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Project Summary

A Methodology to Inventory, Classify, and Prioritize Uncontrolled Waste Disposal Sites

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A comprehensive approach has been developed for use by local governments to inventory active and inactive waste disposal sites for which little or no information is available and to establish priorities for further investigation. This approach integrates all available historic, engineering, geologic, land use, water supply, and public agency or private company records to develop as complete a site profile as possible. Historic aerial photographs provide the accuracy and documentation required to compile a precise record of site boundaries, points of access, and adjacent land use. Engineering borings for construction projects in the vicinity of suspected sites can be integrated with geologic information to construct reasonable hydrogeologic models to evaluate potential leachate impact on water wells or nearby inhabitants. Sites are systematically ranked in terms of potential hazard, based on current land use, hydrogeology, and proximity to water wells. Greatest attention is given to those sites that could impact public or private drinking water supplies.

This kind of evaluation is a necessary step in prioritizing abandoned dump sites where little is known about contents and where numbers of sites preclude a comprehensive drilling or testing program. Case histories from Monroe County, New York, indicate that a well-designed study provides a conservative estimate of the number of large dump sites which deserve further consideration. The Monroe County study also provided a comprehensive, 50-year inventory of all potentially significant sites in a large urban area (Rochester, NY) in which at least 90 percent of initially identified targets were either eliminated or were not classified as high priority sites.

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This Project Summary was developed by EPA's Environmental Monitoring Systems Laboratory, Las Vegas, NV, to announce key findings of the research project that is fully documented in a separate report of the same title (see Project Report ordering information at back).

Introduction

In order to locate and classify uncontrolled waste disposal sites that could pose a hazard to human health, accurate information is needed on site locations, boundaries, contents, subsurface hydrogeologic conditions, and proximal land uses. Documentation of past waste disposal activities is at best incomplete and, in many instances, nonexistent. An accurate and inexpensive method is needed to develop site information based on existing data so that expensive drilling and testing programs can be focused on those sites of greatest potential hazard to human health.

This report describes a comprehensive approach that can be used by local governments, particularly counties and large municipalities, to inventory active and inactive waste disposal sites for which little or no information is available

and to establish priorities for further investigation. The methods were developed in Monroe County, New York, in response to county and state requirements to locate suspected inactive hazardous waste sites.

The Monroe County approach provides a method for inventorying both known and unknown sites at the countywide level. The method, described schematically in Figure 1, involves accurately delineating site locations and boundaries, developing site profiles, and using geologic information to rank sites in terms of their potential impact on drinking water supplies and nearby populations. This is accomplished by integrating data from a variety of sources. Table 1 lists some of the available sources.

A number of comprehensive systems have been proposed to rank the hazard potential of waste disposal sites. These detailed ranking systems cannot be applied to the type of information developed from this more general survey of sites because they require considerable site-specific information. The methodology developed for this study was designed to inventory and rank active and inactive sites for which little information is available. The ranking scheme is an attempt to apply a relative hydrogeologic ranking scale to all dump sites within a specific area, such as a county, so that significant sites can be further investigated in a logical, consistent, scientific, and efficient manner.

Historical aerial photographs provide the accuracy and documentation required to compile a precise record of site boundaries, points of access, and adjacent land use. Interviews and files in various government agencies substantiate types of activity noted on the photos and provide information on water supply locations. Data from engineering borings for construction projects in the vicinity of suspected sites are integrated with geologic information to construct preliminary hydrogeologic models to evaluate potential leachate impact on water supplies or nearby inhabitants.

When all the information has been collected and reviewed, the sites are identified as one of five types, and if sufficient information is available, assigned ranks for current land use, hydrogeology, and proximity to water supplies. Construction of matrices using combinations of these rankings for individual sites allows the development of an overall site ranking. Depending on the variables that might be considered most important in each region, the relative ranking derived from the matrices can be used to select priority sites for further testing or referral action.

