A Manual for Conducting Preliminary Environmental Site Assessments for Illinois Department of Transportation Highway Projects

Anne L. Erdmann
Robert A. Bauer
Phyllis L. Bannon
Nicholas P. Schneider*

** now Executive Director, Nature of Illinois Foundation*

In cooperation with:

ILLINOIS DEPARTMENT OF TRANSPORTATION
2300 S. Dirksen Parkway
Springfield, Illinois 62764

Peter J. Frantz, Chief of Environment
John R. Washburn, Chief of Geologic and Waste Assessments

Open File Series 1996-5

Department of Natural Resources
ILLINOIS STATE GEOLOGICAL SURVEY
William W. Shilts, Chief

615 E. Peabody Drive
Champaign, Illinois 61820-6964
(217) 333-4747

OFS 1996-5

A Manual for Conducting Preliminary Environmental Site Assessments for Illinois Department of Transportation Highway Projects

Anne L. Erdmann
Robert A. Bauer
Phyllis L. Bannon
Nicholas P. Schneider*

** now Executive Director, Nature of Illinois Foundation*

In cooperation with:

ILLINOIS DEPARTMENT OF TRANSPORTATION
2300 S. Dirksen Parkway
Springfield, Illinois 62764

Peter J. Frantz, Chief of Environment
John R. Washburn, Chief of Geologic and Waste Assessments

Open File Series 1996-5

Department of Natural Resources
ILLINOIS STATE GEOLOGICAL SURVEY
William W. Shilts, Chief

615 E. Peabody Drive
Champaign, Illinois 61820-6964
(217) 333-4747

Contents

GLOSSARY OF ACRONYMS

BTEX	Benzene, toluene, ethyl benzene, and total xylenes
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CERCLIS	Comprehensive Environmental Response, Compensation, and Liability Information System
FEMA	Federal Emergency Management Agency
FHBM	Flood Hazard Boundary Maps
FID	Flame Ionization Detector
FIRM	Flood Insurance Risk Maps
GC	Gas Chromatograph
HRS	Hazard Ranking System
HWRIC	Hazardous Waste Research and Information Center
ICC	Illinois Commerce Commission
IDOT	Illinois Department of Transportation
IEMA	Illinois Emergency Management Agency
IEPA	Illinois Environmental Protection Agency
IMD	Illinois Manufacturers' Directories
ISD	Illinois Services Directories
ISGS	Illinois State Geological Survey
ISV	Initial Site Visit
JULIE	Joint Utility Locating Information for Excavators
LUST	Leaking Underground Storage Tank
NPL	National Priority Listing
NRCS	Natural Resources Conservation Service (formerly Soil Conservation Service)
OSFM	Office of the State Fire Marshal
OSHA	Occupational Safety and Health Administration
OVA	Organic Vapor Analyzer
PAH/PNA	Polynuclear Aromatic Hydrocarbons
PCB	Polychlorinated Biphenyls
PESA	Preliminary environmental site assessments
PID	Photoionization Detector
ppm	parts per million (equivalent to mg/kg in solids, and mg/l in liquids)
RCRA	Resource Conservation and Recovery Act
RPTA	Responsible Property Transfer Act
ROW	Right-of-Way
SIC	Standard Industrial Classification
TRI	Toxic Release Inventory
USEPA	United States Environmental Protection Agency
USGS	United States Geological Survey
UST	Underground Storage Tank
VOC	Volatile Organic Compound
XRF	X-ray Fluorescence Spectroscopy

INTRODUCTION

Preliminary Environmental Site Assessments (PESAs) have become an important component of real estate transactions, especially with regard to commercial and industrial property. The regular program of new highway construction and improvement to existing roadways requires the Illinois Department of Transportation (IDOT) to acquire properties that have the potential for environmental problems. Various natural and man-made hazards may be present on existing right-of-way (ROW) or on sites proposed for acquisition. The Illinois State Geological Survey (ISGS) has developed and tested for IDOT a PESA program that provides information on environmental conditions associated with highway projects.

This manual describes the procedures and equipment used by the ISGS in preparing a report on environmental conditions and level of risk associated with man-made and natural hazards that may impact an IDOT highway project. The manual is a product of the PESA program developed by ISGS, and it reflects work completed on more than 800 highway projects since March 1989.

