

# SECTION 2

## SAMPLING OVERVIEW

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### 2.1 MULIWAI SEDIMENT SAMPLING STRATEGY

Tetra Tech's sampling program was conducted to support the MMR EIS by collecting and analyzing sediment samples in the muliwai ponds downstream of MMR. Three muliwai ponds were identified for sampling as shown on Figure 2-1. These three muliwai have been identified in the work plan as the north muliwai, the south muliwai, and the dry muliwai. The north muliwai is the pond that results from runoff from Mākua Stream, the principal stream that runs through the center of MMR. The south muliwai is the pond that results from runoff from Kaiahi Gulch, which runs along the south side of MMR. Based on the topography and the drainage ditches along the MMR access road, runoff from most of the live-fire areas and the disposal areas at MMR would drain to the south muliwai. The dry muliwai was dry at the time the investigation was conducted. It is located at the mouth of Punapohaku Stream, which drains the north side of MMR.

Tetra Tech also sampled streambed sediments north and south of these muliwai for comparison. One of these background sample areas was near the mouth of the dry streambed of the Kaluakauila Stream, which drains the watershed immediately north of the Mākua Valley. Kaluakauila Stream is within the boundary of MMR, but is considered a background location because no live-fire military training activity takes place in this watershed. The USEPA collected background samples from this streambed in 1999 for metals analysis. A second background sampling area was selected at the closest drainage south of the MMR valley in the Ohikilolo Valley. The locations of the two background sediment sampling areas are shown on Figure 2-1. Background sample results are useful in evaluating ambient concentrations of chemicals of concern that may result from natural or other sources not related to activities at MMR. These background samples were analyzed for metals and explosives. Site photographs of these activities are included in Appendix A.



Forty-four primary and three field duplicate sediment samples were proposed for collection from a maximum depth of three feet below the pond floor surface at three different ponds located west of MMR (Tetra Tech 2003). An additional six sediment samples and two field duplicate samples were proposed for collection from a maximum depth of three feet below ground surface at two background sites located outside of the MMR boundary. All told, 50 primary sediment samples and five field duplicate samples (ten percent) were proposed in this sampling program. All of these planned samples were collected, however, except for one sediment sample near the center of the south Muliwai, where the water depth prevented access.

The samples were collected in compliance with the health and safety guidelines outlined in the SSHP and the SAP (Tetra Tech 2002b and 2003). All sediment and background samples were analyzed for metals (including mercury) and explosives. In addition, twelve samples (ten sediment and two field duplicate samples) were analyzed for an extended suite of analytes, including cyanide, nitrate, nitrite, total organic carbon (TOC), perchlorate, nitroglycerine, benzene, toluene, ethylbenzene, total xylenes (BTEX), organochlorine (OC) pesticides, SVOCs, chlorinated herbicides, dioxins, and furans. Particle size/sieve analyses were also performed to characterize the set of twelve samples associated with the extended suite of analytes.