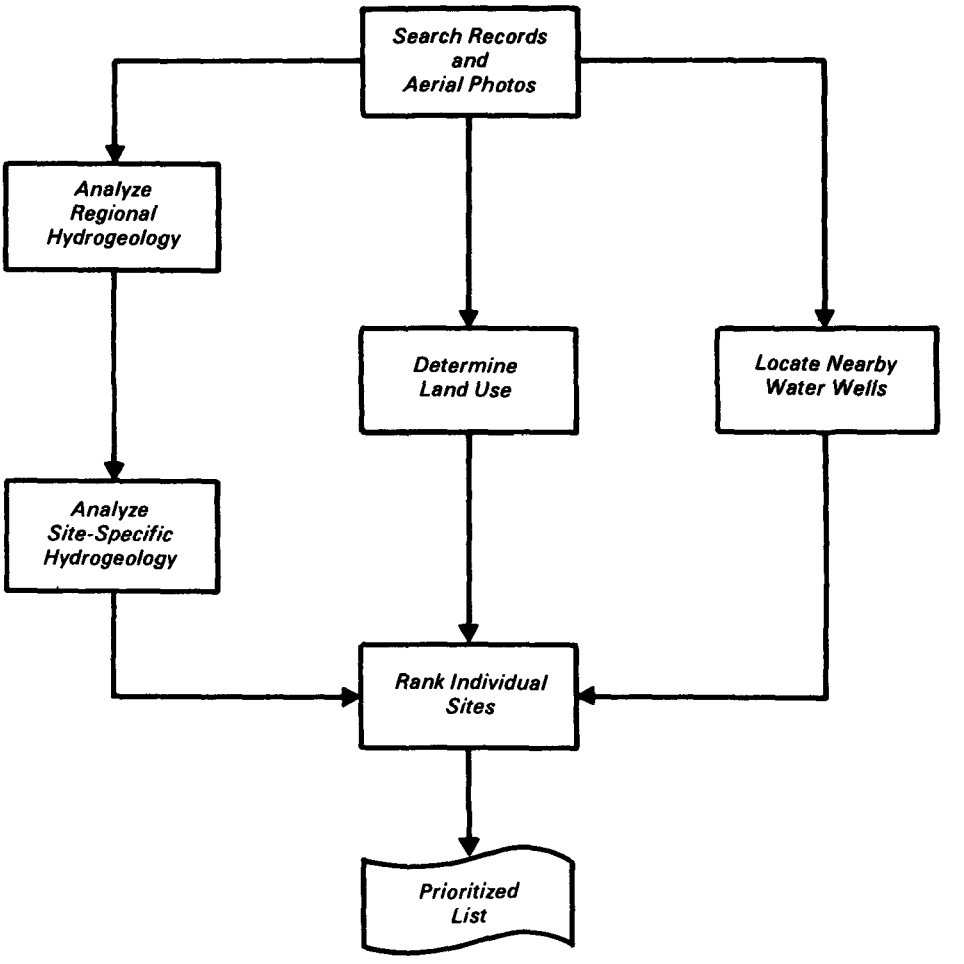

Figure 1. Uncontrolled waste site inventory methodology.

Table 1. Data Sources for Uncontrolled Site Inventory and Prioritization

- *Aerial photographs*
- *Local and state health and conservation agency records*
- *Environmental atlases*
- *Government publications on hazardous waste sites*
- *Historic resources (newspapers, directories, fire insurance maps, plat books, industrial surveys)*
- *Interviews with public officials*
- *Public call-in campaign*
- *Engineering data and reports (soils tests, boring logs)*
- *County soils maps*
- *USGS publications (especially the geologic quadrangle series)*
- *Topographic maps*
- *Geologic maps and reports in professional journals*

Greatest attention is given to those sites that could impact either public or private drinking water supplies. The ranking scheme is based on the assumption that any site could contain hazardous waste because of past unregulated waste disposal practices. Rank is assigned according to potential impact on human health or drinking water rather than toxicity or quantity of waste, because the chemical composition of the waste is generally unknown at this stage of the investigation.

The five basic steps that are followed for the inventory and ranking of sites are

Site Identification: Interpretation of historical aerial photographs, a search of agency records, and a public call in campaign.

Site Characterization: Refinement/ confirmation of information through interviews with local officials, residents, and industrial representatives; review of agency files, street directories, tax records, and historic documents. Location of water supplies in close proximity to sites.

General Geologic Analysis: Development of general hydrogeologic information on depth to groundwater and bedrock hydraulic gradient, the character and permeability of the overburden.

Hydrogeologic Hazard Analysis: Evaluation of sites for potential impact of leachate on nearby water supplies and human populations based on geologic conditions.

Application of Methodology to Rank Sites: Ranking of sites according to land use, geology, and proximity to water wells.

The key to the successful implementation of this type of program is the careful organization and integration by qualified individuals of all the critical resources that might be overlooked or ineffectively utilized in a less comprehensive effort. Involvement of personnel from all affected or peripheral agencies is strongly recommended.

Procedures

Site Identification and Classification

The site identification methodology uses historical black and white aerial photographs in stereographic pairs as the data base to search for unknown sites and to delineate accurate site boundaries. Recommended criteria guide the photointerpreter in distinguishing between waste disposal and fill areas. The photos also supply information on periods of operation and impacts on natural features and nearby residents.

While these photographs serve as the primary source of information on site locations and activity, they must be supplemented by researching old records, conducting interviews, and by a public call-in campaign. These secondary sources, when used without photo analysis, are often insufficient for locating sites and for determining boundaries, periods of operation, and potential impacts. The integration of all available resources is the key to accurate site identification and provides the most complete profile of site activity.

