1.0 PROJECT DESCRIPTION

1.1 INTRODUCTION

The Phase I Remedial Investigation (RI) of the National Advisory Committee on Aeronautics (NACA) Test Area at the Ravenna Army Ammunition Plant (RVAAP), Ohio, (Figure 1-1) will evaluate the presence and distribution of contaminants in soil, surface water, and sediment with respect to facility-wide background criteria for all significant media.

This Phase I RI Sampling and Analysis Plan (SAP) Addendum for the NACA Test Area at RVAAP has been prepared by Science Applications International Corporation (SAIC) under contract DACA62-94-D-0029, Delivery Order No. 0077, with the U.S. Army Corps of Engineers (USACE), Louisville District. This SAP Addendum has been developed to tier under and supplement the *Facility-wide Sampling and Analysis Plan for the Ravenna Army Ammunition Plant, Ravenna, Ohio* (USACE 1996a). The facility-wide SAP provides the basic documentation, technical procedures, and investigative protocols for conducting RIs under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) at RVAAP, whereas this SAP Addendum includes all of the sampling and analysis objectives, rationale, planned activities, and criteria specific to the Phase I RI at the NACA Test Area. Consequently, the Phase I RI cannot be implemented without the guidance provided in both documents. Where appropriate, the SAP Addendum contains references to the facility-wide SAP for standard procedures and protocols.

Both the facility-wide SAP and this SAP Addendum have been developed following the USACE guidance document *Requirements for the Preparation of Sampling and Analysis Plans* (USACE 1994) to collectively meet the requirements established by the Ohio Environmental Protection Agency (Ohio EPA), Northeast District, and the U.S. Environmental Protection Agency (EPA), Region V, for conducting CERCLA investigations.

1.2 NACA TEST AREA HISTORY AND CONTAMINANTS

RVAAP is located in northeastern Ohio in Portage and Trumbull counties and lies about 16 kilometers (10 miles) east of Ravenna, Ohio (Figure 1-1). Operations at the facility date to 1940 and include the storage, handling, and packing of military ammunition and explosives. The facility encompasses 8,668 hectares (21,419 acres) and is jointly operated by the Industrial Operations Command (IOC) of the U.S. Army and the National Guard Bureau. The IOC controls environmental areas of concern (AOCs) and bulk explosives storage areas. A detailed history of process operations and waste disposal processes for each AOC at RVAAP (Figure 1-2) is presented in the *Preliminary Assessment for the Ravenna Army Ammunition Plant, Ravenna, Ohio* (USACE 1996b). The following is a summary of the history and related contaminants for the NACA Test Area.

NACA Test Area (Figure 1-3), designated as AOC RVAAP-38, encompasses an area approximately 914 × 305 meters (3,000 × 1,000 feet) in plan and is located within Training Area "G." The NACA Test Area was used to develop explosion-proof fuel tanks for aircraft, or explosion-proof fuel, and was in operation from 1947 to 1953 (AGOH 1997). An airplane would land on an old clay runway and taxi to the Test Facility along plant roads. The planes were fueled, then propelled under their own power along a guide monorail (crash strip or catapult line) in controlled crashes into a fixed crash barrier at speeds of 80 to 105 miles per hour. The crash strip is a concrete airstrip approximately 488 meters (1,600 feet) long comprised of three parallel concrete

strips. The aircrafts' main landing wheels traveled upon the two outer strips, while the center strip supported a monorail that locked in the aircrafts' nose or tail wheel.

During the period of operation, a total of 17 aircraft were used for full-scale crash-fire studies at the site (AGOH 1997). The crash-fire testing was designed to permit identification of the mechanisms for crash-fires and the true nature of the disruption suffered by airplanes, specifically relating to fuel spillage, combustible vapor distribution, generation of ignition sources, fire incidence and progression, and temperatures and toxic gas concentration. Combustible liquids involved in the crash-fire study included 100/130 octane aviation fuel, low volatility fuel, lubricating oil, coolant compounds, hydraulic fluids, alcohol for deicing systems, and brake fluid. The unburned combustible fluids were generally found within a fan-shaped area beginning at the crash barrier and extending outward (eastward) up to 400 feet. A small drainage pond is located at the southern edge of, and slightly downgradient from, the fan. While it is known that 17,850 gallons of aviation fuel were consumed during this study, the exact amounts of the other combustible liquids expended are unknown. A large portion of the combustible liquids spilled and soaked into the unfrozen ground following impact, releasing combustible vapors into the air that burned long after the crash. Burning continued until the vapors emanating from the soil had diminished to the point at which they could no longer support combustion. An undisclosed number of the aircraft were nearly totally consumed during the crash-fires. Others, however, were significantly damaged, but not totally burned. After the removal of telemetry and instrumentation, a majority of the damaged and burned airframes were removed from the site, however, some were bulldozed into an area east of the end of the strip and buried. A few remnants of the buried airframes protrude from the soil in various places within the training area.