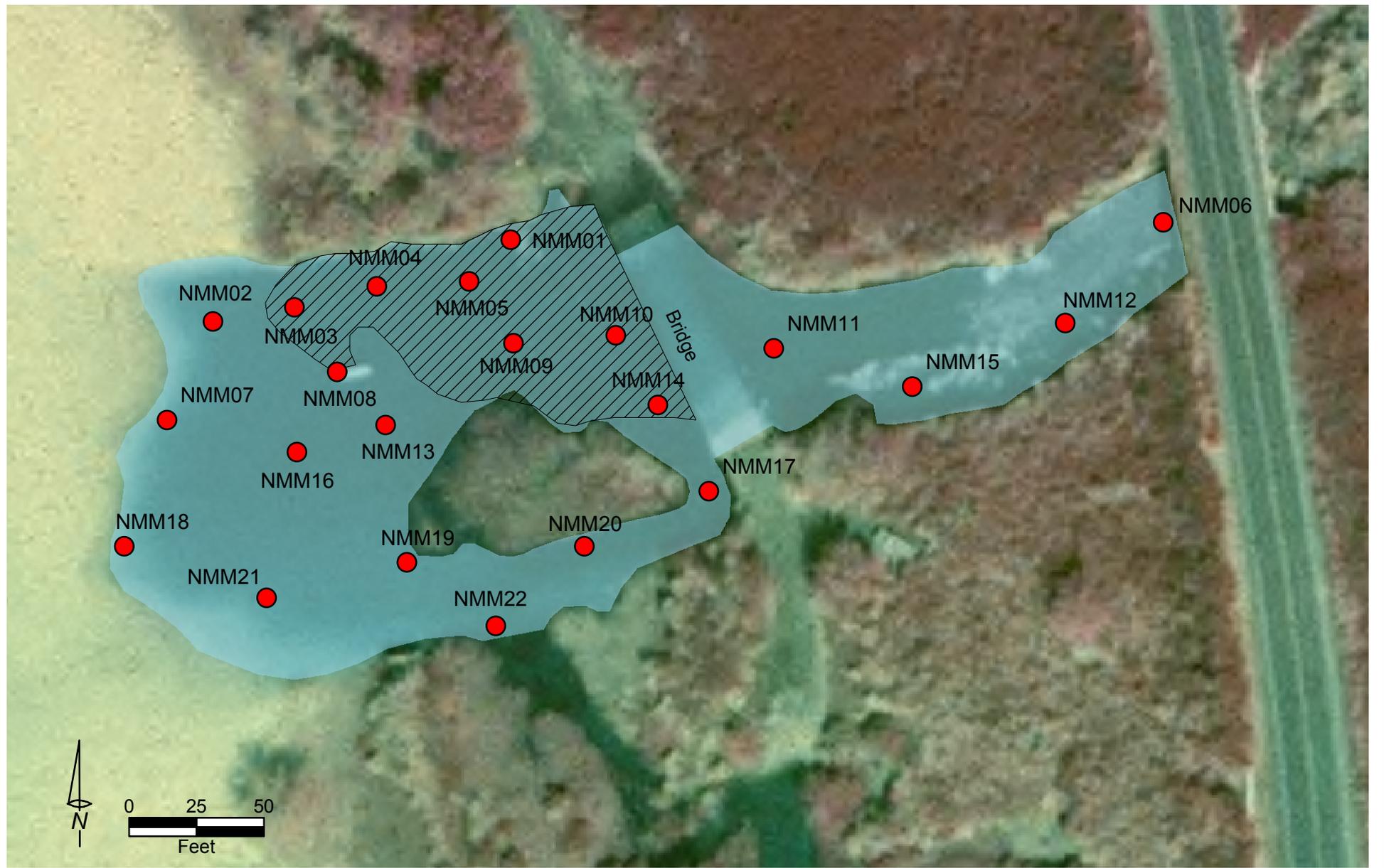
## 2.2 SAMPLE LOCATIONS

### 2.2.1 Muliwai Pond Sampling

The sampling locations for the north and south muliwai ponds, and for the dry muliwai are shown on Figures 2-2, 2-3 and 2-4, respectively. The sampling locations of the north and south background sampling sites are shown on Figures 2-5 and 2-6, respectively. The bases of these figures are registered aerial photographs of the ponds supplied by the Army, which depict a period when the ponds were full of water. The sample locations selected for investigation were identified in the field using a global positioning system (GPS) instrument and by reference to features recognizable in the photographs.

The sampling plan called for collecting these samples from an approximate triangular grid laid out over the ponds' boundaries. Twenty-two sediment samples were to be collected from the composited top one foot of the muliwai floor, and another twenty-two sediment samples were to be collected from the composited top three feet of the floor.

The sample collecting procedure was modified due to conditions encountered in the field. Although, as intended, most of the samples were collected as composite samples, the final sample depths varied depending on the location. Those sample locations that were within the high water level of the historical muliwai, but outside of the low water level area shown on the figures representing existing muliwai at the time of the sampling, were covered with wind-blown beach sand. Test pits were dug at these locations in an attempt to visually identify sediments associated with the muliwai floor; however, this sedimentary horizon was not always found. Also, where the test pit or