The rating system for risk assessment developed for this program is key to the site assessment process. The rating provides an explicit description of potential site hazards, which trigger specific actions by IDOT to avoid, mitigate, or remediate the hazards.

Program Rationale

State and federal laws (e.g., the Illinois Environmental Protection Act, the Comprehensive Environmental Response, Compensation, and Liability Act [CERCLA], and the Illinois Responsible Property Transfer Act [RPTA]) require landowners, including the state, to be aware of the environmental condition of the property they own or control. Already the largest landowner in Illinois, IDOT routinely acquires property for new road alignments and improvements to existing alignments.

IDOT must be able to assess environmental risks and liabilities associated with such property for the following reasons.

- To protect worker and public safety. Workers who encounter an unknown hazard may be at risk, and may spread the hazard beyond its original limits.
- To reduce IDOT's liability. Environmental site assessments are conducted to determine the environmental condition of a site. This process is usually undertaken to establish the innocent purchaser defense against claims for cleanup expenses under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). To qualify for this defense, IDOT must establish that an appropriate investigation into the environmental condition of the real estate in question was conducted prior to acquisition.
- To avoid delays by operating in an efficient and cost-effective manner. An important difference exists between the standard site assessment conducted for a commercial real estate transaction and the PESAs the ISGS conducts for IDOT. Although IDOT needs to establish that an appropriate inquiry was made for the purposes of CERCLA, the department also needs to have prior knowledge of environmental conditions that could impact the highway project. Such impacts may require mitigation and result in construction delays due to the need for special permits and equipment or to the liability associated with worker exposure to health and safety hazards. Ordinarily, a potential buyer of commercial real estate may elect not to purchase if environmental conditions are shown to be unfavorable, but IDOT may be required to proceed because of the public need. Alternatively, IDOT may be able to redesign the project to avoid a contaminated area.

Potentially hazardous situations can be mitigated in a timely manner provided that IDOT has prior knowledge and is prepared for the situation. Unexpected conditions can create delays, expense, and liability, especially if contamination or other conditions are exacerbated by construction, and jeopardize the health and safety of workers and the public. Also important is the nature of the project itself. A simple resurfacing project that involves no excavation may not be significantly impacted by unfavorable environmental conditions, such as soil or water contamination from a leaking underground storage tank. But if excavation will occur, such as for new traffic signal equipment, utility relocations, or road widening, then the planned excavation may intersect the contamination and require regulated substance permits and special material handling techniques.

These preliminary environmental site assessments performed by the ISGS for IDOT differ from the industry-standard site assessments in two key ways. First, the majority of site assessments performed by environmental consulting firms are single-parcel assessments. The ISGS performs some single-parcel assessments, but most assessments are for multiple-parcel strips of right-of-way (ROW) or new highway construction with several potential alignments. For such projects, hundreds or even thousands of parcels may be impacted by the proposed road work. The intensive methods that are standard for a single-parcel assessment are prohibitive in cost and resources; therefore, the ISGS developed other methods of assessing multiple-parcel projects.

Second, the assessments the ISGS conducts are neither the industry-standard Phase I assessments (background information and on-site inspection, but no subsurface testing), nor Phase II assessments (contaminant plume characterization and delineation). The ISGS performs limited subsurface screen (nonanalytical) testing for volatile organic compounds (VOCs), heavy metals, and chlorinated compounds, but it does not engage in plume or source studies. Through historical research, site inspection, and subsurface screen testing, the ISGS identifies potential environmental hazards for IDOT. IDOT then uses the information to determine whether the hazard can be avoided or whether further information is needed. If IDOT determines further information is needed, it contracts with an environmental consulting firm to perform the necessary source, characterization, and plume delineation studies.

Program Development

In 1989, the ISGS began a program to conduct preliminary environmental site assessments throughout the state for IDOT. To enable determination of environmental risk, IDOT contracted with ISGS to develop procedures to identify sites, prior to their acquisition for ROW or improvements to existing state-owned property, that contain natural and man-made hazards. Discovery of these hazards depends on a thorough investigation of targeted properties, including a review of the historical use of the property and adjacent properties, examination of current uses and conditions, and subsurface screen testing as necessary. The PESA program also includes the evaluation of field testing and analytical equipment and the development of procedures and methods to determine the potential for regulated substance and natural hazard impacts on IDOT highway construction projects. These projects have varied from small actions involving a single parcel to a corridor 112 kilometers (70 miles) long, having several proposed alternate routes.

