

DRAFT - Technical Memorandum - Work Plan for Investigation of Lead Impacts in Soil – Former Water Tower Sites S-5, SBA-108, S-830 and LCH-4004 – MCB Camp Lejeune, North Carolina

PREPARED FOR: NAVFAC/ MCB CAMP LEJEUNE

PREPARED BY: Osage of Virginia

DATE: April 4, 2016

Introduction

This Technical Memorandum Work Plan provides the approach for soil investigation for lead in soils at four former water tower sites (S-5, SBA-108, S-830 and LCH-4004). The investigation areas include the immediate vicinity of each former water tower. All four sites are located aboard the Marine Corps Base Camp Lejeune (MCB CAMLEJ), North Carolina (Figure 1).

Site Description and History

The subject sites are the former locations of four elevated water towers with structural designations S-5, S-830, SBA-108 and LCH-4004. The water towers were recently dismantled and removed from the sites in 2014 and 2015. Generally, ground surfaces in the immediate vicinity and beneath the existing or former water towers are unpaved. No waterbodies are located within immediate vicinity of the sites. The nature of property uses in the vicinity of each site varies. Structure identification numbers, general location, land uses and dates of operation are provided below.

Water Tower Structure ID	General Location / Site description and Land Use	Dates of operation
S-5	Located at the corner of McHugh Blvd and Virginia Dare Drive on the Mainside area of MCB CAMLEJ. The Site is generally open and grassy. This Site is within the boundaries of CERCLA Site IR 88. Land uses in the vicinity consist of office buildings and general military training facilities	1942 - 2014
SBA-108	Located adjacent to picnic and recreational area at Onslow Beach. The site is generally unpaved and open. A new water tower is located to the southwest of the former water tower and investigation area. Land use in the vicinity is recreational and undeveloped.	1944 - 2014
S-830	Located at the corner of Florida Avenue and Maryland Avenue in the Wallace Creek housing area of MCB CAMLEJ. Though the vicinity includes paved and unpaved areas, the investigation area will consist of only unpaved areas in the	1962 - 2015

	vicinity of the former tower. Land uses in the vicinity consist of residential structures, recreational areas and an office building.	
LCH-4004	Located in the northern portion of the Midway Park housing area of MCB CAMLEJ. The Site is unpaved and open. There is a new water tower located to the north of the former water tower and investigation area. Land use in the vicinity consists of residential structures.	1942 – 2015

It is likely that the former water towers at the subject sites have been repainted several times during their operation. Paint applications on the towers may have contained lead. The use of lead based paint (LBP) was banned for residential application in 1978; however, their use continued in industrial and large public works applications. Paint can either peel/flake off or be physically removed during repainting and other maintenance. As a result, lead-containing dust (or chips) can settle on the surrounding ground surfaces and leach lead into the soil.

Previous Site Investigations – 2015 Composite Sampling

From September through November 2015 Osage conducted composite sampling at the four subject sites. Water towers S-830 and LCH-4004 were still on site at the time of the composite sampling events, water towers S-5 and SBA-108 had been removed previously. Five five-point composite soil samples were collected in a circular distribution at each site (Figures 2 through 5) and analyzed for total lead by EPA Method 6010. Each composite sample was comprised of five aliquots collected from soils from zero to 12-inches below ground surface (bgs). For comparison to background values two background soil (grab) samples were collected from similar areas in the vicinity of each site (with the exception of S-5). The background samples were collected from approximately 400 to 600 feet from the former towers in areas representative of the investigation area, though outside of the potential zone of impact of LBP from the towers. Analytical data was compared to the United States Environmental Protection Agency (US EPA) Regional Screening Levels (RSLs) and the North Carolina Department of Environmental Quality (NC DEQ) Soil Screening Levels (SSLs) for lead. The analytical results of composite samples for each site, as well as applicable RSLs and SSLs are tabulated below.

S-5 Water Tower

S-5 WATER TOWER - COMPOSITE SOIL SAMPLE RESULTS – TOTAL LEAD					
EPA Industrial RSL (mg/kg)	800				
EPA Residential RSL (mg/kg)	400				
NC DEQ SSL (mg/kg)	270				
Sample ID	S5-S001	S5-S002	S5-S003	S5-S004	S5-S005
Analytical Result (mg/kg)	263	328	313	612	174

Three of the five composite samples collected from the former S-5 Water Tower site indicated concentrations of lead in excess of regulatory screening levels. Two samples (S002 and S003) indicated concentrations in excess of the NC DEQ SSL, and one sample (S004) indicated a concentration in excess of both the NC DEQ SSL and the EPA Residential RSL. Figure 2 illustrates the composite sample locations. No background samples were collected from the vicinity of the S-5 Water Tower site; however, the *Final Expanded Soil Background Study Report* for MCB CAMLEJ (CH2M Hill, 2011) has established a background threshold value (BTV) for lead of 20.2 mg/kg for similar surface soils in developed areas.

SBA-108 Water Tower

SBA-108 WATER TOWER - COMPOSITE SOIL SAMPLE RESULTS – TOTAL LEAD							
EPA Industrial RSL (mg/kg)	800						
EPA Residential RSL (mg/kg)	400						
NC DEQ SSL (mg/kg)	270						
Sample ID	SBA108-S001	SBA108-S002	SBA108-003	SBA108-S004	SBA108-S005	SBA108-BG01	SBA108-BG02
Analytical Result (mg/kg)	45.1	646	192	25.3	307	4.34	16.3

Two of the five composite samples collected from the former SBA-108 Water Tower site indicated concentrations of lead in excess of regulatory screening levels. One sample (S005) indicated a concentration in excess of the NC DEQ SSL, and one sample (S002) indicated a concentration in excess of both the NC DEQ SSL and the EPA Residential RSL. Figure 3 illustrates the composite sample locations. As tabulated above, background samples were substantially below all regulatory screening levels for lead.

S-830 Water Tower

SBA-830 WATER TOWER - COMPOSITE SOIL SAMPLE RESULTS – TOTAL LEAD							
EPA Industrial RSL (mg/kg)	800						
EPA Residential RSL (mg/kg)	400						
NC DEQ SSL (mg/kg)	270						
Sample ID	S830-S001	S830-S002	S830-003	S830-S004	S830-S005	S830-BG01	S830-BG02
Analytical Result (mg/kg)	251	258	116	1,050	1,290	19.8	18.3

Two of the five composite samples collected from the former S-830 Water Tower site indicated concentrations of lead in excess of regulatory screening levels. Samples S004 and S005 indicated concentrations in excess of the NC DEQ SSL, as well as both Residential and Industrial RSLs. Figure 4 illustrates the composite sample locations. As tabulated above, background samples were substantially below all regulatory screening levels for lead.

