

SECTION 7

Descriptions of RD and RA Sites

The following sections discuss the site history, summary of previous investigations, and future activities at Sites 69 and 86, the only sites that are in the RD/RA phase of the CERCLA process. There are currently no MMRP sites in the RD/RA phase of the CERCLA process.

7.1 IRP RD/RA Sites

7.1.1 Site 69 (OU 14)—Rifle Range Chemical Dump

Site 69, the Rifle Range Chemical Dump, encompasses approximately 14 acres located approximately 1,300 feet west of the New River in the Rifle Range area of MCIEAST-MCB CAMLEJ (Figure 7-1). From 1950 to 1976, Site 69 was reportedly used to dispose of chemical wastes including PCBs, solvents, pesticides, and drums of “gas” that possibly contained cyanide (tear gas) or other training agents, also known as chemical agent (CA). Site 69 is located within Site UXO-02 (Section 8.3.3), which was used as an explosive range from 1973 to 2002 and was addressed under the MMRP.

FIGURE 7-1
IRP Site 69, OU 14



Previous investigations are listed in **Table 7-1**. A LUC summary is provided in **Table 7-2**.

TABLE 7-1
Previous Investigations Summary, IRP Site 69

Previous Investigation/Action	Date	Activities
Radiation Survey and Soil Sampling (NEESA, 1981)	1980 - 1981	Based on the reported history that Site 69 was a suspected radioactive waste disposal site, a radiation survey and soil sampling were conducted. Radioactivity was not detected at higher than average natural concentrations and soil sample results indicated naturally-occurring radioactivity.
Initial Assessment Study (WAR, 1983)	1983	The IAS was conducted to identify potential hazardous sites at MCIEAST-MCB CAMLEJ. A confirmation study was recommended at Site 69 based on the presence of buried hazardous or toxic wastes and the potential for migration into the aquifer.
Confirmation Study (ESE, 1990)	1984 - 1990	To verify the presence or absence of contamination due to the site's history as a dump, confirmatory sampling was conducted. Groundwater, surface water, and sediment samples were collected and analyzed for VOCs, pesticides/PCBs, select SVOCs, select metals, and residual chlorine. Analytical results identified VOCs in groundwater and surface water and pentachlorophenol (PCP) in one sediment sample.
Remedial Investigation (Baker, 1997)	1995 - 1997	Field activities were conducted to assess the nature and extent of contamination and potential human health and environmental impacts of the site. Geophysical investigations were conducted and groundwater, surface water, sediment, fish, shellfish, and benthic macro invertebrate samples were collected. Samples were analyzed for VOCs, SVOCs, metals, and pesticides/PCBs. Geophysical investigations indicated buried metallic objects near the groundwater source area. Potential human health risks were identified for future residents due to exposure of VOCs and metals in groundwater. No unacceptable ecological risks were identified and surface water and sediment analytical results indicated that the New River, Everett Creek, and the unnamed tributary north of the site were not impacted by the former disposal operations.
In-Well Aeration Pilot Study (Baker, 1998)	1996 - 1998	A pilot study was initiated to assess the effectiveness of In-well aeration for treatment of VOCs in groundwater. After 2 years of operation and testing, the method was determined to be ineffective at reducing groundwater contamination and the pilot study was discontinued.
Proposed Remedial Action Plan (Baker, 1998)	1998	The Proposed Remedial Action Plan (PRAP) identified MNA and LUCs as the preferred alternative to address potential risks from groundwater and waste. The PRAP was submitted for public review and comment. General comments for informational purposes were addressed during the public meeting and no written comments were received.
Interim Record of Decision (Baker, 2000)	2000	The interim selected remedy was LTM for MNA of VOCs in groundwater and to monitor potential migration and LUCs to prevent exposure to waste, soil, and groundwater.
Interim Remedial Action	1998 - 2005	Groundwater LTM for VOCs and NAIPIs was implemented in 1998 and continued until 2005, as the site was a part of ongoing investigations and studies in which the LTM requirements are being fulfilled or exceeded by site-specific monitoring programs. LUCs were implemented in 2001 and updated in 2002 and remain in place.
Surface Water and Sediment Sampling	2005	Due to a request by Onslow County Commissioners, NCDENR–Department of Water Quality and the Base performed split surface water and sediment sampling in surface waters adjacent to Site 69. NCDENR recommended no further sampling and no advisory to be issued.
Radiation Survey (New World Technology, Inc., 2007)	2007	A radiation survey was conducted and radioactivity was not detected at higher than average natural concentrations, which confirmed the 1980 to 1981 findings.
Supplemental Investigation (CH2M HILL, 2011)	2008 - 2011	A supplemental investigation was conducted simultaneously with the UXO-02 PA/SI to further delineate the nature and extent of contamination and move the site towards a final ROD. Field activities included a geophysical survey, monitoring well installation, and soil, groundwater, surface water, and sediment sampling. Potential human health risks were identified due to exposure to pesticides, PCBs, VOCs, and metals in groundwater. Potential ecological risks were identified due to exposure to pesticides in surface soil and sediment. An FS was recommended to identify RAOs and evaluate potential treatment alternatives. The current CSM is shown on Figure 7-2.