When the ISGS began the PESA program, little published information was available pertaining to performing environmental site assessments. Subsequently, journal articles and books have been written on the subject, and courses on site assessment procedures have been developed and presented by professional organizations. The American Society for Testing and Materials published *Standard Practice for Environmental Site Assessments: Phase I Environmental Site Assessment Process* (Practice E-1527) and *Standard Practice for Environmental Site Assessments: Transaction Screen Process* (Practice E-1528).

Program Administration

An organizational framework consisting of the principal investigators and three staff groups (data support, project managers, and field support) was established to administer the program. The three groups reflect the three components of the program: collection of historical, geologic, and basic environmental information about an area (data support); analysis of this information and current land use and conditions (project managers); and field and laboratory studies (field support).

Principal investigators The role of the principal investigators is to provide scientific direction and manage the resources connected with the program. They have backgrounds and experience in engineering geology, hydrogeology, surficial processes, and geophysics, as well as expertise in basic research, field and laboratory instrumentation, and field experience. The principal investigators are the final reviewers, and they provide signature approval on all PESAs submitted to IDOT.

Data support staff Each project is assigned to a member of the data support staff and a project manager. The data support staff member locates and compiles background and historical information on the areas in which individual highway projects are located. Geologic, hydrologic, and land use data are assembled from maps of various types, aerial photographs, directories, inventories, and published and unpublished lists. The current checklist contains approximately 45 items for the historical portion of the report (see Historical Methodology Section and appendix A of the appendix). Individual data support staff are responsible for coordinating information with the assigned project manager.

Members of the data support staff may have varied backgrounds. They typically have a degree, some course work, or other experience in the natural or physical sciences, and experience in library research and information retrieval. Important criteria for individuals in this position include attention to detail, thoroughness, and the ability to manage multiple projects. For data support staff members with the appropriate background, this position can serve as training for the project manager position.

Project manager The project manager is responsible for the synthesis of all information gathered for the report. After a review of all data, the project manager assigns the risk assessment rating for the project on the basis of the findings of the investigation. The project manager is trained to make observations related to the project and its environmental setting. This individual must understand the geologic framework of the project and the effects of the geologic setting on environmental elements that may impact the highway project. Project managers are also required to complete the 40-hour Hazardous Waste Worker safety training course certified by the Occupational Safety and Health Administration (OSHA) and the 8-hour annual refresher training.

Project managers are required to have at least a bachelor's and preferably a master's degree in one of the earth sciences or a closely related field. They also require strong verbal and written communication skills. Although the ability to collect and interpret data is of prime importance, the effectiveness of the data is diminished if the investigator cannot clearly communicate the findings in writing in a timely manner. Similarly, since project managers often interact with private individuals and public officials, the ability to communicate effectively over the telephone and in person is important. Observational skills are also key, as well as understanding how geology, geomorphology, and human-induced disturbances of the near-surface geology may impact possible contaminant migration.

Field support Field support staff members are assigned to assist with field investigations to provide the project manager with sufficient interpretive time and maximize report productivity. The field support staff's role is to provide quality-controlled and quality-assured data to the responsible project manager. The data may be collected in the presence of the project manager or according to a site work plan developed by the project manager. Field support staff are trained to operate and maintain the tools and equipment used in conducting PESAs. As is required of the project managers, field support staff also undergo the OSHA-certified 40-hour Hazardous Waste Worker safety training and the annual 8-hour refresher course.

Members of the field support staff typically have a degree, some course work, or other experience in the natural or physical sciences, as well as experience in field and laboratory work. Important criteria for individuals in this position include thoroughness, mechanical aptitude, the ability to physically handle heavy field equipment, and the ability and willingness to travel extensively. For field support staff members with the appropriate background, these positions can serve as training for a position of project manager.

HISTORICAL RESEARCH METHODOLOGY

A PESA is initiated when IDOT submits a Hazardous and Non-Hazardous Waste Assessment Survey Request Form to ISGS. Upon receipt, the project is assigned to a member of the data support staff, who collects information regarding the historical background and the geological and hydrogeological character of the project site. A variety of resources and reference materials are used as part of the historical background evaluation, and they are updated and modified as new information becomes available. The project manager supplements the historical investigation with field observations and further investigations. A checklist of the various sources of information used to prepare a PESA is included in this report (appendix A of the appendix). The following are descriptions of the resources consulted as part of a routine site assessment.