LCH-4004 Water Tower

LCH-4004 WATER TOWER - COMPOSITE SOIL SAMPLE RESULTS – TOTAL LEAD							
EPA Industrial RSL (mg/kg)	800						
EPA Residential RSL (mg/kg)	400						
NC DEQ SSL (mg/kg)	270						
Sample ID	LCH400 4-S001	LCH400 4-S002	LCH400 4-003	LCH400 4-S004	LCH400 4-S005	LCH400 4-BG01	LCH400 4-BG02
Analytical Result (mg/kg)	4,030	1,360	521	1,250	560	10.4	15.6

All five composite samples collected from the former LCH-4004 Water Tower site indicated concentrations of lead in excess of regulatory screening levels. Samples S003 and S005 indicated concentrations in excess of the NC DEQ SSL and the Residential RSL. Samples S001, S002 and S004 indicated concentrations in excess of the NC DEQ SSL, as well as both Residential and Industrial RSLs. Figure 5 illustrates the composite sample locations. As tabulated above, background samples were substantially below all regulatory screening levels for lead.

Previous Site Investigations – 2015 XRF Screening

Due to the residential land use in the vicinity of the former S-830 and LCH-4004 Water Towers, interim measures were conducted to preliminarily delineate lead impacts and mitigate potential exposures at the sites. In December 2015, Osage mobilized to the two sites to conduct a delineation of lead impacted soils via X-ray fluorescence (XRF) spectrometer. Osage established a 20-foot sample grid and conducted shallow soil borings at the each grid node. The grid was expanded outward from the center of the composite sampling investigation areas until XRF data indicated no lead impacts. Data collected by the XRF spectrometer is considered quasi-quantitative; however, screening data were within the same order of magnitude as detected in the November 2015 analytical composite samples. The XRF instrument used is reportedly accurate to within 20 parts per million (ppm). As a protective measure, safety fencing with was erected at each site along the boundary of soils with lead concentrations detected in excess of 250 mg/kg. The boundary concentration of 250 mg/kg was implemented to account for soils within 20 ppm of the most restrictive regulatory screening level (NC DEQ SSL = 270 mg/kg). Red ribbon labeled “Danger” was placed along the top of the protective boundary fencing. The XRF sampling grids, highlighted areas with detections greater than 250 mg/kg, and XRF screening data are illustrated on Figures 6 and 7.

Based on the results of 2015 composite soil sampling and XRF screening data, additional investigation was considered warranted. The following sections present the proposed activities required to delineate the full extent of lead impacts in soil attributable to LBP at the four former water tower sites.

Pre-Sampling Activities

Prior to the field sampling mobilization, Osage will procure the following types of subcontractors to support the investigation:

- Utility locator

Osage will coordinate subsurface utility clearances with a private and public utility location services. No intrusive activities will be initiated until the utility clearance has been completed.

Once utilities are located and clearly marked on site, Osage will utilize GPS to re-establish former composite sampling and XRF screening areas. This data will provide a basis on which to establish sampling grids as detailed below.

Prior to beginning any phase of work, Osage and its subcontractors will have field meetings to discuss the work items, worker responsibilities, and familiarize workers with the safety plan.

DPT Soil Sampling

Osage will conduct soil sampling at each site sequentially with a direct push technology (DPT) drilling machine. Borings will be conducted across a 20-ft grid at former water tower sites S-830 and LCH-4004. Due to the lack of XRF delineation data at former water tower sites S-5 and SBA-108, sampling grid nodes will be spaced farther apart to encompass a greater area and help ensure complete delineations. Sampling grids will include two grid nodes in every direction beyond former composite sampling areas or areas determined to be noncompliant via XRF screening (S-830 & LCH-4004). The proposed DPT sample grid for each site is illustrated on Figures 8 through 11.

During DPT sampling activities, each boring will be advanced to approximately five feet bgs. Grab samples will be collected at depths of approximately 0.5-feet, 1.5-feet, 2.5-feet, 3.5-feet and 4.5-feet bgs, from each boring. Soil samples will be placed into laboratory provided glassware, properly labeled, stored in an ice chilled cooler, and transported to Katahdin Analytical Services in Scarborough, Maine with proper chain of custody documentation. The samples will be submitted for analysis of total lead by EPA Method 6010.

In order to achieve complete lateral and vertical delineation, and to minimize unnecessary lab costs, samples collected from step-out borings (illustrated as blue on figures 8 through 11), as well as from depths of 2.5 to 4.5-feet will be initially placed on hold by the laboratory. If initially-analyzed samples indicate non-compliant lead concentrations, then hold samples from corresponding step-out borings will be analyzed. Similarly, if overlying samples indicate noncompliant lead concentrations, deeper samples collected from the same boring will be analyzed sequentially until compliant lead concentrations are detected vertically.

During the removal of the water towers, concrete support footers were reportedly removed from the subsurface. It is possible that soil removed during the footer removal could have been returned to the small excavations. Because it is unlikely that the former footer locations will be identifiable in the field, no samples from borings advanced in the immediate footprint of the former towers will be put on hold, pending analysis of overlying soils.

During soil sampling, quality assurance/quality control (QA/QC) procedures will be followed as described below. Laboratory analyses will conform to accepted QA requirements. Blanks, duplicate samples, and matrix spike/matrix spike duplicate (MS/MSD) samples will be collected and submitted for laboratory analyses at the following frequency:

- Duplicate samples—1 total
- MS/MSD samples—1 total
- Equipment blank—1 per day

An independent data validator will be retained to validate laboratory analytical data. The validated analytical results will be evaluated to assess the technical adequacy and usability of the data. Once the data is received from the laboratory and is validated, an evaluation of the data will be completed. Lead concentrations detected in soil samples will be compared to applicable screening levels for lead including the US EPA RSLs, the NC DEQ SSL and the MCB Camp Lejeune (BTV) for surface and subsurface soils in developed areas.

IDW Management

IDW will be managed in accordance with the Investigation and Remediation Waste Management Plan (CH2M HILL, 2013c), or subsequent revisions. IDW will consist of soil cuttings, used personal protective equipment (PPE), and decontamination fluids. Samples will be collected from each waste stream for analysis, as required by the Investigation and Remediation Waste Management Plan. The drums will be transported to and staged at the storage facility located on Michael Road, pending final disposition. Osage will procure a waste management subcontractor transport and dispose of the staged IDW.

Reporting

Upon the completion of field activities and receipt of validated analytical data, Osage will prepare a Preliminary Assessment and Site Inspection (PA/SI) Report summarizing the results of the investigation and recommending a path forward.

Schedule

The proposed schedule for field activities is presented below:

- 4/4/16 - TM Work Plan submitted for review/approval.
- 5/9/16 – 5/13/2016 - Utility location and sample location layout.
- 5/16/16 to 5/26/16 - Soil sample collection and laboratory submittal.
- 6/13/16 to 6/23/16 - Receipt of laboratory results. Submittal of results for third party validation.
- 7/14/16 - Receipt of 3rd party validation report of analytical soil data.
- 8/25/16 - Submittal of Draft PA/SI Report, with recommendations for path forward.

References

North Carolina Department of Environmental Quality (NC DEQ). 2015. *Federal Remediation Branch Target Screening Values Table*. <http://portal.ncdenr.org/web/wm/sf/ihs/ihsguide>.

