DIRECT FROM ATSDR

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Agency for Toxic Substances and Disease Registry Brownfields/ Land-Reuse Site Tool

Editor's Note: **As part of our continuing effort to highlight innovative approaches to improving the health and environment of communities, the *Journal* is pleased to bring back the bimonthly column from the U.S. Agency for Toxic Substances and Disease Registry (ATSDR). The ATSDR, based in Atlanta, Georgia, is a federal public health agency of the U.S. Department of Health and Human Services and shares a common office of the Director with the National Center for Environmental Health at the Centers for Disease Control and Prevention (CDC). ATSDR serves the public by using the best science, taking responsive public health actions, and providing trusted health information to prevent harmful exposures and diseases related to toxic substances.**

The purpose of this column is to inform readers of ATSDR's activities and initiatives to better understand the relationship between exposure to hazardous substances in the environment and their impact on human health and how to protect public health. We believe that the column will provide a valuable resource to our readership by helping to make known the considerable resources and expertise that ATSDR has available to assist communities, states, and others to assure good environmental health practice for all is served.

The conclusions of this article are those of the author(s) and do not necessarily represent the views of ATSDR, CDC, or the U.S. Department of Health and Human Services.

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Introduction

The Agency for Toxic Substances and Disease Registry (ATSDR) Brownfields/ Land-Reuse Site Tool ("ATSDR Site Tool") was developed to meet the needs of local health departments' request for a tool with rapid site inventory capabilities, including site history, proposed use, contaminants, and future use. This tool was the result of a local public health department survey and includes a robust set of features such as a site inventory, site visit, citizen concerns call log, multiple chemical dose calculator, and document repository. This tool enhances what is available and it is free, cost-effective, and helps protects public health (Figure 1).

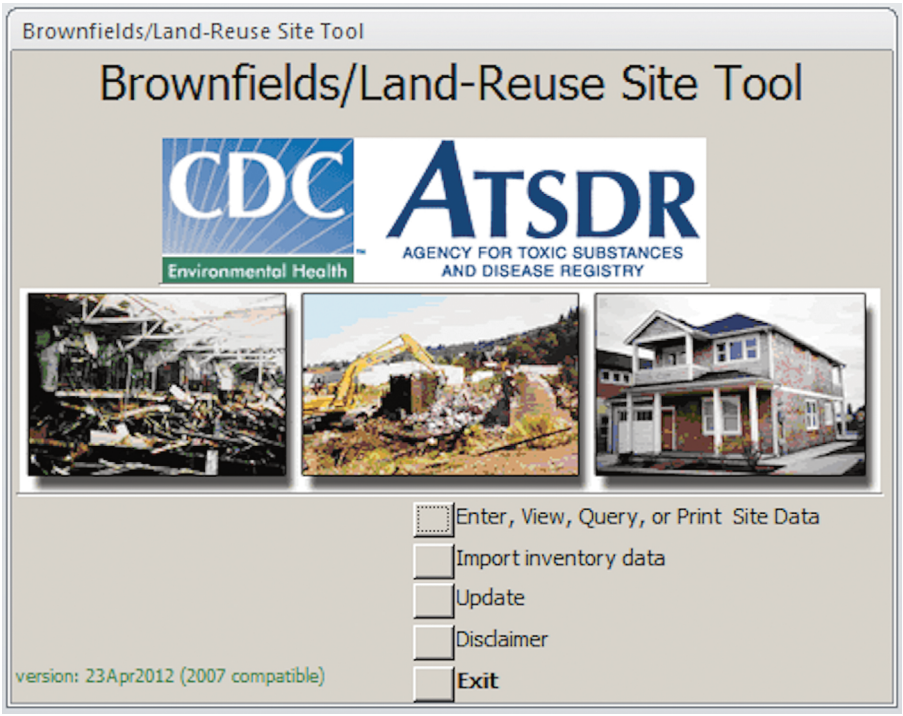
This tool is designed to be used on platforms independent of the Internet. Users may use it virtually anywhere. Moreover, since the data are stored locally, users have full access control to site information. The information may be entered in the field using laptops and shared with other computers by directly importing data from other versions.