TABLE 7-1
Previous Investigations Summary, IRP Site 69

Previous Investigation/Action	Date	Activities
UXO-02 Expanded Site Investigation (CH2M HILL, 2012)	2011-2012	An ESI was conducted at UXO-02, including Site 69, to further investigate potential unacceptable risks identified during the UXO-02 PA/SI and Site 69 Supplemental Investigation. Field activities included an intrusive anomaly investigation, monitoring well installation, and soil, groundwater, surface water, and sediment sampling for pesticides, metals, and/or explosives residues analyses. No unacceptable human health or ecological risks were identified from potential exposure to soil, surface water, sediment, or metals in surficial aquifer groundwater. NFA was recommended for the portion of UXO-02 located outside of the Site 69 perimeter fence. The remaining environmental impacts to be further assessed were associated with potential risks from exposure to waste and the VOC groundwater plume associated with Site 69.
Feasibility Study (CH2M HILL, 2012)	2011-2012	Remedial alternatives were evaluated to address the waste disposal area and COCs in groundwater. The alternatives evaluated for the waste disposal area were no action, LUCs, capping with LUCs, and removal. The alternatives evaluated for groundwater were no action; MNA with LUCs; permeable reactive barrier (PRB) with MNA and LUCs; ERD with bioaugmentation, MNA, and LUCs; and ISCO with MNA and LUCs.
Proposed Remedial Action Plan (CH2M HILL, 2012) and Record of Decision (CH2M HILL, 2013)	2012-2013	A PRAP was issued to solicit public input on the preferred alternative (capping with LUCs for waste and MNA and LUCs for groundwater) and a public meeting was held. General comments for informational purposes were addressed during the public meeting and no written comments were received. The ROD was issued and signed on June 25, 2013.
Remedial Design (CH2M HILL, 2013) and Draft Interim Remedial Action Completion Report (TetraTech, 2015)	2013-2015	The RD presents the design of remedy as specified by the ROD, including capping, plans for MNA and LTM, and a Land Use Control Implementation Plan (LUCIP). Construction of the soil cap was completed in 2014.

TABLE 7-2
Land Use Control Summary, IRP Site 69

LUC Boundary	Estimated Area (Acres)	Final Land Use Control Implementation Plan (LUCIP)	Onslow County Registration Date
Non-Industrial Use Control Boundary	14.55	July 2002	Pending removal
Intrusive Activities Control Boundary (Groundwater)	8		Pending removal
Aquifer Use Control Boundary (1,000 feet)	127.2		February 2002
Access Control Boundary	14.6	Proposed	--
Intrusive Activities Control Boundary (Soil and Groundwater)	14.6		
Industrial/Non-Industrial Use Control Boundary (Vapor Intrusion)	15.7		