Once sites have been initially identified, it is important to verify the type of activity noted on the aerial photographs. Interviews with municipal and public works officials and representatives of industry and a search of agency records are the best means of confirming waste disposal activity. Local residents are contacted only after other sources have been reviewed. Once waste disposal locations are confirmed, a careful search for private and public water supplies within specified distances of the sites is undertaken.

For both the site characterization and water supply location phases, it is important to contact individuals with detailed knowledge of municipal records and personnel who have worked in the municipality for a number of years. Employees or board members who regularly conduct field inspections often can provide valuable information.

Regional Hydrogeologic Analyses

At the same time the inventory of sites is being conducted, a general geologic analysis of the entire region under study should be done so that sites can be evaluated and ranked according to potential impact on nearby residents and surface and groundwater drinking water supplies. This analysis also provides useful information for site-specific studies conducted during later phases of the project.

The principal products of this regional hydrogeologic analysis are maps of the surface of the underlying bedrock, the surface of the water table, and the overburden thickness throughout the area of interest. A regional map describing overburden composition is also necessary. This basic information permits a general hydrogeologic analysis of factors directly influencing the production, containment, attenuation, or migration of leachate. These factors generally involve the groundwater system, the soil or rock permeability, and the structures within the overburden or rock that control either the direction of movement, rate of movement, or local concentrations of fluids. In most cases, landfills or old dumps will be found in unconsolidated soils or overburden, but occasionally the character of the local bedrock is also significant. The critical factors must be evaluated within the particular region under study.

The detail and accuracy of the geologic interpretations will depend on the quality and types of available information, as well as on the complexity and variability of surficial and bedrock geology. The information needed requires a comprehensive review of published literature, the location and collection of unpublished data, development of both regional and site-specific groundwater models, and an integrated analysis of the geologic/ historic information preserved on aerial photographs. Because there may be valuable geologic information contained on aerial photography, it is recommended that the geologic and aerial photographic analysis be closely coordinated and integrated. Sources commonly used in the development of a geologic data base for both general or site-specific geologic models are geologic maps and reports, county soils maps, aerial photographs and topographic maps, and engineering data from public or private agencies or firms.

Once a site has been identified and all available information compiled from historic aerial photographs and records, a hydrogeologic ranking is assigned based on the best available surface and subsurface information. Since this study does not attempt to deal with the comparative risks associated with specific chemical substances but rather with the hydrogeologic conditions that control the migration of fluids under typical geologic circumstances, direct contamination of groundwater or dwellings near the site is considered the primary concern. This approach dictates that sites with private or public water wells close by should receive the highest priority.

A geologic ranking sheet was developed to allow a subjective but practical comparison of high, intermediate, and low hazard site hydrogeology. It also serves to document the information and the process by which the ranking is accomplished. As such, it becomes a valuable part of the data base to be used for reference and possible revision or updating. The system requires that knowledgeable decisions be made by a hydrogeologist familiar with the local geologic conditions.

Application of Methodology to Rank Sites

In general, studies that deal with the analysis and prioritization of known hazardous waste sites where a great deal of specific information is available on site history, contents, and hydrogeology, rank the sites on the basis of four variables—waste content, land use, proximity to water supplies and hydrogeology. For the

purpose of an inventory of sites, where little is known about the composition of the waste contained in most sites, it is impossible to rank the sites on the basis of waste content for further investigation. Sites can be classified as to kind of activity and then ranked according to land use, potential hazard in terms of geology, and proximity to water supplies.

Once values have been assigned in all of the separate ranking categories, a matrix is constructed to establish final site rankings. In Monroe County only confirmed dumps/landfills, junkyards, and lagoons were included in the matrices, since information on the remaining sites was too limited to justify further investigation. However, records on those sites were maintained in the event that more information became available at a later date.

Since little is known at this stage about the waste contents of most sites, the assumption is made that any confirmed disposal site may contain hazardous waste. It is the potential impact of *assumed* hazardous wastes, then, that is evaluated by using the matrix. The matrix itself combines the variables considered most important for the evaluation of potential impact in the particular area under study. Once all sites within a county or municipality are assigned a priority ranking, referrals are made to appropriate agencies for site-specific action; water supply owners, well owners and site owners are notified.

Conclusion

The methods outlined in this report are a suggested approach based on the experience of one county. Other local governments undertaking a similar study can adapt the approach to meet local needs and conditions. While the procedures described apply to conducting a general inventory, the basic approach can also be used to investigate individual sites. Application of the procedures will reduce the expense of costly drilling and testing programs by focusing resources on the most critical sites.

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The complete report, entitled "A Methodology to Inventory, Classify, and Prioritize Uncontrolled Waste Disposal Sites," (Order No. PB 84-120 153; Cost: $14.50, subject to change) will be available only from:
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