Many robust features are included that allow a wide range of data to be collected about a site. Advanced users who have environmental contamination analytical results can process those data quickly through the multichemical dose calculator module and use the resulting public health information to prioritize sites.

Local, state, and tribal governments are currently using this system to enhance their capacity to respond to public health requests related to sites of any kind. This tool emerged out of the brownfields environment; however, its capabilities may be applied to virtually any site where real or perceived contamination exists.

FIGURE **1**

Brownfields/Land-Reuse Site Tool



What Are Brownfields and Land-Reuse Sites?

Brownfield sites are "real property, the expansion, redevelopment, or reuse of which may be complicated by the presence or potential presence of a hazardous substance, pollutant, or contaminant (U.S. Environmental Protection Agency [U.S. EPA], 2012)." ATSDR defines land-reuse sites as any sites slated for redevelopment. This broader definition encompasses Brownfield sites, former Superfund sites, industrial facilities, and any property slated for redevelopment.

Public Health Role in Land-Reuse Sites

Some brownfield sites contain significant physical or chemical health hazards. Physical hazards include open holes, unstable structures, and sharp objects. Past industrial activities often leave behind chemical contamination. Many times these types of sites do not have adequate security to prevent people from entering and being exposed to site hazards. While most adults may show little interest in entering these properties, children and adolescents often view brownfields as playgrounds and places to explore, thereby increasing their risks from exposure.

Public health agencies are an important resource to communities who are either concerned about current health impacts or are considering redevelopment of these properties. Local public health agencies can assist communities in assessing potential health impacts, addressing health concerns, communicating risks, and supporting appropriate actions to protect the health of the community.

Our Public Health Department Survey

On the basis of a formal internal review of ATSDR activities, it is apparent that early intervention and collaboration by state or local health departments (LHD) involved with redevelopment of potentially contaminated sites are essential for success. Interventions may reduce the amount of emergency response activities, increase trust among communities involved in the redevelopment process, and eliminate or reduce harmful exposures to contaminants.

Land-reuse decisions involving local public health departments appear to be minimal. In 2005, the National Association of County and City Health Officials (NACCHO) surveyed over 3,000 local U.S. health agencies. Results described LHD infrastructure and practice (NACCHO, 2006). Less than one in six LHDs reported involvement in land use planning. To that end, ATSDR developed a local health department survey to assess their capacity to work on land-reuse issues.

The pool of potential health departments to survey was obtained from a NACCHO database (Valerie Rogers, personal communication, November 21, 2011). Local health departments identified for inclusion were located in the same county or jurisdiction that received U.S. Environmental Protection Agency (U.S. EPA) brownfields funds in the U.S. EPA Region 5 (Illinois, Indiana, Michigan, Minnesota, Ohio, Wisconsin, and 35 Tribal Nations). ATSDR selected eight (three large and five medium) local health departments for the survey. Seven were located within jurisdictions that received brownfield grant funds. One was located in a jurisdiction that included only limited brownfields involvement activities, mostly from their state brownfields program.

The general characteristics of the eight health departments interviewed varied widely. The average amount of time spent on brownfields/land-reuse site issues was not related to either the population size served or the number of environmental employees. One survey question most applicable to this article was stated as follows: "What tools and training could enhance relevant local health department skills?" The respondents favorably ranked (3.6/5) developing a tool with rapid site inventory capabilities, including site history, contaminants, and proposed future use (Berman et al., 2007).

Our Site Tool Components

One of the main components is the inventory checklist. This includes a series of data screens prompting the user for information for the following topics:

- basic site information;
- type of site;
- type of data available about the site;
- federal, state, local, or tribal involvement;
- proposed future property use;
- distance to sensitive populations (daycare centers, schools);
- chemicals associated with the site;

- community concerns;
- description of known or suspected trespassing; and
- important tribal considerations such as whether subsistence resources are impacted (Figure 2).

