

Update on the Orote Landfill Groundwater Investigation



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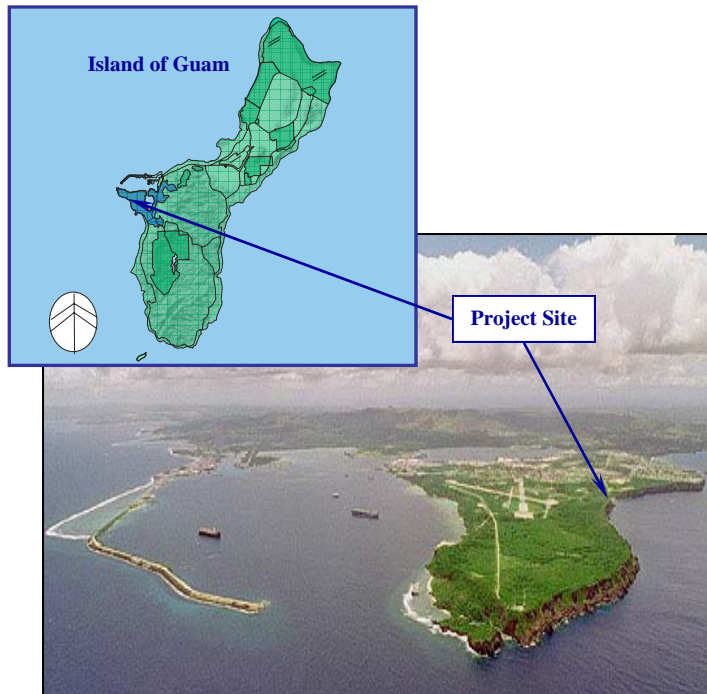


Figure 1: Site Location

Background

The Orote Landfill is located in COMNAVMARIANAS, Guam along the southwest side of the Orote Peninsula (Figure 1). The landfill was stabilized in 2001 with a seawall and cap. This cleanup effort has reduced chemicals seeping into the ocean from the landfill. Levels of landfill chemicals such as PCBs were found in fish near the seawall and a seafood advisory was issued in September 2001.

The results of additional fish sampling conducted during 2003 indicated the Orote Landfill may be a source of PCBs and other chemicals, because the fish caught furthest from the seawall had the lowest concentration of PCBs. Groundwater flowing beneath the landfill is one of the suspected transporters of contamination from the landfill to the sea. Consequently, a groundwater investigation was initiated in May 2005, focusing on the Orote Landfill and the immediately surrounding area.

Groundwater Investigation Objectives

The objectives of the groundwater investigation were to:

- Assess where chemicals occur in the groundwater under the landfill.
- Monitor where the chemicals are going and where they are seeping into the nearby sea.
- Evaluate the effects of tidal fluctuation and rainfall on chemical levels near the seawall.

The above objectives will help scientists and regulators understand where the groundwater is going and what chemicals are in the water, and what risk is posed to nearby marine life.

Groundwater Investigation

Seven new monitoring wells and three piezometers (monitoring wells for measuring water level readings only) were installed and sampled in May 2004. After well installation, water samples were collected and analyzed for PCBs, pesticides, metals, and other chemicals (Figure 2). Water samples are collected every three months (each quarter). The Navy completed five quarters of groundwater monitoring by May 2005.