CH2M Hill, 2011. *Final Expanded Soil Background Study Report. Marine Corps Base Camp Lejeune, Jacksonville, North Carolina. August 2011.*

CH2M Hill., *Investigation and Remediation Waste Management Plan Marine Corps Installations East - Marine Corps Base Camp Lejeune, North Carolina.*, Updated February 2013.

Figures

Figure 1 - Aerial Site Location Map

Figure 2 – S-5 Composite Sample Location Map

Figure 3 – SBA-108 Composite Sample Location Map

Figure 4 – S-830 Composite Sample Location Map

Figure 5 – LCH-4004 Composite Sample Location Map

Figure 6 – S-830 XRF Investigation Map

Figure 7 – LCH-4004 XRF Investigation Map

Figure 8 – S-5 Proposed Delineation Sample Location Map

Figure 9 – SBA-108 Proposed Delineation Sample Location Map

Figure 10 – S-830 Proposed Delineation Sample Location Map

Figure 11 – LCH-4004 Proposed Delineation Sample Location Map

FIGURES



- Former Water Tower Site Location
- ▭ Camp Lejeune Base Boundary

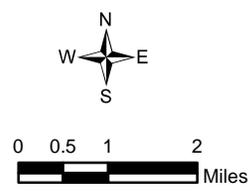
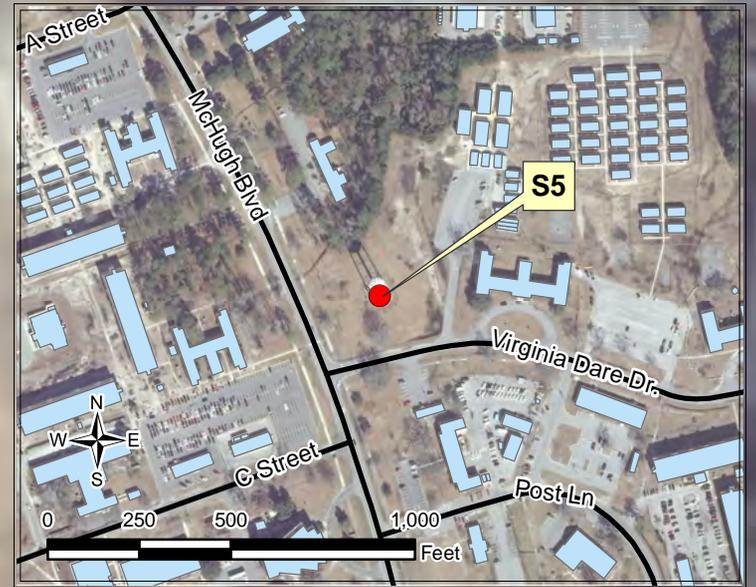
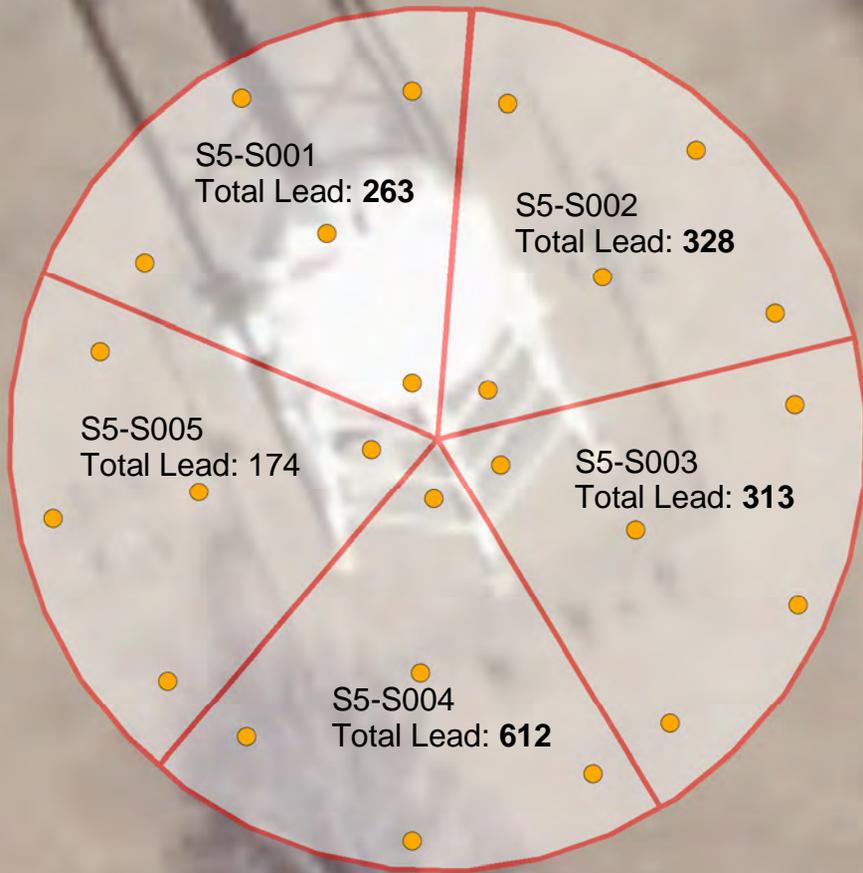


Figure 1
Aerial Site Location Map
MCBCAMLEJ
North Carolina





Regulatory Screening Level	
EPA Industrial RSL (mg/kg)	800
EPA Residential RSL (mg/kg)	400
NC DEQ SSL (mg/kg)	270