The main expected contaminants are volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), and metals associated with fuels, deicers, lubricants, hydraulic fluids, and fire extinguishing agents, specifically bromochloromethane (AGOH 1997, NACA 1953). Minor amounts of polychlorinated biphenyls (PCBs) may be present due to previous spills or leaks of fluids from equipment. In addition, Demolition Area 1 is located about midway along and immediately south of the catapult strip. This AOC was operational from 1941 to 1949 and included the thermal treatment of munitions and explosives. A Phase I RI for that site is being concurrently implemented with that for the NACA Test Area. As a result of operations at Demolition Area 1, the central portions of the NACA catapult strip may be contaminated with explosive residues, propellants, and metals.

Since 1969 the Ohio National Guard has been the licensed user of Training Area "G." Activities include dismounted troop training, bivouacking of the troops in training, and vehicular parking. The Training Area has also been used as a helicopter day and night landing zone. Firing of small (7.62mm and smaller) blank ammunition is permitted within the Training Area between 1000 and 2200 hours daily.

1.3 SUMMARY OF EXISTING DATA

Appendix A presents a summary of the previous investigations performed at the NACA Test Area. Two previous investigations have been conducted: (1) a Water Quality Surveillance Program (USATHAMA 1980–1992) and (2) a Relative Risk Site Evaluation (RRSE; USACHPPM 1996). Figure 1-4 presents the locations and media sampled during the Water Quality Surveillance Program and RRSE. Table 1-1 summarizes the chemical analytical data relevant to this RI. Historical data are of limited usefulness because data quality documentation is lacking, older analytical methods had lower degrees of precision and accuracy, and detection limits were generally higher for older analyses (i.e., early and mid-1980s data).