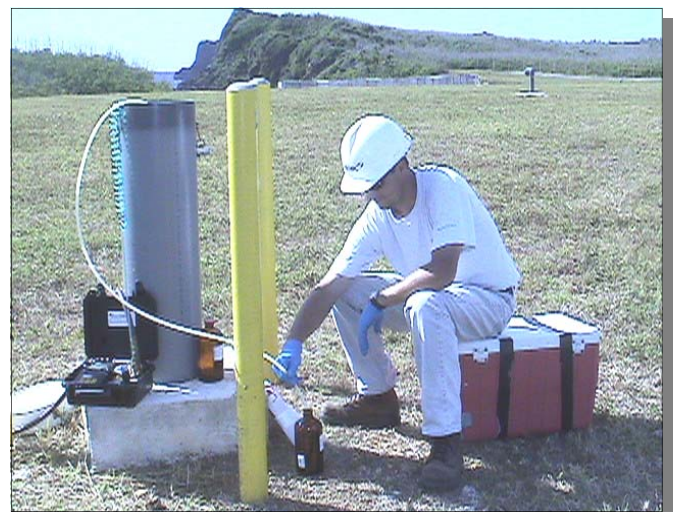
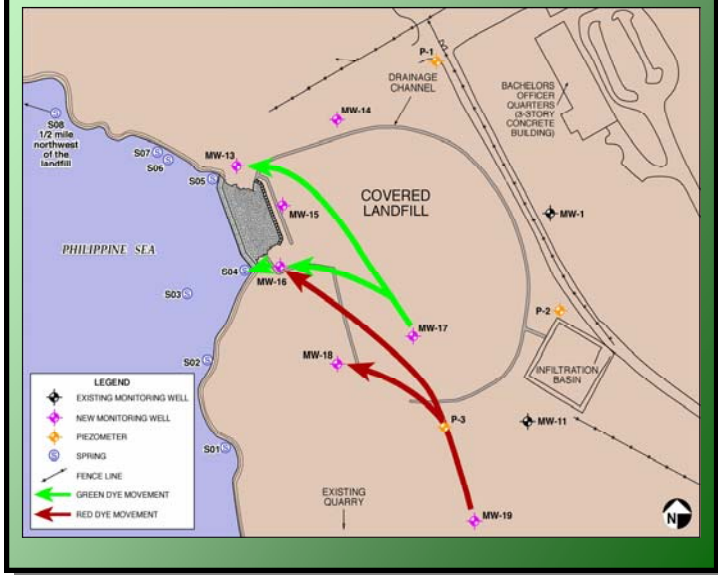


Figure 2: Groundwater Sample Collection

Dye Trace Study

Scientists used harmless dyes to trace the flow of groundwater beneath Orote Landfill, green dye was injected into MW-17 and red dye was injected into MW-19. Water samples were collected from all monitoring wells after dye injection. The presence of dye in neighboring monitoring wells demonstrates how groundwater moves beneath the landfill. If the groundwater contained chemicals it would follow a similar path. Dye trace study results are depicted in the figure below and show that groundwater gets to the ocean.



Groundwater Monitoring Results

The results of the five quarters of groundwater monitoring conducted to date indicate:

- Pesticides, metals, and PCB concentrations are above screening levels.
- Pesticides are found at similar concentrations in groundwater both inside and up gradient of the landfill; indicating that these chemicals may be from another source.
- PAH and dioxin/furan concentrations are below screening levels.

Conclusions

The following conclusions can be drawn from the Groundwater Investigation conducted to date:

- The findings suggest that the low-permeability landfill covering is functioning as designed. Infiltration of rainwater through the landfill and

subsequent leaching of chemicals from landfill materials has been largely curtailed. Groundwater flow predominantly originates offsite to the east and south and passes beneath the landfill materials. Some residual contamination within the underground fracture pathways may continue to be flushed out by this flow of groundwater.

- Groundwater and chemical flow beneath the site is predominantly directed towards the west along pathways formed by intersecting underground fractures.
- Groundwater levels are strongly influenced by the oceanic tidal pulse and is little affected by seasonal climate variations. Major storm events can cause a rapid rise in groundwater levels, however; groundwater flow conditions quickly return to normal.

Upcoming Work

The Navy will continue to assess concentrations of metals, PCBs, and pesticides in groundwater within the vicinity of Orote Landfill. The findings of this Groundwater Investigation will be used to support the Remedial Investigation (RI) Addendum Report that is anticipated to be published in Spring 2006.

The overall objectives of the RI include:

- Evaluate and assess the nature, extent, and source of contamination associated with the Orote Landfill.
- Determine potential chemical migration pathways and receptors.
- Determine potential risk to receptors by conducting human health and ecological risk assessments.

The RI Report findings will be used to assess whether further action is necessary to address the effects of landfill contaminants transported into the sea. The final decision for the Orote Landfill will be documented in the Proposed Plan/Decision Document that is scheduled for publication in Summer 2006.

For More Information

Contact the Commander, U.S. Naval Forces Marianas (COMNAVMARIANAS) at (671) 339-5207 or Guam EPA at (671) 475-1658. Past studies and reports on Orote Landfill are currently available at the Information Repository at Nieves M. Flores Library in Hagatna, Guam.