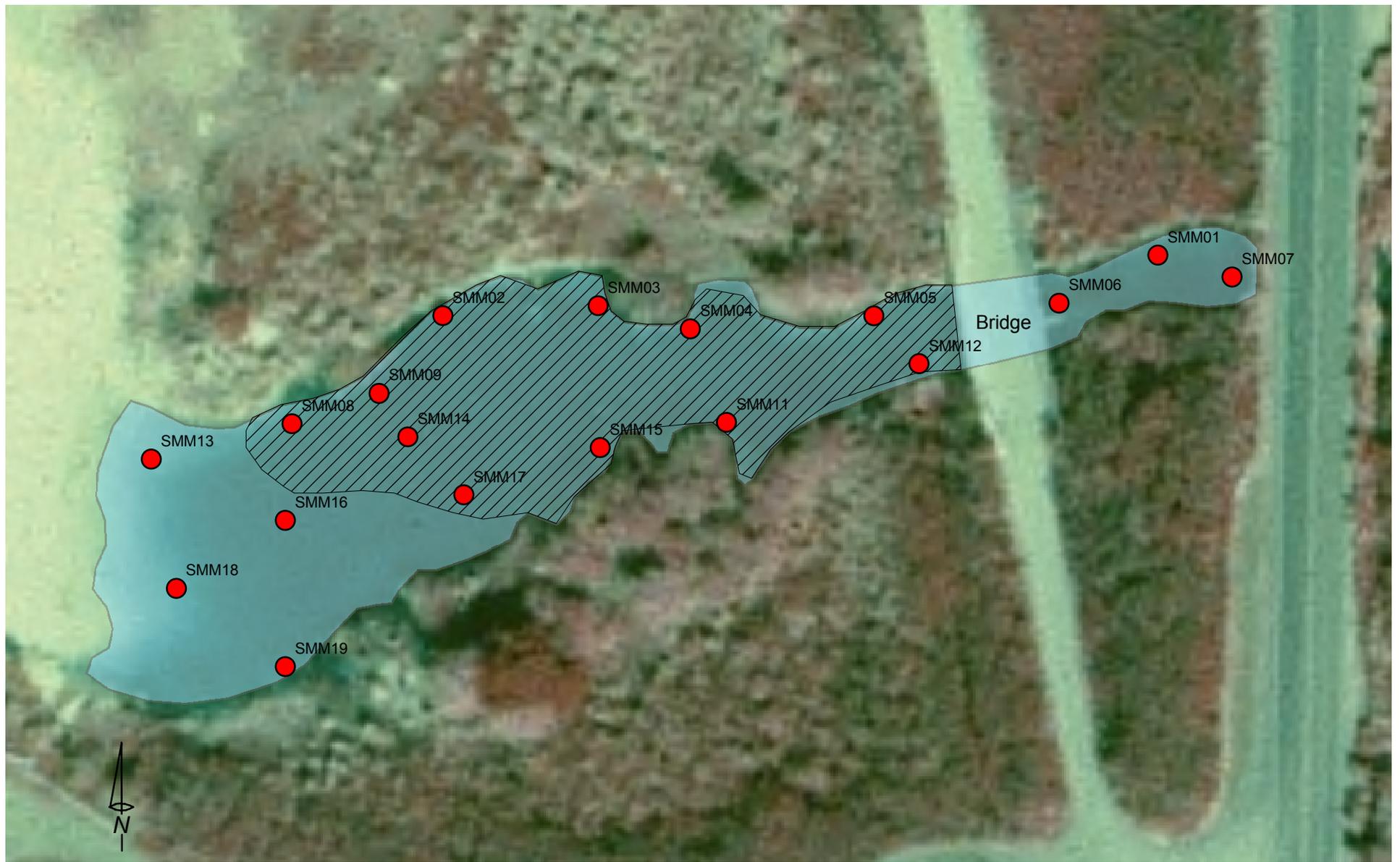
**Legend**

- Sampling Locations
- ▨ Low Water Level - covers approx. 0.1771 acres (7,713 ft sq)
- High Water Level - covers approx. 0.8166 acres (35,570 ft sq)

**North Muliwai Sample Location Map**

Mākua Military Reservation  
O'ahu, Hawai'i

**Figure 2-2**



**Legend**

- Sampling Locations
- ▨ Low Water Level - covers approx. 0.2498 acres (10,879 ft sq)
- High Water Level - covers approx. 0.4915 acres (21,409 ft sq)

**South Muliwai Sample Location Map**

Mākuā Military Reservation  
O'ahu, Hawai'i