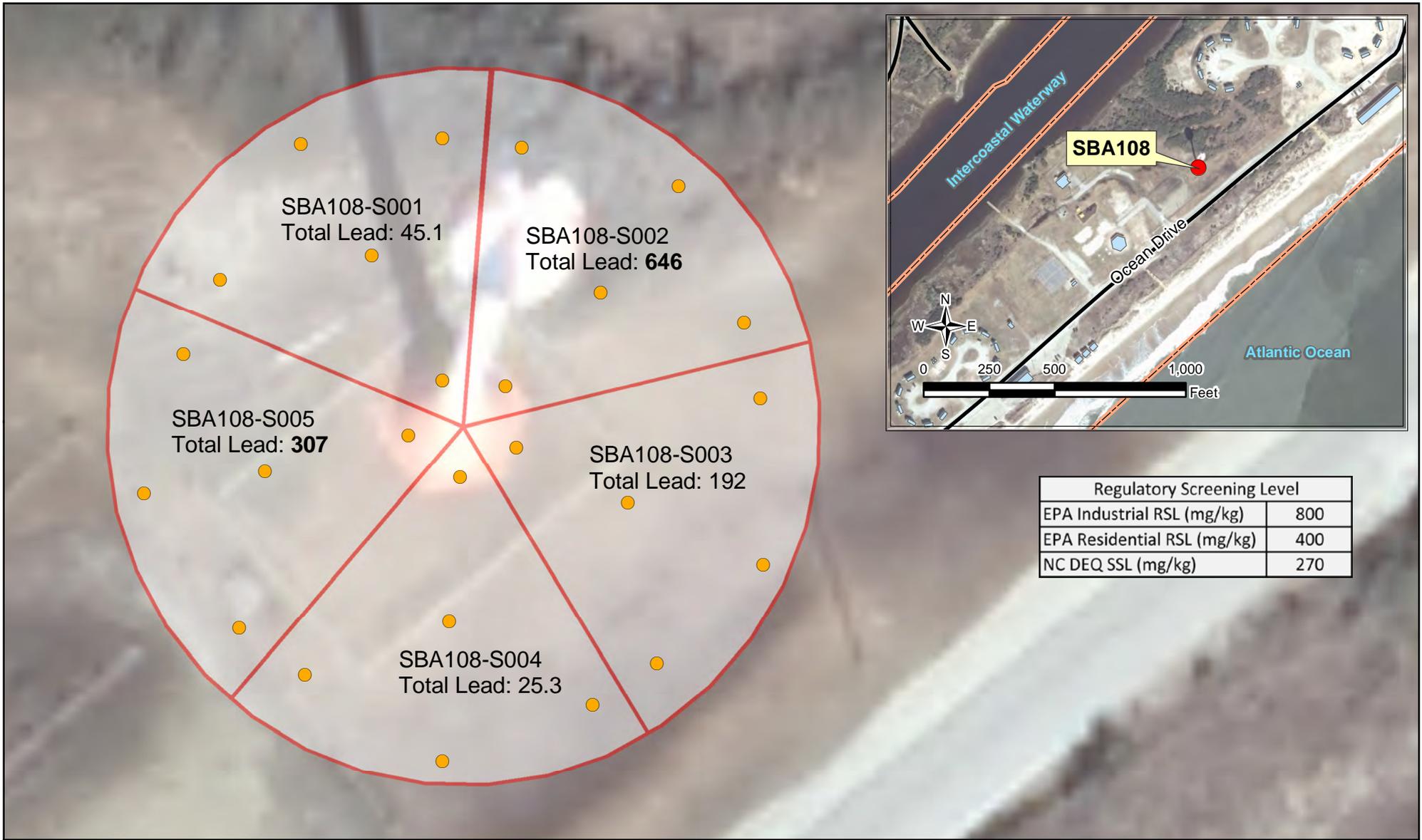
- Former Water Tower
- Composite Sample Aliquot Location
- Composite Sample Cell
- Road
- Existing Structures

Total Lead Results reported in mg/kg
BOLD = Regulatory Screening Level Exceedance



Figure 2
 S-5 Composite Sample Location Map
 MCBCAMLEJ
 North Carolina





Regulatory Screening Level	
EPA Industrial RSL (mg/kg)	800
EPA Residential RSL (mg/kg)	400
NC DEQ SSL (mg/kg)	270

- Former Water Tower Location
 - Composite Sample Aliquot Location
 - Composite Sample Cell
 - Camp Lejeune Base Boundary
 - Road
 - Existing Structure
- Total Lead Results reported in mg/kg
BOLD = Regulatory Screening Level Exceedance

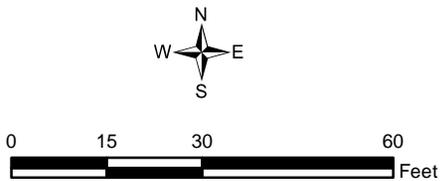
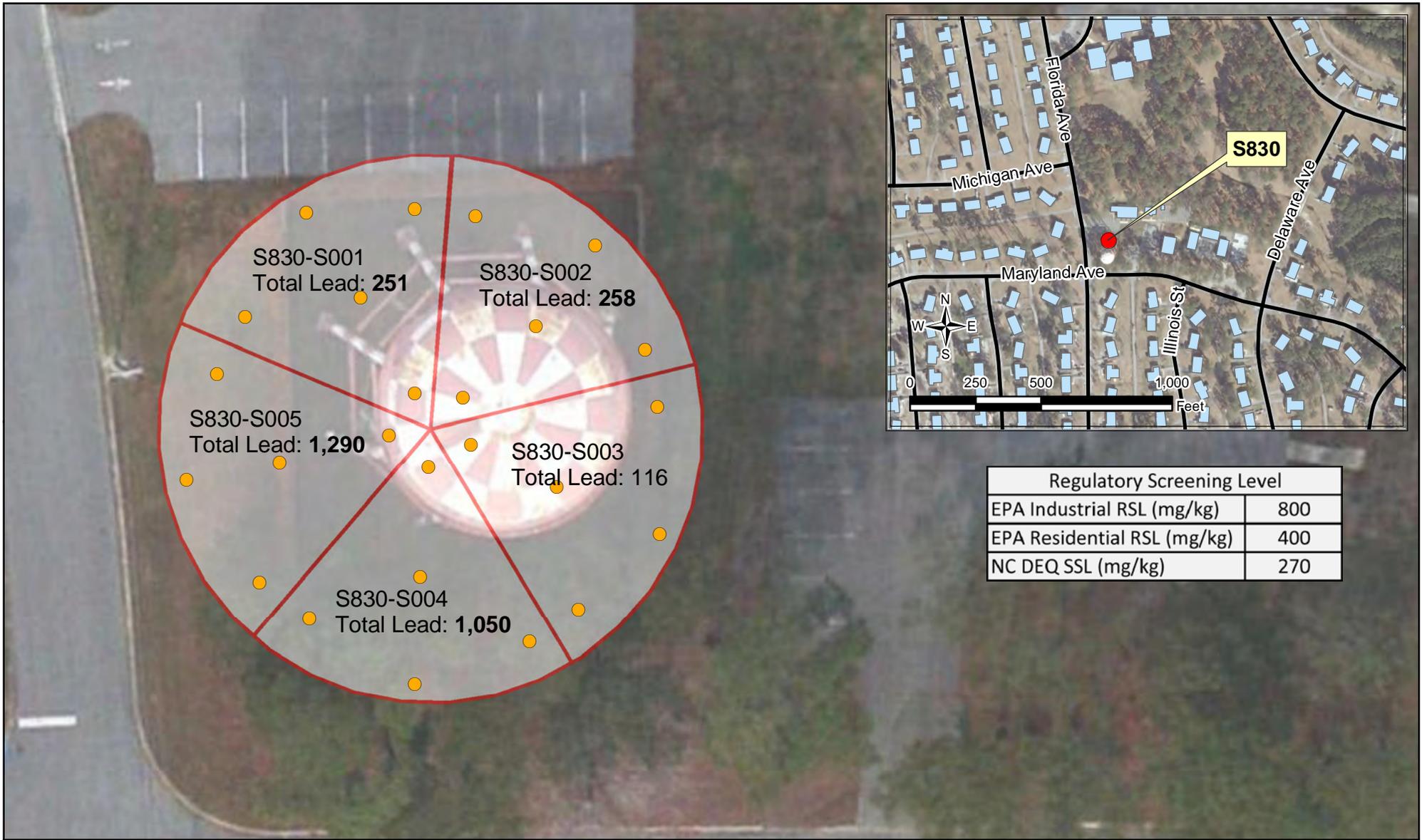