Locational Resources

Topographic maps are available in 7.5-minute (1:24,000-scale) quadrangles for the entire state of Illinois. Topographic maps are used to delineate the project site, determine elevations in the project area, assess the local and regional direction of surficial drainage, estimate the direction of natural groundwater flow, and identify some natural and man-made features in the project area. Names and locations of natural features near the project area, such as rivers, lakes, and wetland areas, can be noted. Man-made features depicted on topographic maps include political boundaries, forest preserves, railroads (active and abandoned), roads and highways, gravel and clay pits, quarries, and mine dumps. Other man-made features specifically labeled on topographic maps include large above-ground storage tanks, sewage disposal facilities, water towers, refineries, schools, hospitals, trailer parks, cemeteries, airports, drive-in theaters, fairgrounds, churches, and electrical substations. Very large buildings, such as manufacturing plants and shopping malls, are sometimes depicted on these maps, as well as smaller residential and commercial properties. Although topographic maps are commonly too general for the determination of site-specific information, the maps are useful for a generalized depiction of the principal natural and man-made features in the project area. The maps are periodically updated. In Illinois, partial funding for the updates is provided by IDOT and ISGS.

Street or city maps are also used for a more detailed description of the project area. They provide the names of streets that may not be included on topographic maps. Address information (block numbers) can also be obtained from some of these maps. A series of historical street or town maps, which provides information about changes in street names through time, can be used when determining the location of industrial and commercial activity through the years. A computerized, commercially available mapping program is commonly used to retrieve map information.

Geologic and Hydrogeologic Information Resources

Soil survey manuals published by the United States Department of Agriculture, Natural Resources Conservation Service (NRCS; formerly Soil Conservation Service) are used to identify the probable soil types and associations found in the project area. These surveys are published by county. The modern surveys available for most Illinois counties contain maps of soil distributions and information on soil parameters, including slope, drainage, permeability, available water capacity, parent materials, pH, organic matter content, rate of surface runoff, and type of natural vegetation. These characteristics can help predict the behavior of pollutants in the subsurface.

The NRCS prepares lists that specify hydric soils and prime agricultural soils for each county in Illinois. Hydric soils can indicate past or current presence of wetlands, which may have to be avoided or mitigated. Nonprime agricultural soils are preferentially used for borrow pits during road construction.

Geologic maps and publications are used to determine the composition and approximate thickness of the surficial materials in the project area, as well as the type of bedrock. Information on site geology is used to predict the behavior of pollutants in the subsurface. The resources commonly used to obtain geologic information are listed below; many of these are available from the ISGS.

The *Geologic Map of Illinois* (1:500,000; Willman et al. 1967) is used to determine the type and approximate age of bedrock in the project area. The map *Buried Bedrock Surface of Illinois* (1:500,000; Herzog et al. 1994) indicates elevations of the bedrock surface in 50-foot (15.2-m) contour intervals. Approximate thickness of surficial materials can be estimated by comparing elevation information from topographic maps and bedrock elevations from the map of Herzog et al. (1994).

Thickness of Glacial Drift in Illinois (1:500,000; Piskin and Bergstrom 1975) depicts glacial drift thickness in 25-foot (7.6-m) contour intervals, and can be used to estimate depth to bedrock. Outcrop areas are depicted as well. *Total Loess Thickness in Illinois* (approximately 1:1,647,360; Fehrenbacher et al. 1986) shows the approximate thickness of loess (a surficial windblown deposit consisting primarily of silt) in the state.

Stack-Unit Map of Geologic Materials in Illinois to a Depth of 15 Meters (1:250,000; Berg and Kempton 1988) depicts the horizontal and vertical distribution of surficial deposits. A series of maps entitled *Geologic Materials to a Depth of 20 Feet* (1:62,500; ISGS 1976, 1977) provides information at a more detailed scale on the composition of surficial deposits for the northeastern Illinois counties only.

Publications in the ISGS Geology for Planning series, available for selected areas in Illinois, include maps at a scale of 1:63,360 that provide information on surficial deposits, soil units, and subsurface stratigraphy. Mineral resources are depicted on these maps as well, including sand, gravel, clay, peat, and borrow materials. Information on engineering geology is included, along with information on groundwater geology and its relation to conditions for waste disposal. Other areas of Illinois may also be covered by publications describing geological characteristics of the area in greater detail. These publications are included in *Publications of the Illinois State Geological Survey*, released periodically.

