
NAS NORTH ISLAND - NAVY REGION SOUTHWEST

NAVY ENVIRONMENTAL LEADERSHIP PROGRAM

INFORMATION TECHNOLOGY

MONTE CARLO SIMULATION

LEAD ACTIVITY

Southwest Division Naval Facilities Engineering Command (SWDIV)

STATUS

Complete

MISSION

Reduce cleanup costs by better defining areas of concern and chemical cleanup goals

REQUIREMENT

Navy sites are faced with the task of prioritizing areas of concern during remedial investigations. Simulated assessments are required to provide scientifically defensible statistical distributions of risks and hazards. All Navy and Department of Defense (DoD) sites involved in remedial investigations could use this process to determine risk and hazard levels.

DESCRIPTION

Rapid screening-level assessments were performed for both human health and ecological risks in order to prioritize areas of concern (AOC) during the remedial investigation (RI) conducted at Naval Air Station (NAS) North Island Site 9. Areas that failed the screening analysis for human health or ecological effects were evaluated further in the feasibility study (FS)/corrective measures study (CMS).

State-of-the-art Monte Carlo simulations were used to quantify the uncertainties associated with the AOC-specific risk assessments and provide scientifically defensible statistical distributions of risks and hazards. The Monte Carlo simulation provides approximate solutions to a variety of mathematical problems by performing statistical sampling experiments. For this demonstration a computer-based simulation was performed. The method applies to problems with no probabilistic content as well as to those with inherent probabilistic structure.

The results of the RI screening ecological evaluation conducted at Site 9 indicated that certain areas should be recommended for further action based on a potential threat of adverse impact to the identified assessment endpoints from various chemicals. Other areas were not shown to pose a threat of adverse impact to the identified assessment endpoints. Nine areas were recommended for further ecological evaluation and were not addressed from an ecological perspective in the FS/CMS.

Based on the risks and hazard probability distributions for both human and ecological receptors, several AOCs were eliminated from further consideration in the FS/CMS. For those AOCs showing unacceptable human health or ecological risks, cleanup levels were established for both human and ecological receptors using the Monte Carlo risk/hazard probabilistic analyses. Those chemicals that did not pose a risk to human and ecological receptors were removed from the list of contaminants to be remediated, allowing the remedial design to focus on a subset of chemicals that were the most toxic and mobile in the environment.

The Human and Ecological Risk Section (HERS) of the Department of Toxic Substances Control (DTSC) reviewed the FS/CMS for the State of California and provided recommendations regarding the use of the Monte Carlo simulation for the selection of remedial action objectives (RAOs). Although HERS disagreed with the species used to calculate ecological RAOs, suggesting a more appropriate species be applied, HERS agreed that the simulation was appropriate to determine human health RAOs.

BENEFITS

- Cost savings were achieved by focusing remedial alternatives to only those chemicals representing a true hazard or risk and establishing higher, more reasonable, and more achievable cleanup levels

ACCOMPLISHMENTS/CURRENT STATUS

Date	Activity
MAY 1996	Draft Final Remedial Investigation, Resource Conservation and Recovery Act (RCRA) Facility Investigation Report, Site 9, NAS North Island submitted
NOV 1997	Draft Feasibility Study/Corrective Measures Study, IFS/CMS Site 9, NAS North Island submitted
JUN 1998	"FS/CMS Review" results received from HERS

FUTURE PLAN OF ACTION & MILESTONES

Not applicable

COLLABORATION/TECHNOLOGY TRANSFER

The RI and the FS/CMS were a collaborative effort between NAS North Island, SWDIV, and Jacobs Engineering Group Inc., the consultant who conducted the studies. Monte Carlo simulations may be applied in other risk assessment scenarios as appropriate.

BIBLIOGRAPHY

- Jacobs Engineering Group Inc. Draft Feasibility Study/Corrective Measures Study, Site 9, NAS North Island, November, 1997, Volume 1
- Jacobs Engineering Group Inc. Draft Final Remedial Investigation, Site 9, NAS North Island, September, 1995.

RELATED GOVERNMENT INTERNET SITES

[EPA Region 3: Use of Monte Carlo Simulation in Risk Assessments](#)

RELATED NAVY GUIDEBOOK REQUIREMENTS

- 02039 Solid Waste Management Unit (SWMU) Cleanup

UPDATED: 01/23/02