Figure 3
 SBA108 Composite Sample Location Map
 MCBCAMLEJ
 North Carolina





S830-S001
Total Lead: **251**

S830-S002
Total Lead: **258**

S830-S005
Total Lead: **1,290**

S830-S003
Total Lead: 116

S830-S004
Total Lead: **1,050**

Regulatory Screening Level	
EPA Industrial RSL (mg/kg)	800
EPA Residential RSL (mg/kg)	400
NC DEQ SSL (mg/kg)	270

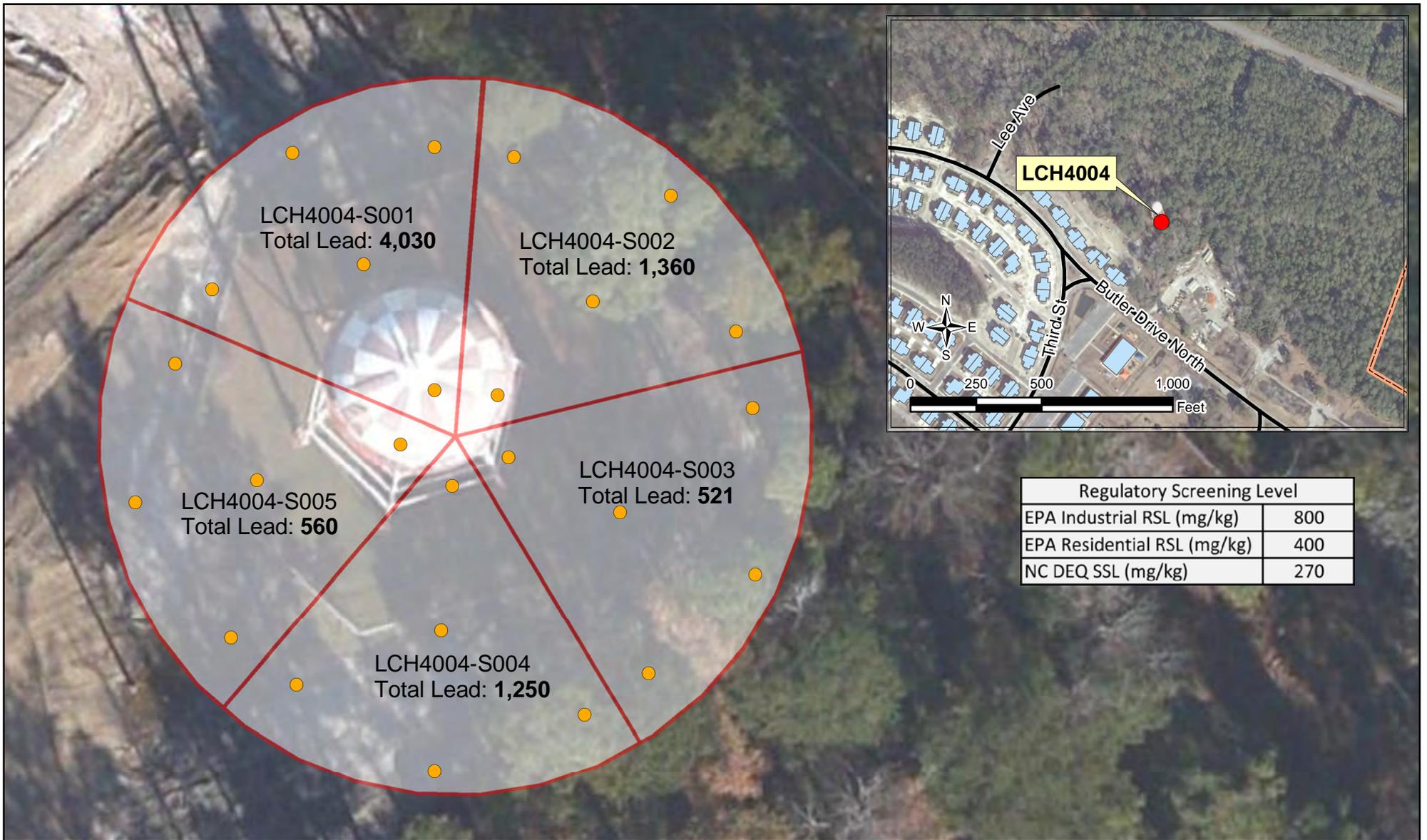
- Former Water Tower Location
- Composite Sample Aliquot Location
- Composite Sample Cell
- Road
- Existing Structure

Total Lead Results reported in mg/kg
BOLD = Regulatory Screening Level Exceedance



Figure 4
S830 Composite Sample Location Map
MCBCAMLEJ
North Carolina





Regulatory Screening Level	
EPA Industrial RSL (mg/kg)	800
EPA Residential RSL (mg/kg)	400
NC DEQ SSL (mg/kg)	270

- Former Water Tower Location
 - Composite Sample Aliquot Location
 - Composite Sample Cell
 - Camp Lejeune Base Boundary
 - Road
 - Existing Structure
- Total Lead Results reported in mg/kg
BOLD = Regulatory Screening Level Exceedance

