Removal Site Evaluation Report
Orote Waste Burning/Disposal Area

Naval Activities (NAVACTS)
Apra Harbor, Guam

June 1997

EXECUTIVE SUMMARY

This document serves as the Removal Site Evaluation (RSE) report for the Orote Landfill Site located at the Naval Activities (NAVACTS) on the island of Guam. This document has been prepared to complement information in the Remedial Investigation (RI) Report (Ogden 1995) for Contract Task Order (CTO) 047. This RSE report has been prepared for the Pacific Division Naval Facilities Engineering Command (PACNAVFACENGCOM) under Comprehensive Long-term Environmental Action Navy (CLEAN) Contract Number N62742-90-D-0019, CTO 0187.

The Orote Landfill Site is located on the western edge of the Orote Peninsula and was previously a limestone sinkhole. This sinkhole was used for disposal of residential, industrial, and construction wastes from approximately 1944 to 1969. The face of a cliff and beach area was reportedly the most active disposal area. The site is approximately 9.4 acres in size.

Previous investigations conducted at the site include an Initial Assessment Study (IAS), 1983; a Site Inspection (SI), 1991; and an RI, 1994. These investigations identified the need for additional data in support of an Engineering Evaluation/Cost Analysis (EE/CA) to be conducted at the site as an RSE.

The objectives of this RSE were threefold: (1) to delineate the southern and western boundaries of the landfill; (2) to assess ground-water quality and flow directions, including analysis of an upgradient background well; and (3) to assess the potential for environmental impacts to the marine environment resulting from the discharge of subtidal ground-water springs.

Surface and subsurface geologic investigations indicate that the Orote Landfill Site is located within a limestone sinkhole underlain by highly karsted and fractured limestone. Landfill soils consist primarily of sands and gravels intermixed with abundant metal debris, industrial hardware, construction debris, glass, oily wood, and minor plastic. Additional subsurface investigations have resulted in the full delineation of the landfill boundaries. During the RI, the thickness of the fill was estimated to range from 0 feet at the outer boundaries to approximately 25 feet in the southeast portion of the landfill. However, during the RSE, it was discovered that the thickness of the fill actually ranges from 0 feet at the margins of the landfill to approximately 42 feet in the southwest central portion of the landfill. Volume calculations based on fully delineated landfill boundaries indicate the presence of approximately 87 acre-feet (141,600 cubic yards) of landfill debris.

Hydraulically, the landfill acts to accumulate and discharge ground water on a seasonal basis. Ground-water gradients and flow directions across the site are strongly influenced by sinkhole morphology and by the N38'W fracture system in the limestone underlying the landfill. Two new

ground-water monitoring wells (MW-11 and MW-12) were installed to further characterize ground-water conditions upgradient of and beneath the landfill. Monitoring well MW-11 was installed in the southern portion of the site outside the landfill boundary. This well was completed in native materials and is located hydraulically upgradient of the landfill. Monitoring well MW-12 was completed in the deepest known portion of the landfill debris.

The nature and extent of contamination at the Orote Landfill Site was assessed by collecting surface and subsurface soil samples, ground-water and seawater samples, and marine tissue samples to assess impacts associated with the disposal of various chemical compounds in the landfill. Soils within the newly delineated portion of the landfill were very similar to those found in other portions of the landfill investigated during the RI. Soils within the central portion of the landfill generally contain higher concentrations of volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), polynuclear aromatic hydrocarbons (PAHs), pesticides, polychlorinated biphenyls (PCBs), and metals than soils along the margins of the landfill. In addition, surface soils generally contain lower concentrations of these analytes than subsurface soils. Analytical results from ground-water samples collected from the upgradient well (i.e., MW-11) indicate that an unidentified source of low-level pesticide contamination is suspected to contribute to overall ground-water contamination beneath the Orote Landfill Site.

Marine springs display high concentrations of iron, zinc, naphthalene, members of the total DDT and chlordane series, and dieldrin. In contrast, higher concentrations for certain types of the dioxin/furan group are observed in samples from a nearshore reference location.

Tissue samples from marine organisms collected in the vicinity of the subsurface springs indicate an accumulation of some chemicals. Organisms collected include brown algae, black sponge, sea urchin, green tunicate, and limpet. Detected chemicals in some of these organisms include arsenic, chromium, iron, lead, tin, zinc, PAHs, DDT, total chlordane, dieldrin, and total PCBs.

As part of the scope of work for this RSE, an addendum Screening Ecological Risk Assessment (SERA) was conducted to address specific conclusions identified during a previous SERA (Ogden 1994) prepared in conjunction with the RI. The principal conclusion of the 1994 SERA was that soil and ground water at the Orote Landfill Site contain elevated concentrations of various contaminants (e.g., organochlorine pesticides, PCBs, PAHs, dioxins, and selected metals) that may be transferred to the marine environment via submarine discharging springs or by surface runoff. Based on the results of the addendum SERA conducted during this investigation, ecological risks associated with presently occurring ground-water discharges to marine waters via springs do not indicate a significant probability of adverse biological effects to the nearshore marine environment. Hence, no obvious benefit to the marine ecology would result from either of the possible capping options for the landfill, whether such a cap would be permeable or impermeable to surface water leachate.

In contrast to the SERA, the Human Health Risk Assessment (HRA) previously conducted during the RI indicated that site-related contamination does pose a risk to human health via dermal contact with soil, soil ingestion, and ingestion of terrestrial organisms. Additionally, the previous SERA conducted as part of the RI indicated possible adverse effects to terrestrial organisms inhabiting the landfill soils; hence, remedial options for the Orote Landfill Site will be driven primarily by the human health risk and terrestrial ecological risk identified during the RI.

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