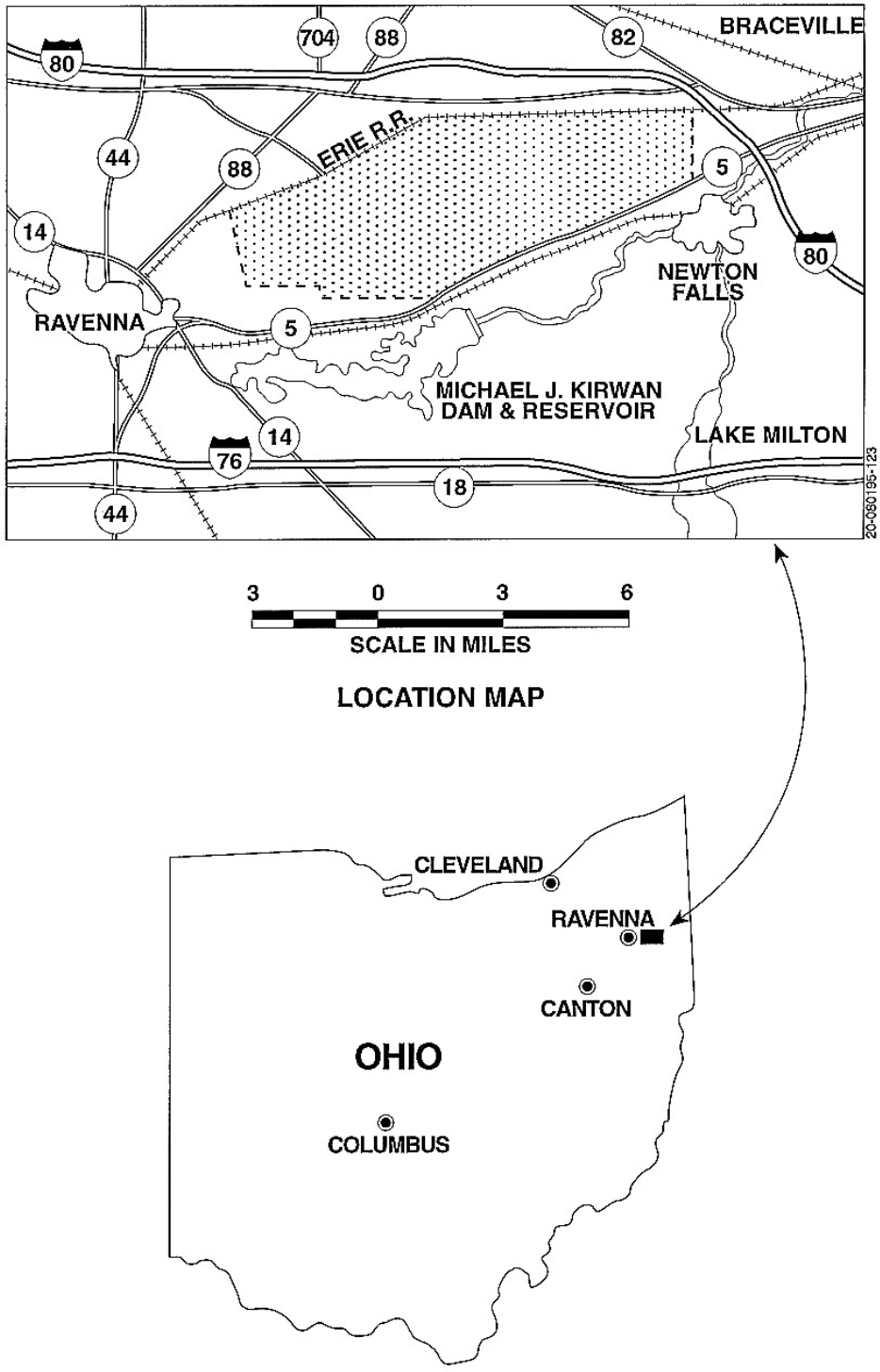

Figure 1-1. General Location and Orientation of RVAAP

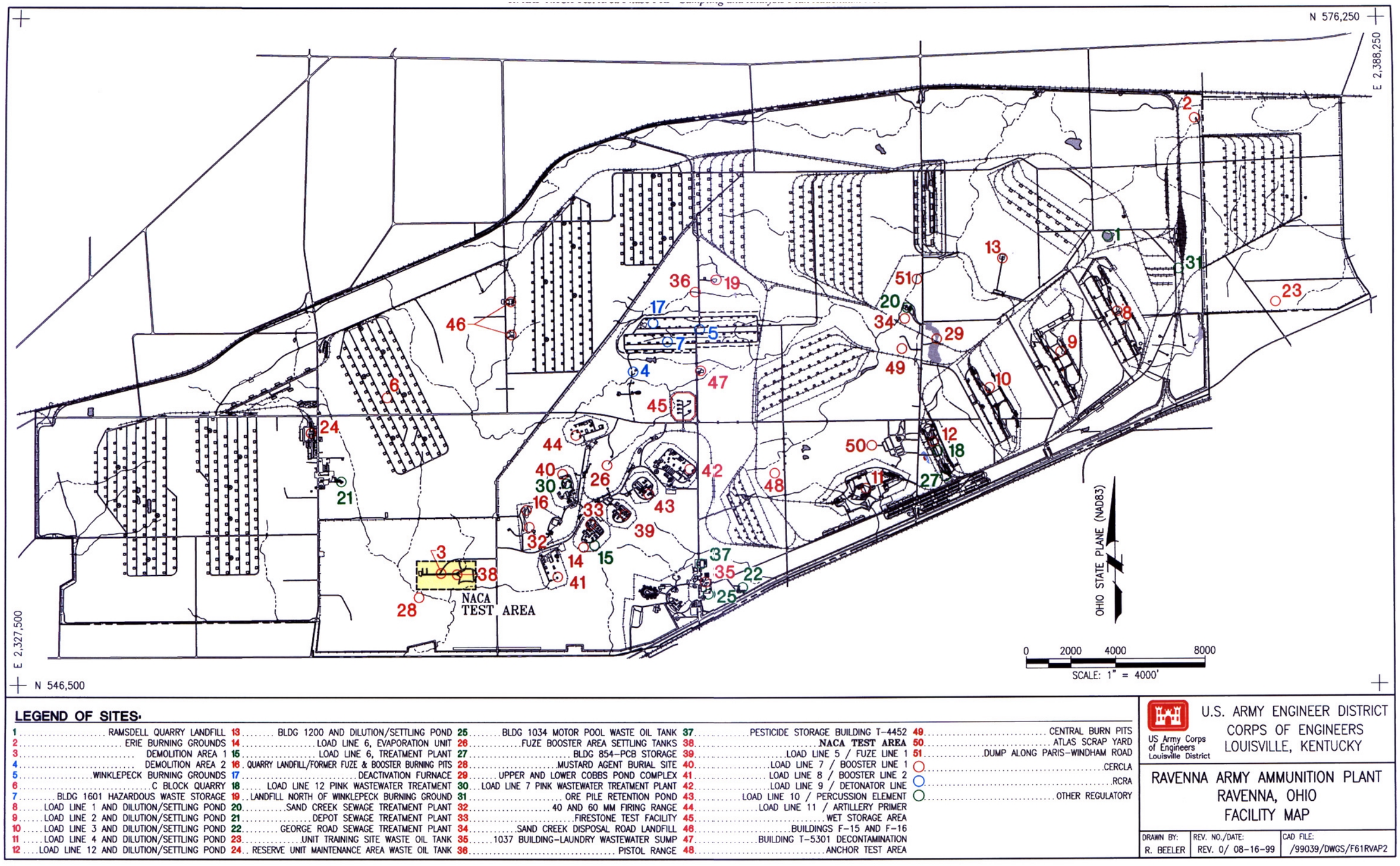

Figure 1-2. RVAAP Installation Map

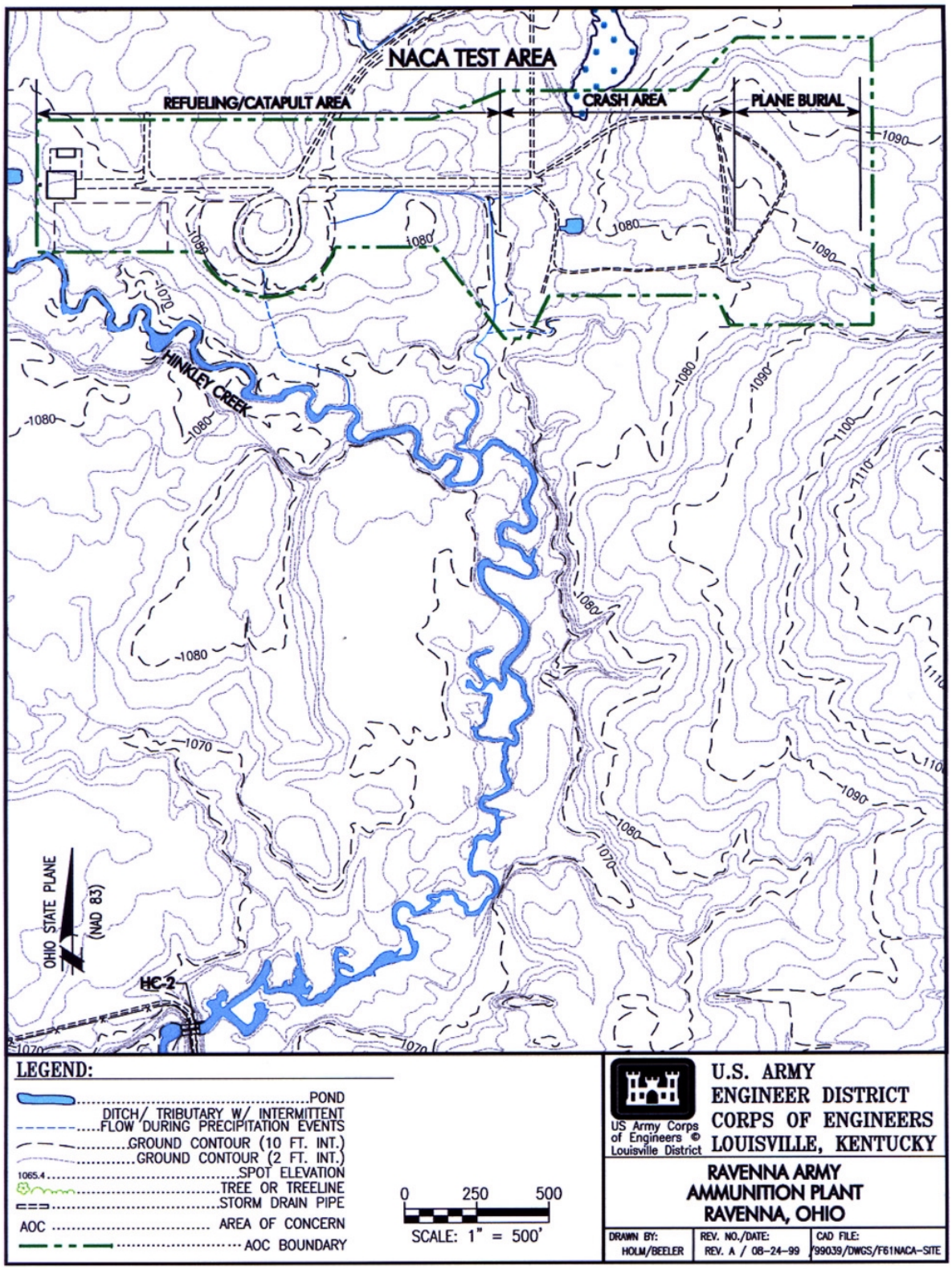

Figure 1-3. NACA Test Area Site Map

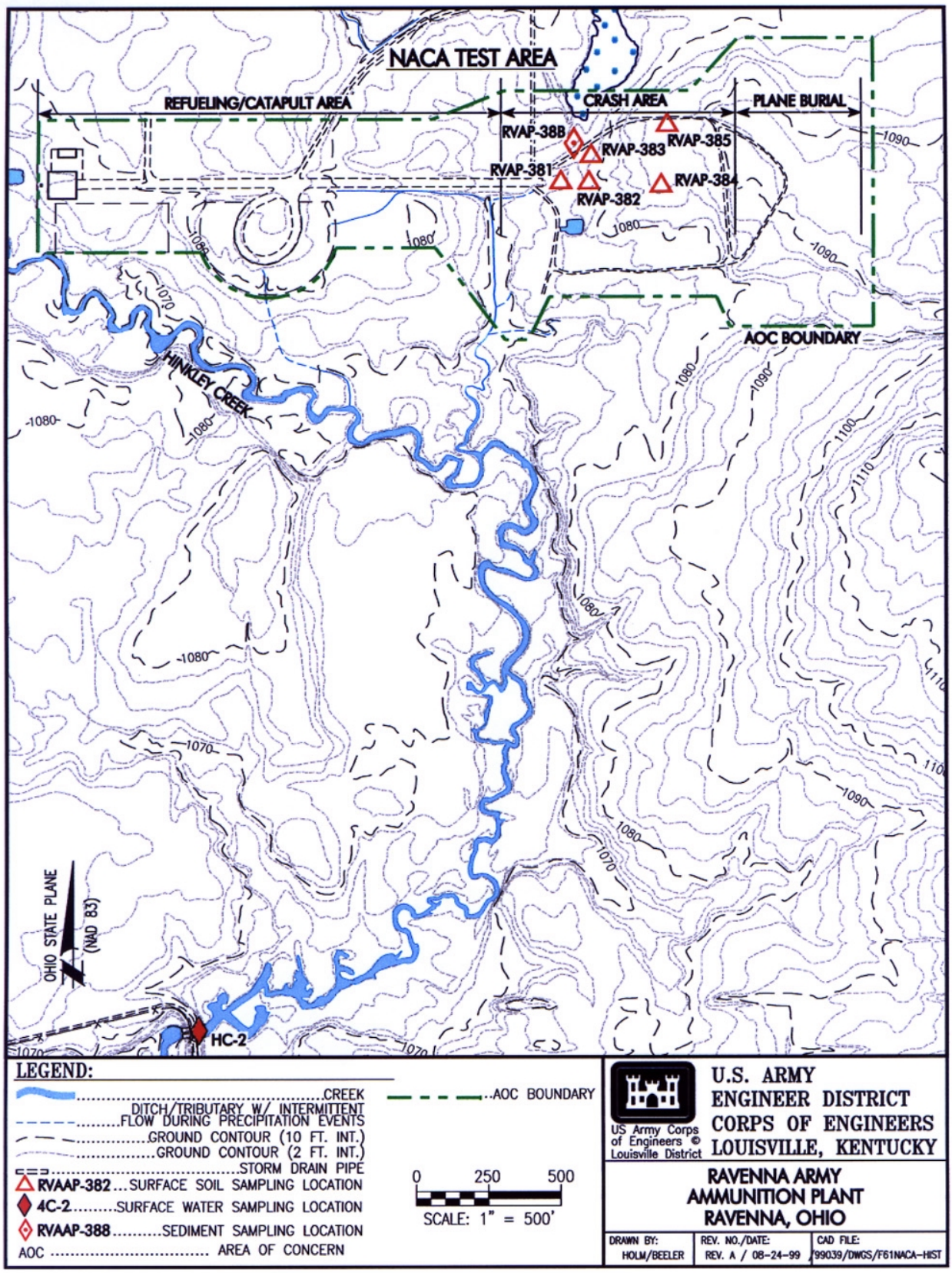

Figure 1-4. Historical Sampling Locations for the NACA Test Area

Table 1-1. Summary of Historical Analytical Data

Parameter	HC-2 Surveillance (water, µg/L)[a]	RRSE (sediment, mg/kg)[b]	RRSE (soil, mg/kg)[b]
Arsenic	ND	3.9	12.7
Barium	ND	67.6	179
Cadmium	ND	ND	46
Chromium	ND	20.3	48.3
Copper	11	4.95	13.4
Zinc	31	44.2	53
RDX	4.8	ND	ND
Phenol	NA	3.8	ND
2-Chlorophenol	NA	3.6	ND
4-Chloro-3-methyphenol	NA	4	ND
1,3-Dichlorobenzene	NA	2	ND
1,4-Dichlorobenzene	NA	1.9	ND
2-Methylnaphthalene	NA	1.6	ND
Methylene chloride	NA	ND	12
n-Nitroso-di-n-propylamine	NA	2.3	ND
1,2,4-Trichlorobenzene	NA	2.1	ND
Acenaphthene	NA	2	ND
2,4-Dinitrotoluene	NA	2.2	ND
4-Nitrophenol	NA	3.9	ND
Pentachlorophenol	NA	4.4	ND
Pyrene	NA	2.2	ND

[a] *Source*: USATHAMA 1980 – 1992. Values are maximum detected concentrations.