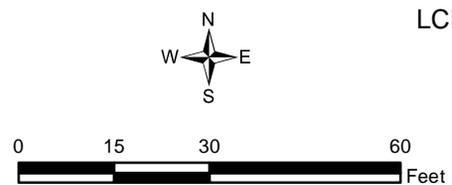
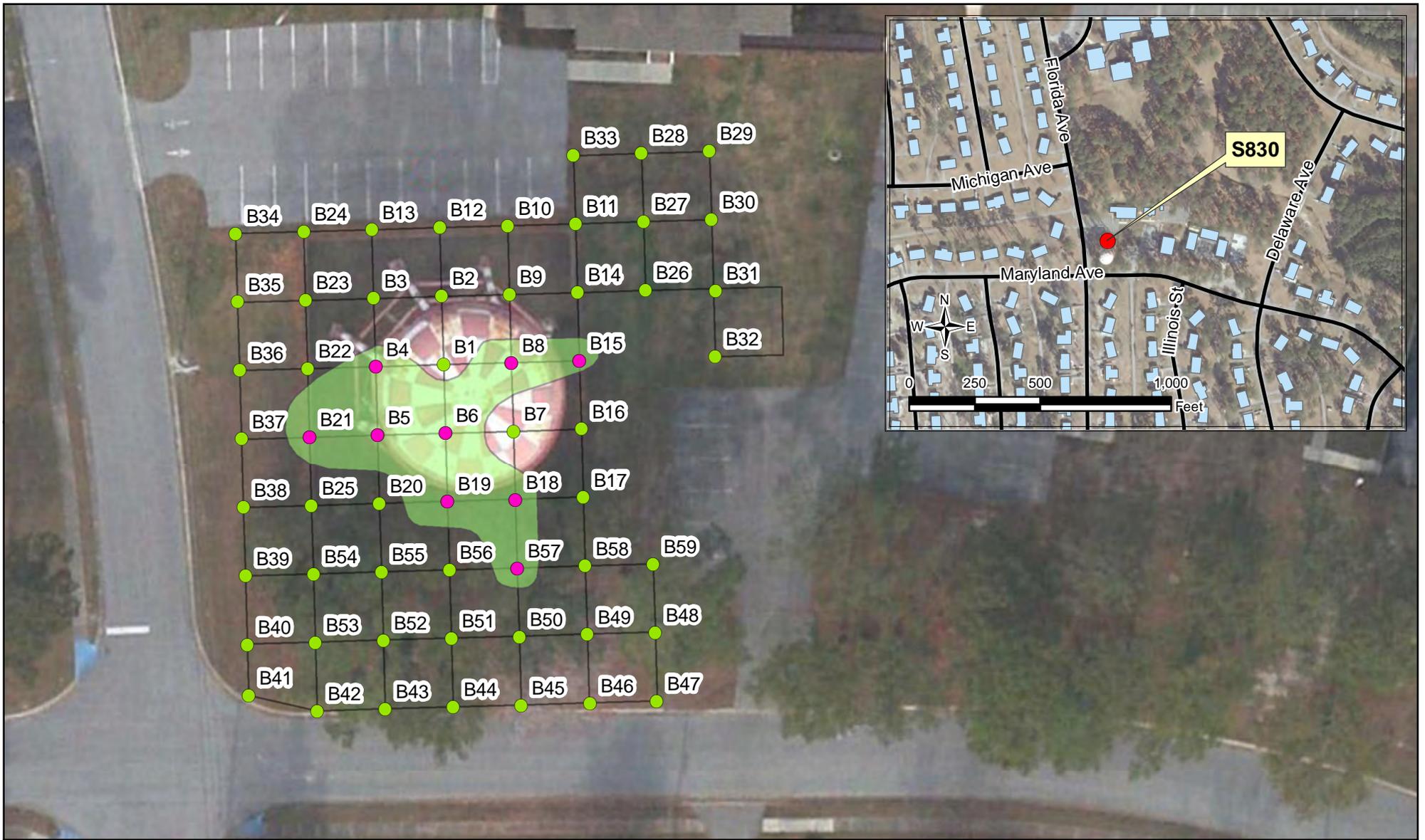


Figure 5
 LCH4004 Composite Sample Location Map
 MCBCAMLEJ
 North Carolina





- Samples > 250 ppm
- Samples < 250 ppm
- 20ft x 20ft Sample Grid
- Lead Impacted Zone
- Former Water Tower Location
- Road
- Existing Structure

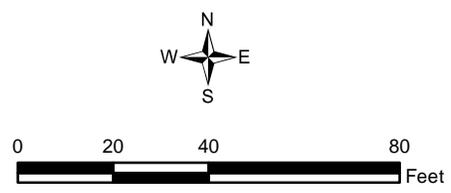
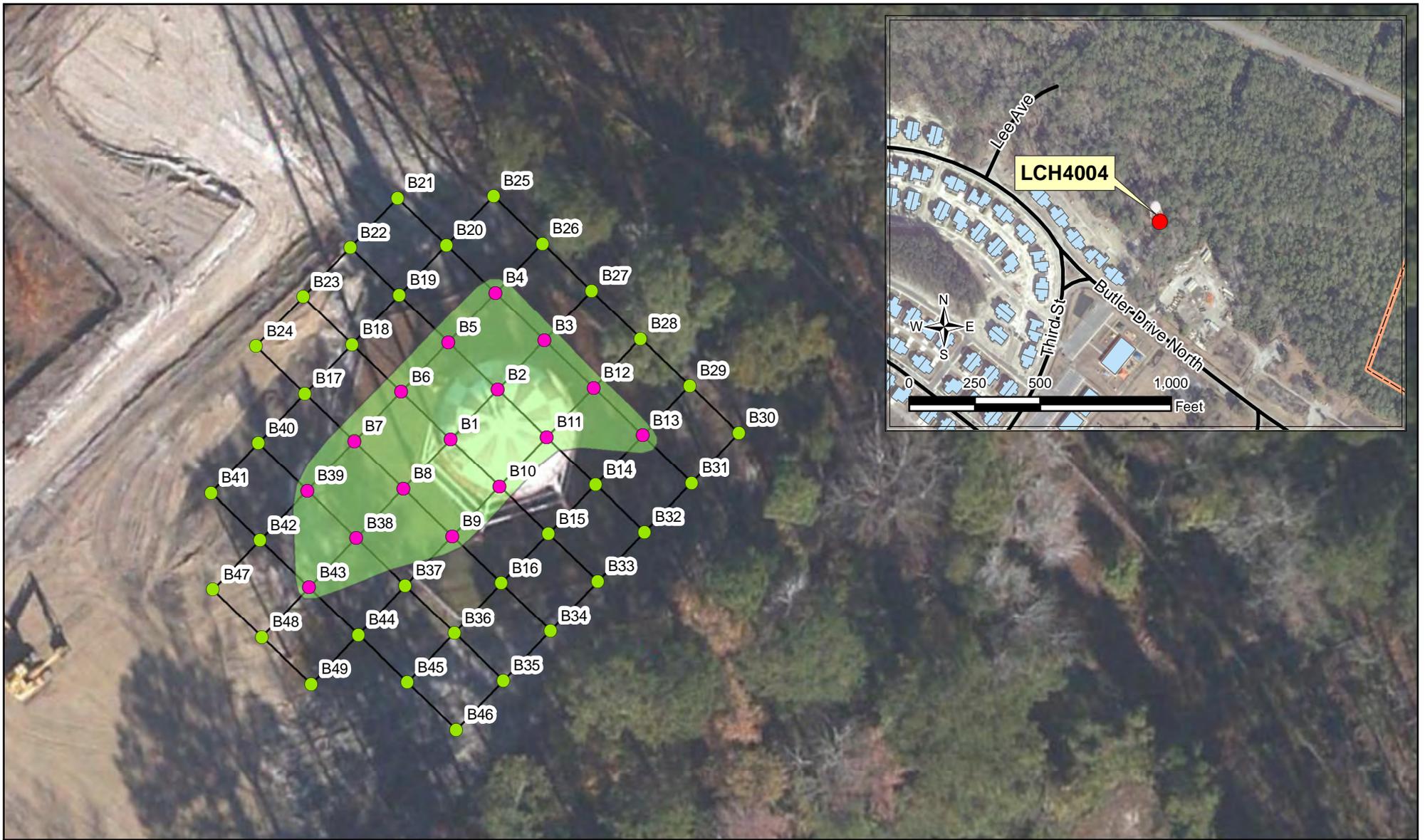