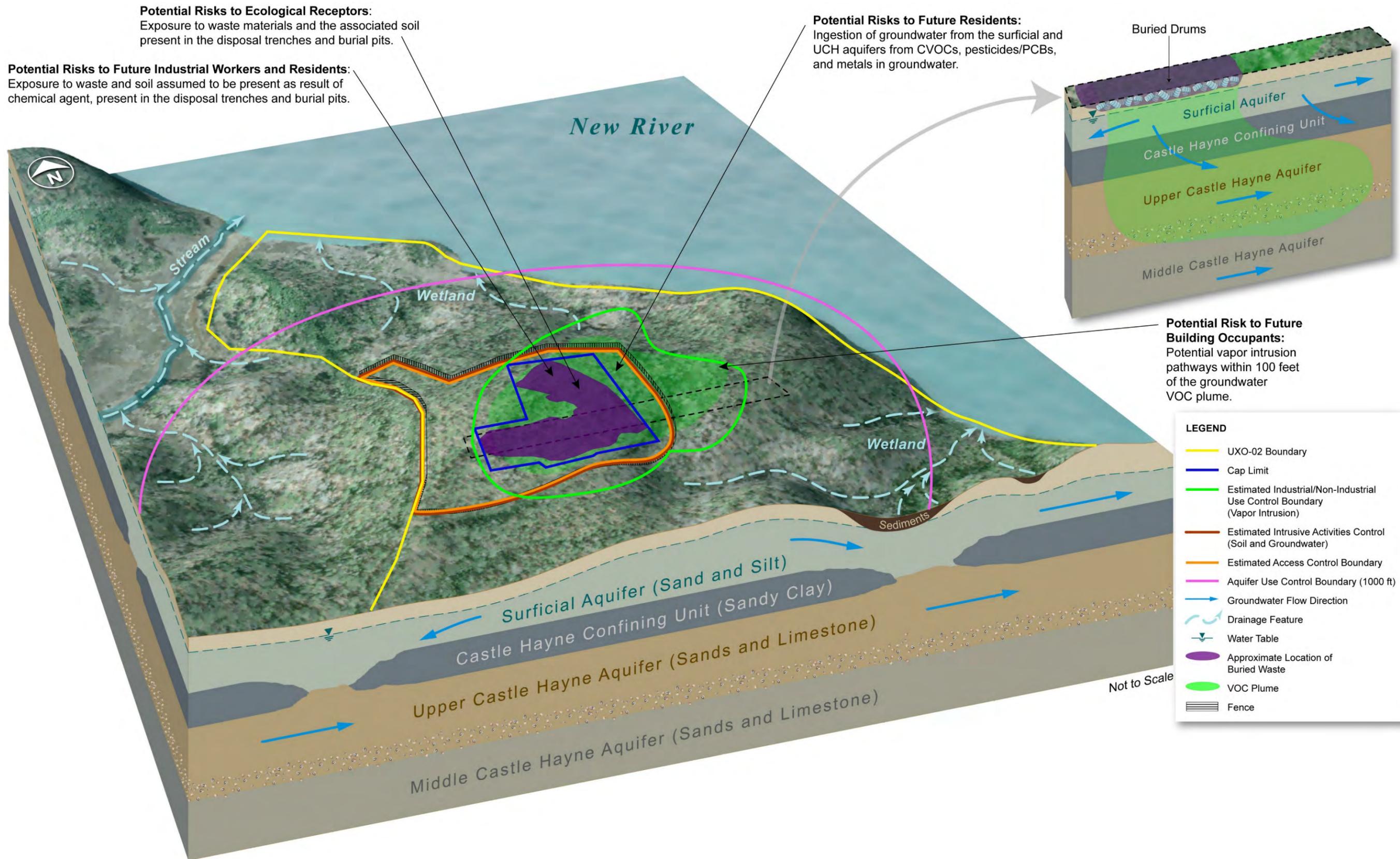
7.1.1.1 Future Activities

In FY 2015, the updated LUCs will be filed with the Onslow County Register of Deeds, LTM will begin, and the IRACR to document that the remedy is in place will be finalized (**Schedule 7-1**).