Some sites are first identified by concerned community members contacting a government entity. In order to provide assistance with these interactions, the tool has a community concern call log component for collecting these concerns.

Site visits often provide invaluable information when first discovering a site or reevaluating exposure conditions. When visiting a site, it is important to identify contamination and physical hazards, as well was evidence of trespasser activity and proximity to sensitive populations. Coordinating site visits with members of the community and other contacts is an important means of obtaining relevant documents and gathering additional information (Agency for Toxic Substances and Disease Registry, 2005). As a site visit aide, a detailed check list and data collection section is devoted to a site visit. This assists in collecting information to develop a detailed understanding of current site conditions (Figure 3).

Important site-related documents such as reports, photographs, and diagrams are easily imported into the document archival component. These documents become part of one unified location to maintain site files.

Trespassers accessing a site with chemical or radiological contamination may be adversely impacted by exposures to toxic substances. The ability to determine the magnitude of these impacts, especially when faced with multiple sites, is important when prioritizing public health needs and resources. Environmental contamination sampling results enable exposure assessments for potential cancer and noncancer health hazards. Our tool includes an enhanced module for users to establish exposure parameters (e.g., surface area of skin exposed, quantity of contaminant ingested, age and body weight of exposed individual, and duration of exposure). Once the parameters and environmental sampling data are in a spreadsheet format, the tool will quickly calculate exposure doses and possible health risks for numerous chemicals detected in air, soil, water, and fish tissue (Figure 4).

Frequently, environmental sampling results contain wide variability. This tool provides several common approaches for statistical representations of data including maximum, geometric average, arithmetic average, and 95% upper confidence limit (UCL). The 95% UCL is a parameter that provides statistical confidence that the actual site average will not be underestimated. One additional statistical parameters that is often used when considering