Figure 6
 S830 XRF Investigation
 MCBCAMLEJ
 North Carolina





- Samples > 250 ppm
- Samples < 250 ppm
- 20ft x 20ft Sample Grid
- Lead Impacted Zone
- Former Water Tower Location
- Camp Lejeune Base Boundary
- Road
- Existing Structure

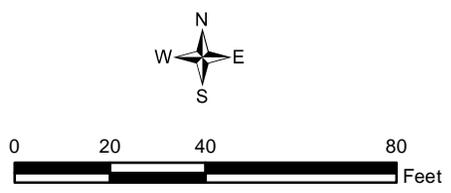


Figure 7
 LCH4004 XRF Investigation
 MCBCAMLEJ
 North Carolina



- Initial grab sample location - analysis to immediately follow lab submittal
- Step-out grab sample location - analysis on hold pending results of initial or preceding interior step-out sample
- 30ft x 30ft Sample Grid
- 2015 Composite Sample Area

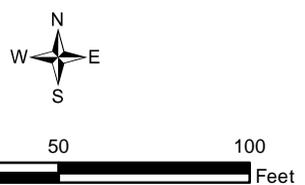
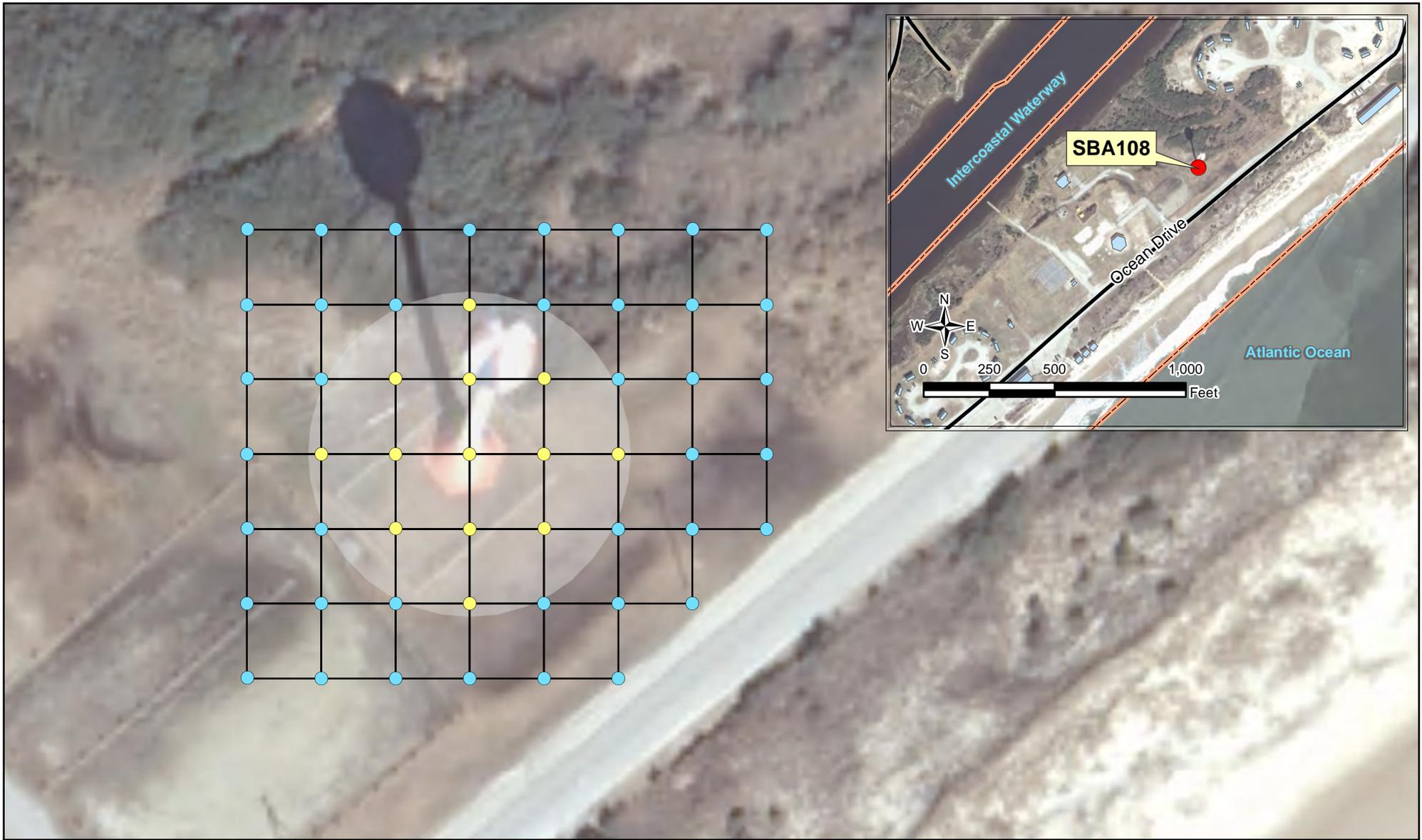


