



US Army Corps
of Engineers®

Engineer Research and
Development Center

SARNAM — Small Arms Range Noise Assessment Model

Problem

Rifles and pistols are fired extensively at small arms ranges for purposes of military and law enforcement training and for recreational and competitive shooting. Noise from small arms ranges often irritates people living in the surrounding community. Their responses may include annoyance, noise complaints, political pressure, legal action, and efforts to curtail the firing activity.

Description of Research

This research continues to refine SARNAM, a software program (now in beta-test) that provides the capability to calculate and display noise level contours for firing operations at small arms ranges. SARNAM is designed to consider type of weapon and ammunition, number and time of rounds fired, range attributes such as size and barriers, metrics and assessment procedure. SARNAM accounts for spectrum and directivity of both muzzle blast and projectile bow shock, which facilitates accurate calculation of propagation and of sound attenuation by barriers. Source model parameter values are based on empirical data. The propagation algorithm assumes a moderate downwind propagation condition and is based on sophisticated calculations and experimental data. SARNAM offers a choice of sound exposure level (SEL) and day-night noise level (DNL) metrics. A variety of frequency weightings are available.

SARNAM features a user-friendly point-and-click graphic user interface, pull down menus, and on-line help, and is designed to maximize user productivity. A library of database records, including weapons (military and commercial), metrics and frequency weighting schemes, is included as part of the software package, and the user can define and store additional entries. Calculated noise contours are displayed via NMPlot (developed for the U.S. Air Force and the U.S. Federal Aviation Administration). Results can be ported to a Geographical Information System (GIS) system via Autodesk Drawing eXchange Format (DXF) file format.

SARNAM is the result of 6.1 basic and 6.2 applied research and development. It has been delivered for beta testing to selected users, including the Environmental Noise Program of the U.S. Army Center for Health Promotion and Preventive Medicine (USACHPPM), which will be the primary DoD user and the transfer agent.

Expected Products

This research has produced SARNAM, an Army-developed PC-based micro-computer application that will run in a Windows® XP, Windows® 2000 (or earlier Windows® versions) environment. Ongoing work continues to improve the model and its software components. Current development will augment SARNAM with a library of database records, including weapons (military and commercial), metrics and frequency weighting schemes, which the user may augment by defining and storing additional entries.



SARNAM helps quantify the noise impacts of small arms fire.

Potential Users

SARNAM will be useful to all of the military services. The program will be specifically designed for use by installation planners and managers who are responsible for training operations (e.g., small-arms ranges), but will also find application within the private sector for applications that involve the use of small arms fire (e.g., law-enforcement agencies).

Projected Benefits

SARNAM users will gain the ability to quantify small arms range noise impact, which facilitates noise management and planning for new and existing ranges. Noise management capabilities include assessing long-term community noise impact, examining noise levels due to a particular firing event, planning range operations, and exploring noise ramifications of range design features such as siting, orientation, and placement of barriers and safety baffles. Noise assessment capability is an essential part of an encroachment management program, which can prevent noise complaints and preclude the need to purchase noise-impacted land. This computerized tool provides a cost-effective, practical approach to resolve the complex calculations required to analyze noise contours.

Program Manager

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