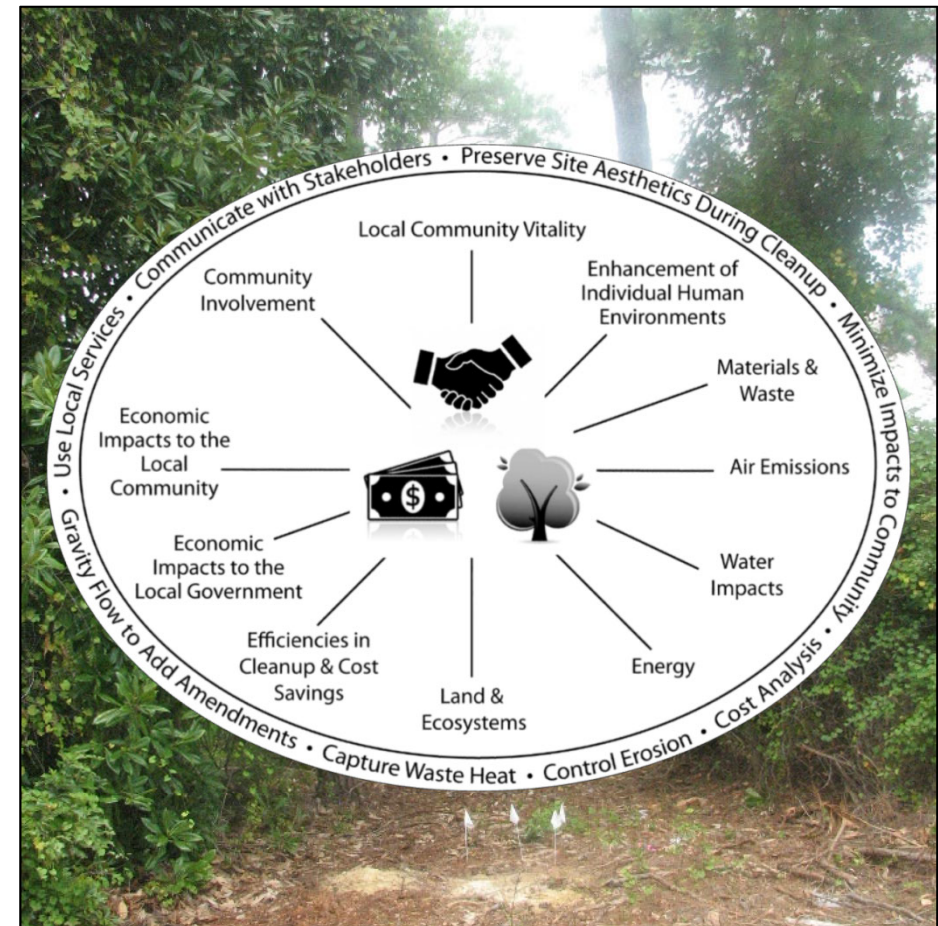
## Benefits to Self Declaration

- Get recognition for BMPs already being applied at sites
- Optimize existing remedies to reduce time, cost, and environmental impacts of cleanup
- Minimize environmental impacts for future cleanup actions
- Trigger “The Virtuous Cycle”



# No “Right Way” to Approach Greener Cleanups

- Approach depends on
  - Stakeholders
  - Phase of cleanup
  - Size of site
  - Priorities
- Iterative Process
  - Approach should change over time
  - Always ways to improve/innovate/optimize



# Thank you!

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