**Schedule 7-1
IRP Site 69
IRP & MMRP Site Management Plan FY 2016
MCIEAST-MCB CAMLEJ**

ID	Task Name	Duration	Start	Finish	2015											
					Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1	RA	231 days	Wed 10/1/14	Wed 8/19/15												
2	Draft IRACR	157 days	Wed 10/1/14	Thu 5/7/15												
3	Review Period (Navy/Base)	30 days	Fri 5/8/15	Thu 6/18/15												
4	Review Period (USEPA/NCDENR)	30 days	Fri 6/19/15	Thu 7/30/15												
5	Final IRACR	14 days	Fri 7/31/15	Wed 8/19/15												

FIGURE 7-2
IRP Site 69 Conceptual Site Model

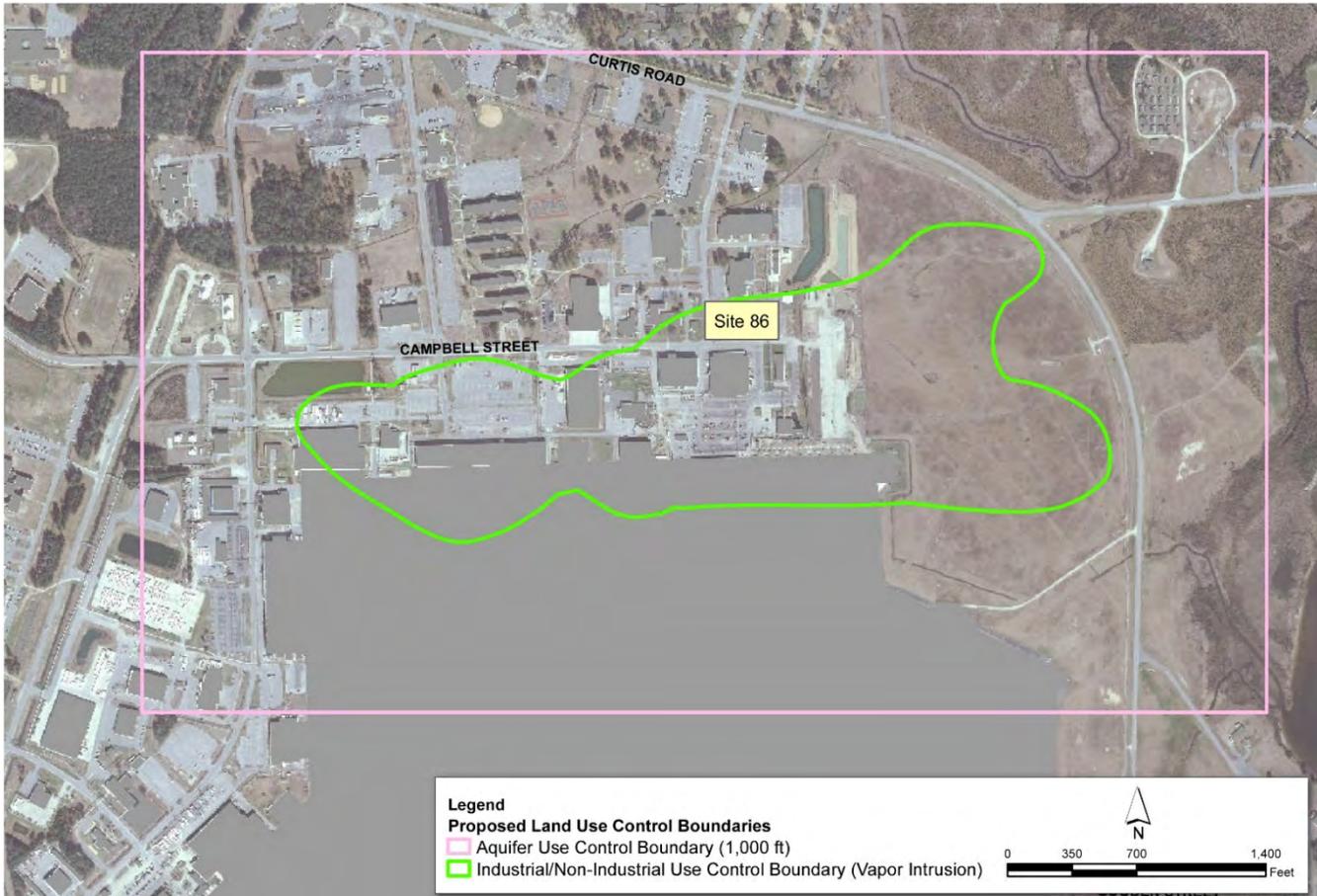


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7.1.2 Site 86 (OU 20)—Tank Area AS419-AS421 at MCAS