FIGURE **2**

Data Entry Screen

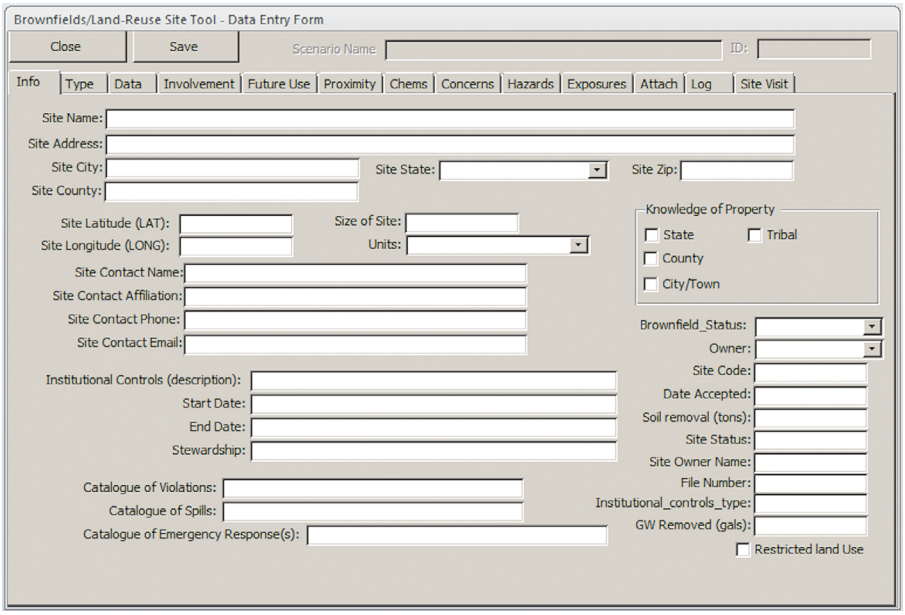


FIGURE **3**

Site Visit Information

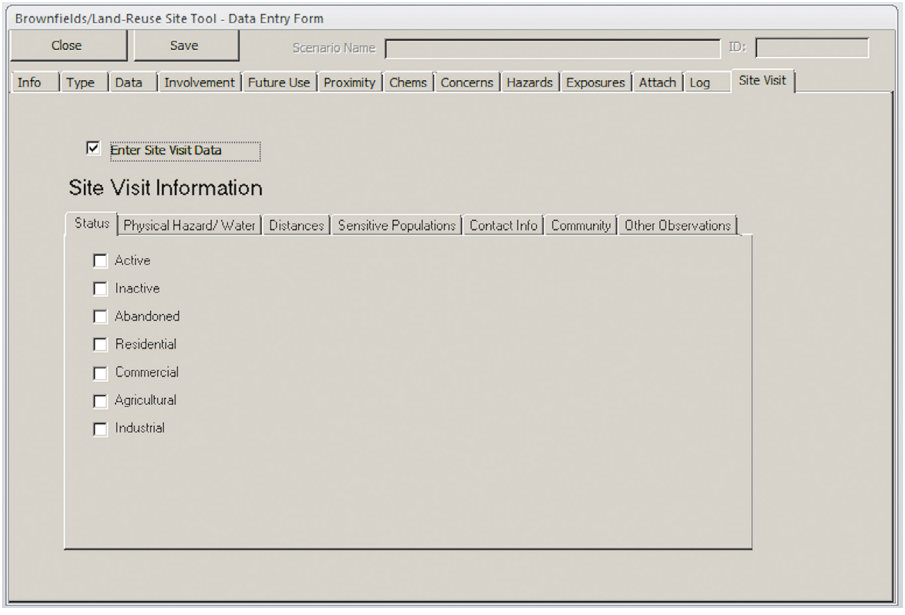


FIGURE **4**

Exposure Parameters Module

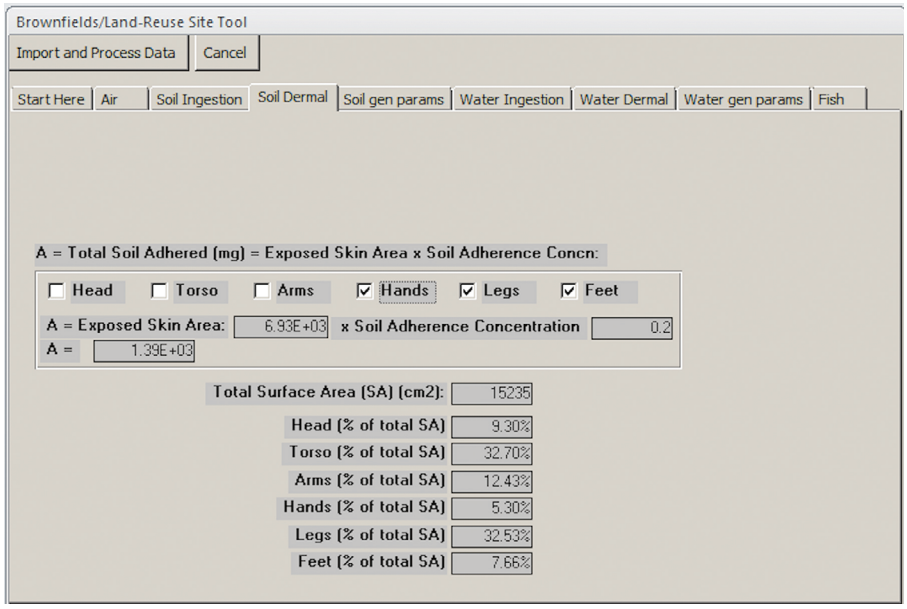


TABLE **1**

Requestors' Affiliations

Requestors	% of Requestor Types
Academia	4.5
ATSDR[a]	8.3
City/County	18.5
Community	5.7
Community group	1.9
Environmental contractors	12.7
Federal	8.9
Health	5.7
International	2.5
State	17.8
Tribal	13.4