[b] *Source*: USACHPPM 1996. Values are maximum detected concentrations.
NA = Not analyzed.
ND = Not detected.
RDX = Hexahydro-1,3,5-trinitro-1,3,5-triazine.

The Water Quality Surveillance Program was conducted at nine sampling locations throughout RVAAP. Of the sample locations, the one of interest to this study was a Hinkley Creek effluent station located east of Post 24 on Charleston Perimeter Road along the southern boundary of the installation (station HC-2; see Figures 1-3 and 1-4). All surface water drainage that exits the NACA Test Area discharges off the installation through this sampling point. However, the station includes drainage from a large area in addition to the NACA Test Area. Copper, chromium, hexavalent chromium, lead, zinc, 2,4,6-trinitrotoluene, and hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX) were monitored annually in surface water. Indicator parameters such as pH, temperature, specific conductance, dissolved oxygen, oil and grease, total suspended solids, fecal coliform, and biochemical oxygen demand were monitored quarterly. Total organic carbon, total Kjehldal nitrogen, nitrate, nitrite, and phosphorus were evaluated semiannually. One explosive compound (RDX) was detected on one occasion (November 1987) among all samples collected and analyzed from station HC-2 between 1980 to 1992. Low concentrations of zinc and copper were occasionally detected.

The RRSE performed for NACA was limited to the evaluation of sediment and soil. Five soil samples and one sediment sample were analyzed for metals, SVOCs, and VOCs, (soil for only VOCs), as shown in Figure 1-4. For the sediment/human endpoint pathway evaluation, concentrations of 4-chloro-3-methyphenol (4 mg/kg) and 2-methylnaphthalene (1.6 mg/kg) were detected in the sediment sample. These compounds were not included in calculating the Contaminant Hazard Factor (CHF) because no risk standard existed for them in the RRSE methodology at the time. Arsenic, barium, chromium, copper, and zinc, as well as a number of organic compounds, were detectable, but all were well below the RRSE standard criteria, and the CHF was

determined to be "low." Migration and receptor pathway factors were determined to be "potential" (i.e., no access or engineering controls were in place), and the human endpoint was determined to be "low" relative risk. For the sediment/ecological endpoint, pyrene was detected at concentrations above the RRSE standard criteria, and thus the CHF was determined to be "moderate." Migration and receptor pathway factors were both determined to be "potential." Thus, the sediment/human endpoint was assessed as a "moderate" relative risk. Surface soil was determined to have a "medium" relative risk, based on a "moderate" CHF (cadmium exceeded the RRSE standard criteria) and "potential" migration and receptor pathway factors.

1.4 SPECIFIC SAMPLING AND ANALYSIS PROBLEMS

Understory plant growth at the NACA may require some clearing by hand in some areas. Available operational data do not indicate that ordnance and explosives (OE) is present on the site. However, due to the proximity of Demolition Area l, OE clearance (avoidance) will be performed prior to and during the sampling effort along the entire catapult strip and plane fueling area at the west end of the strip.