Site 86, Tank Area AS419-AS421, is located within the operations area of MCAS New River and covers approximately 146 acres (**Figure 7-3**). From 1954 to 1988, Site 86 served as a storage area for petroleum products. In 1954, three 25,000-gallon ASTs were installed within an earthen berm. The three tanks were reportedly used for No. 6 fuel oil storage until 1979. From 1979 to 1988, the tanks were used for temporary storage of waste oil. The three tanks were emptied in 1988 and were removed in 1992. Today, the former location of the tanks is grass-covered and only a slight depression remains. In 2006, an RFI was completed for SWMU 303/318 (located south of Site 86) and identified CVOCs in groundwater from an undetermined source. Based on these results, the IRP Partnering Team agreed that Site 86 would be expanded to include the SWMU area.

FIGURE 7-3
IRP Site 86, OU 20



Previous investigations are listed in **Table 7-3**. A LUC summary is provided in **Table 7-4**.

TABLE 7-3
Previous Investigations Summary, IRP Site 86

Previous Investigation/Action	Date	Activities
Preliminary Site Investigation (ESE, 1990)	1990	A Preliminary Site Investigation was initiated to determine the presence or absence of contamination based on the site's history. Soil samples were collected and analyzed for VOCs and TPH. The results revealed limited TPH contamination and low-level detections of VOCs, likely attributable to localized surface spills.
UST Assessment (O'Brien & Gere, 1992)	1992	Soil and groundwater sampling was conducted to determine the nature and extent of contamination as a result of three onsite ASTs used for temporary storage of waste petroleum products. Results revealed TPH contamination in soil and identified VOCs in groundwater. Due to the lack of significant petroleum-related impacts and the discovery of chlorinated solvent contamination in groundwater, UST-AS419-21 (original Site 86) was transferred from the UST Program to the IRP in April 1994. Further investigation and remediation of groundwater were recommended.
Remedial Investigation (Baker, 1996)	1995 - 1996	A soil and groundwater investigation was conducted to analyze the nature and extent of contamination. Samples were analyzed for VOCs, SVOCs, metals, and TPH. Soil results indicated localized VOC and metals contamination in samples collected within and immediately adjacent to the former AST area and wide-spread, low-level SVOC contamination (primarily PAHs). Groundwater analytical results indicated the presence of VOC contamination limited to the surficial aquifer in the central and southeastern portion of the site. Although VOCs were not present in the Castle Hayne aquifer, the VOCs appeared to have migrated vertically to the lower portion of the surficial aquifer and were migrating horizontally in the general direction of groundwater flow.
Post-Remedial Investigation Fieldwork	1997 - 2000	To delineate the vertical and horizontal extent of the VOC contamination and to collect additional data to determine the appropriate remedial alternative, post-RI field work was implemented. Soil and groundwater samples were collected for VOCs and NAIPs. A large plume was identified, extending east-northeast from Site 86, and a much smaller plume was identified to the southwest, near a former wash rack area. The plumes were not fully delineated. The results of this investigation are discussed in the Amended RI (CH2M HILL, Baker, and CDM, 2003).
Long-term Monitoring	1998 - 2005	Groundwater LTM was conducted for VOCs, NAIPs, and metals at Site 86 to assess whether contamination remained present, had migrated, or was degrading through natural processes. In 2005, the site was removed from the LTM program, as other ongoing investigations and studies were being conducted.
Amended Remedial Investigation (CH2M HILL, Baker, and CDM, 2003)	2001 - 2003	Based on the findings of post-RI monitoring, an Amended RI was conducted in order to further delineate the nature and extent of contamination. Soil and groundwater samples were collected and analyzed for VOCs. Potential human health risks were identified from VOCs in groundwater. No unacceptable ecological risks were identified.
Air/Ozone Sparging Pilot Study (AGVIQ/CH2M HILL, 2006)	2004 - 2006	The Technology Evaluation Report and Pilot Study Work Plan were completed in 2004, which recommended injection of ozone through a horizontal well. The pilot study was conducted from 2005 to 2006 for the main TCE groundwater plume at the site. The report concluded that TCE concentrations were reduced by 99 percent in groundwater.
Expanded Supplemental Remedial Investigation (CH2M HILL, 2011)	2007 - 2011	The Supplemental Remedial Investigation (SRI) was conducted to identify the potential source of VOCs, characterize the nature and extent of contamination east of the flight line, and assess potential risk to human health and the environment. Soil, groundwater, sediment, and surface water samples were collected and analyzed for VOCs, SVOCs, pesticides, and metals. Potential human health risks were identified based on future exposure to chromium in soil and VOCs and chromium in groundwater. An FS was recommended to evaluate remedial alternatives.