[a]ATSDR = Agency for Toxic Substances and Disease Registry.

the use of a 95% UCL is how the data are distributed (i.e., do the data follow the typical bell curve). This tool determines whether the data are normally or log-normally distributed. The data are tested for normality using the Wilk-Shapiro normal test. The log-normality is tested using the same test, except the data are first transformed (Beasley & Springer, 1977; Hill, 1973; Royston, 1995; Taylor, 1970).

When site environmental investigations only contain a limited amount of data or wide variability in values exists, the 95% UCL can be above the highest measured concentration. The maximum value should be considered in that case (U.S. EPA, 1992).

ATSDR has derived cancer and noncancer comparison values for contaminants. They are defined as estimates of an individual's daily exposure to a contaminant that are likely to be without an appreciable risk of deleterious effects. This includes sensitive subpopulations such as children. Such guidelines are not thresholds for toxicity, but are useful for screening to determine whether more detailed evaluations are necessary. These comparison values include Environmental Media Evaluation Guides, the Cancer Risk Evaluation Guide for 10^{-6} (i.e., one in a million) Excess Cancer Risks, and Reference Dose Media Evaluation Guides.

The dose calculation results provide a wealth of information. Five results tables show the maximum, geometric mean, arithmetic mean, 95% UCL, and 95% UCL of log transformed data. In addition, the following parameters are listed for each contaminant:

- chemical-specific comparison value;
- number of sample points exceeding the comparison value;
- number of sample points where the contaminant was not detected;
- number of times the detection limit exceeds the comparison value;
- contaminant concentrations;
- ingestion doses;
- dermal;
- inhalation;
- ingestion cancer; and
- dermal cancer risk.

If all contaminants are detected at concentrations below their respective comparison values, then the contaminations listed can be considered to be below a level of concern. This conclusion can only be drawn for the sampling results provided and the exposure parameters used. If the exposure parameters do not appear to reflect actual conditions, then a reevaluation should be considered.

Carcinogenic risk calculations are produced for contaminants that have cancer slope factors (or inhalation unit risk factors). Combined cancer risk estimation is listed at the end of the results printout (listed separately for ingestion and dermal exposures; as relevant). No assessment is conducted that combined contaminants based on their target end-point toxicity. This conservative approach may overestimate cancer risk since it could combine contaminants that produce unrelated cancer types.

This tool requires a Microsoft Windows®–based computer that has Microsoft Office® 2003 or later. Free hard disk space should be at least 100 MB. A mouse or other pointing device is strongly recommended, though most navigation can be conducted from the keyboard. Screen resolution of 800 by 600 pixels is the minimum resolution. The database is shipped on CD with a tour guide and sample data.

The user has the ability to import existing site data directly into the database. The data import module requires the user to identify the variables in the source file and assign them to the most appropriate field in the tool. Conversely, the data can also be exported to a text file that includes each field (exclusive of attached files). The fields are separated by a comma (commonly known as a CSV or comma-separated value file).

The ATSDR Site Tool is updated on a regular basis. The main deciding factor for up-

dates is either updated comparison values or user suggestions. The updated database file will include an option to import data from a previous version. Updates are available by request on CD and are produced generally after new functionality is added or new comparison values are incorporated, whichever is first. We are exploring the migration of this tool to other platforms including handheld tablet devices and smartphones.

Today, the ATSDR Brownfields/Land-Reuse Site Tool is used in the U.S. and four foreign countries (Romania, Trinidad, United Kingdom, and Canada). Table 1 illustrates the percentage of requestors' affiliation. To request our site tool or future updates, visit our Web site (www.atsdr.cdc.gov/sites/brownfields/index.html) or e-mail us at atsdr.landreuse@cdc.gov.

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