Figure 8
 S5 Proposed Delineation Sample Location Map
 MCBCAMLEJ
 North Carolina

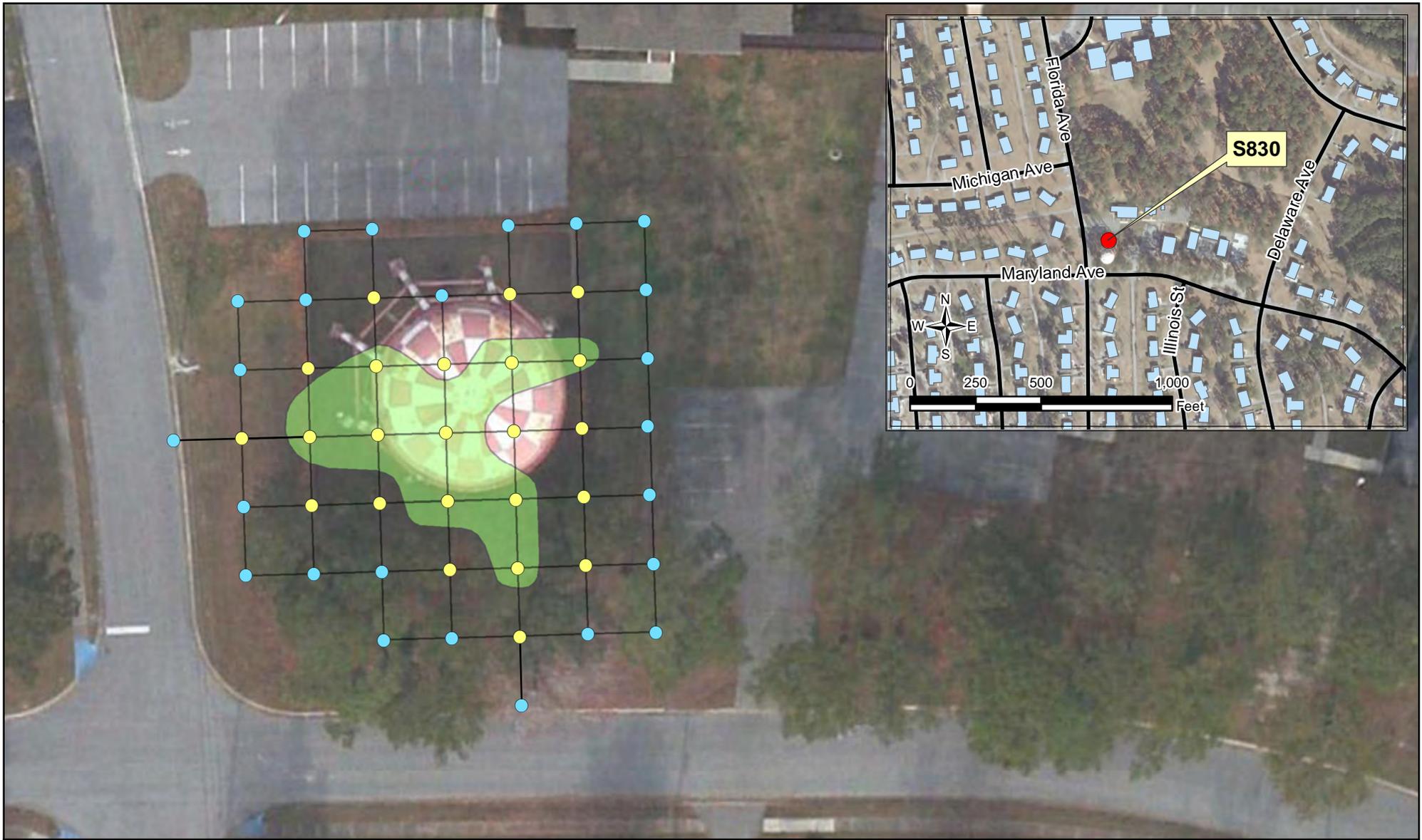




- 30ft x 30ft Sample Grid
- 2015 Composite Sampling Area
- Former Water Tower Location
- Camp Lejeune Base Boundary
- Initial grab sample location - analysis to immediately follow lab submittal
- Step-out grab sample location - analysis on hold pending results of initial or preceding interior step-out sample
- Road
- Existing Structure

Figure 9
SBA108 Proposed Delineation Sample Location Map
 MCBCAMLEJ
 North Carolina





20ft x 20ft Sample Grid

Lead Impacted Zone

Former Water Tower Location

Initial grab sample location - analysis to immediately follow lab submittal

Step-out grab sample location - analysis on hold pending results of initial or preceding interior step-out sample

Road

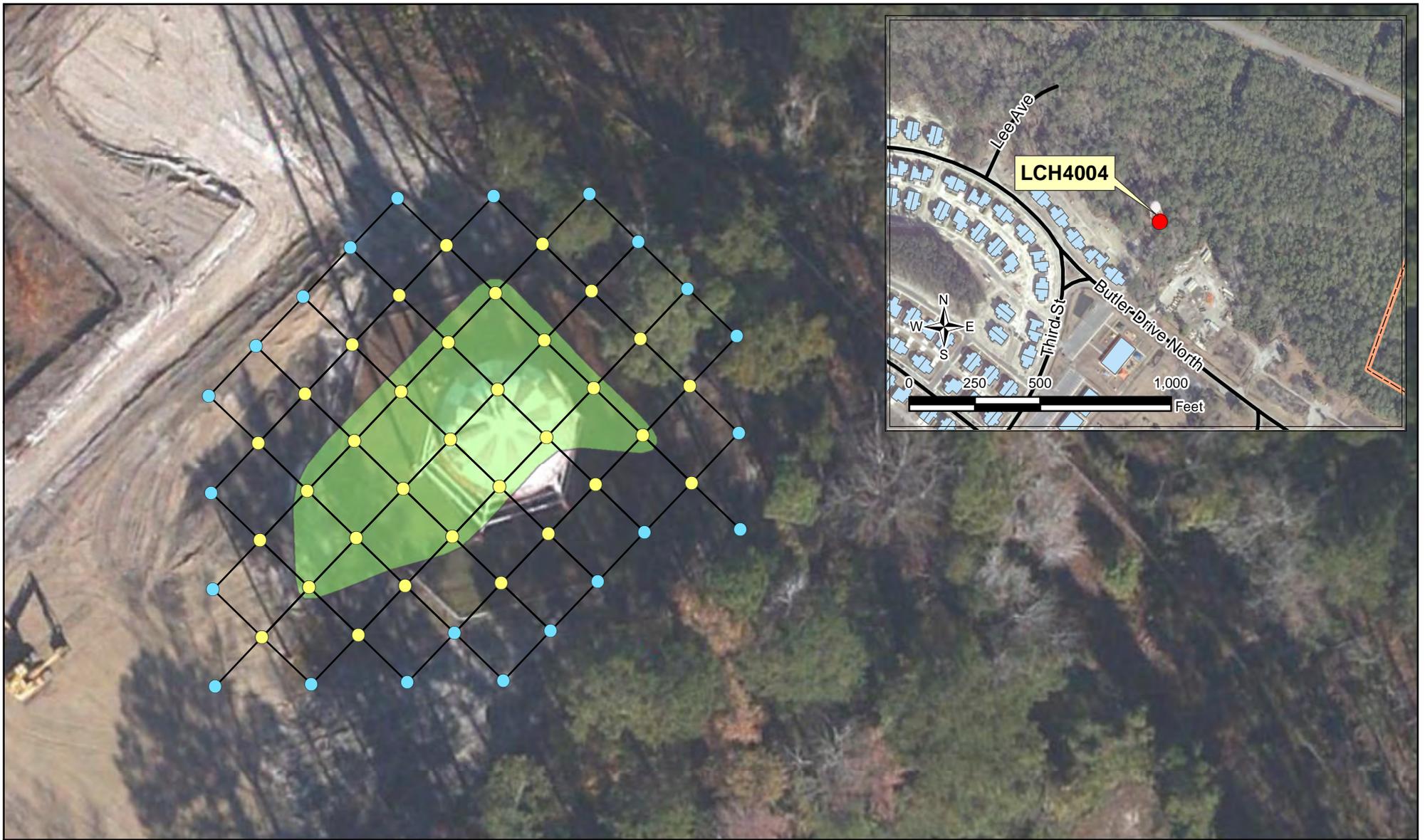
Existing Structure

Figure 10
S830 Proposed Delineation Sample Location Map

MCBCAMLEJ

North Carolina





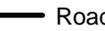
-  20ft x 20ft Sample Grid
-  Lead Impacted Zone
-  Former Water Tower Location
-  Camp Lejeune Base Boundary
-  Initial grab sample location - analysis to immediately follow lab submittal
-  Step-out grab sample location - analysis on hold pending results of initial or preceding interior step-out sample
-  Road
-  Existing Structure

Figure 11
 LCH4004 Proposed Delineation Sample Location Map
 MCBCAMLEJ
 North Carolina