TABLE 7-3

Previous Investigations Summary, IRP Site 86

Previous Investigation/Action	Date	Activities
Pilot Study (CH2M HILL, 2013)	2011 – 2013	To evaluate effectiveness of technologies to treat the VOC plume, a pilot study was conducted in two separate zones at Site 86. ERD with bioaugmentation was conducted in Zone 1 and ISCO using slow-release permanganate candles was conducted in Zone 2. Follow-up monitoring indicates that in Zone 1, the TCE mass was decreased by 93 percent and the VOC mass was reduced by 81 percent. In Zone 2, initial VOC concentrations were reduced by 81 percent and subsequent monitoring results were variable. The results of the pilot study were used for the development of remedial alternatives in the FS.
Feasibility Study (CH2M HILL, 2013)	2012-2013	Remedial alternatives were developed and evaluated to address VOCs in groundwater. The five alternatives were no action, MNA and LUCs, air sparging with MNA and LUCs, ISCO with MNA and LUCs, and ERD with MNA and LUCs.
Proposed Remedial Action Plan (CH2M HILL, 2014) and Record of Decision (CH2M HILL, 2014)	2014	A PRAP was issued in January 2014 to solicit public input on the preferred alternative (MNA and LUCs) and a public meeting was held in February 2014. General comments were addressed during the public meeting and no written comments were received. The ROD was signed on October 29, 2014. The current CSM is shown on Figure 7-4.
Remedial Design (CH2M HILL, 2014) and Draft Interim Remedial Action Completion Report (CH2M HILL, 2014)	2014	The RD presents the design of remedy as specified by the ROD, including MNA and LUCs.

TABLE 7-4

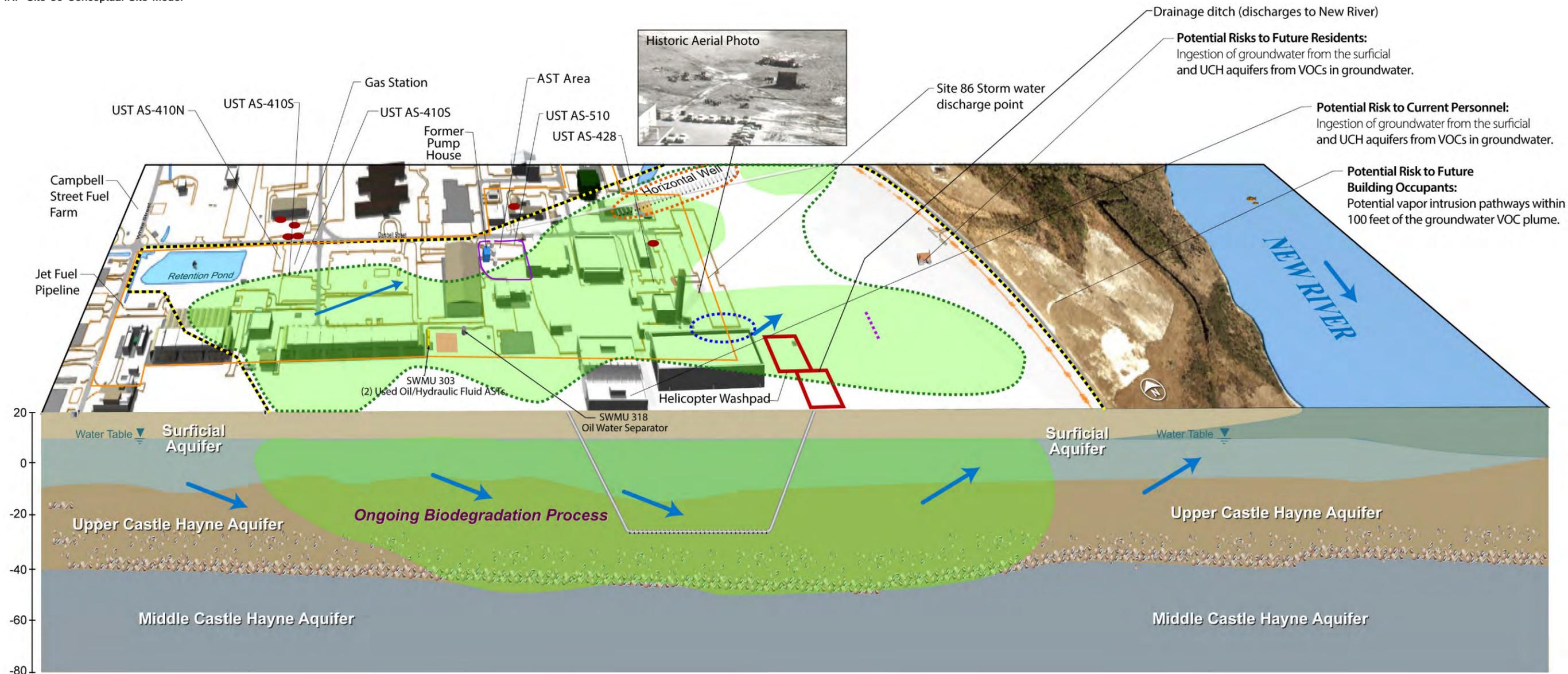
Land Use Control Summary, IRP Site 86

LUC Boundary	Estimated Area (Acres)	Final Land Use Control Implementation Plan (LUCIP)	Onslow County Registration Date
Aquifer Use Control Boundary (1,000 feet)	501	Proposed	--
Industrial/Non-Industrial Use Control Boundary (Vapor Intrusion)	97		

7.1.2.1 Future Activities

In FY 2015, the LUCs will be filed with the Onslow County Register of Deeds, MNA will begin, and the IRACR to document that the remedy is in place will be finalized (**Schedule 7-2**).

FIGURE 7-4
IRP Site 86 Conceptual Site Model



Potential Risks to Future Residents:
Ingestion of groundwater from the surficial and UCH aquifers from VOCs in groundwater.

Potential Risk to Current Personnel:
Ingestion of groundwater from the surficial and UCH aquifers from VOCs in groundwater.

Potential Risk to Future Building Occupants:
Potential vapor intrusion pathways within 100 feet of the groundwater VOC plume.

Legend

→ Groundwater Flow Direction	□ Vehicle Driveway Area
— Horizontal Well	■ COC Plume (Based on 2009 and 2013 data)
▭ Drainage Area	▭ Surface Water Course Area
● Underground Storage Tank	■ Buildings
--- Expanded Site 86 Boundary	▭ Vehicle Parking Area
--- Drainage Ditch	
— Surface Water Centerline	
Utilities	
— Stormwater Drain	
— Water Line	
— Wastewater Line	
— Industrial Waste Collection and Treatment Facilities	
— Historic Wastewater (replaced in 1998)	
Pilot Studies	
--- Horizontal AS Well Pilot Study	
--- ERD and Bioaugmentation Pilot Study	
--- Slow-Release Permanganate Candles Pilot Study	

Note: Not to scale.

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