Hydrogeologic information IDOT distinguishes between two types of PESA projects: those that require an environmental impact statement (EIS) or environmental assessment (EA), and those that receive a categorical exclusion (CE) from having these assessments performed. (The EIS and EA are mandated by the National Environmental Policy Act and should not be confused with the PESA, which is the subject of this manual.) For PESA projects that require an EIS or EA by IDOT, the ISGS collects additional hydrogeological information that is not collected for PESA projects that have CE status. The resources listed below are used to obtain hydrogeologic information for projects that require IDOT to prepare an EIS or EA.

Well logs, sample studies, and engineering and bridge borings near the project area are reviewed to gather site-specific information on geologic materials in the area and depth to bedrock. They can also be used to determine depth, composition, and location of major producing aquifers of the region. This information is helpful in assessing the danger of contaminant migration to a drinking water supply. These well logs and other records are filed by township, range, and section in the Geological Records Library of the ISGS.

To define whether the project right-of-way (ROW) is within a designated groundwater protection area, investigators determine the presence of municipal wells in or near the project area and their corresponding setback zones, as defined by the Illinois Groundwater Protection Act. The source for this information is the *Groundwater Monitoring Raw Source Location Report*, produced by the Illinois Environmental Protection Agency (IEPA) Division of Public Water Supplies, and an accompanying microfiche set of 7.5-minute quadrangle maps on which the locations of many municipal wells have been plotted.

Municipalities, mobile home parks, and other areas served by community water supply wells can request that IEPA analyze the quality of their water supply. The IEPA tests the water supply, and if contamination is discovered, inventories the surrounding area for possible contamination sources. The resulting IEPA reports are available as *Well Site Survey Reports*. These reports provide information on the locations of community water supply wells. They may include some geological information collected during the drilling of these wells, an indication of the quality of the water available from the well in question, and identification of possible contamination sources in the area. The surveys are designed to aid local municipalities and industries in developing and implementing local groundwater protection programs.

Potential for Contamination of Shallow Aquifers From Land Burial of Municipal Waste (1:500,000; Berg et al. 1984) depicts the potential for shallow groundwater contamination, based on the capacities of earth materials to accept, transmit, restrict, or remove contamination from waste effluents. Legislation passed by Illinois in 1994 requires operators of Leaking Underground Storage Tank (LUST) sites that have releases after September 3, 1994, to present to IEPA a classification of their site based on the categories of this map. They must also verify the mapped category of their site by drilling at least one 25- or 50-foot (8- or 15.2-m) borehole on the property. This map, at a scale of 1:500,000, was intended primarily as a tool for regional evaluations and not for site-specific determinations.

Potential for Aquifer Recharge in Illinois (1:1,000,000; Keefer and Berg 1990) depicts the relative potential for water to infiltrate the soil and percolate downward to the uppermost aquifer. This map was also designed primarily as a tool for regional evaluations.

The Illinois State Water Survey (ISWS) maintains the *Public Water Supply Database*, which provides locational information regarding the nearest surficial source of public drinking water in a community, including reservoirs, lakes, rivers, and creeks.

Land Use Information Resources

Plat maps that provide information on current and past ownership of land parcels in the project area are generally available for each county. Because these maps were first published in the late 1920s, and have been updated periodically throughout the years, a sequence of plat maps can provide information on changes in property ownership. Plat maps may also identify land ownership of facilities that may use or handle regulated substances.

Sanborn Fire Insurance maps provide information on the locations and uses of buildings, primarily in urban areas, and they are available for many towns. First published in the late 1800s, these maps have been periodically updated and include detailed illustrations of urban streets and structures located along them. Since building occupancy is typically indicated, these maps can be used to identify a property that was once occupied by a gasoline station or other facility that could be a concern. Specific information, such as the number and location of gasoline or fuel tanks on a parcel, the size of the tanks, and the materials used in building construction, is often given. In addition, these maps show residential dwellings and mine shaft locations. A sequence of Sanborn Fire Insurance maps provides a valuable record of developmental changes in urban areas.

City directories list property owners by address in urban areas. City directories provide specific information on types of businesses, and can provide a record of changes in an area over time. Although available for a limited set of cities and years at the University of Illinois Library, local libraries generally carry city directories specific to their city or town that may not be readily available elsewhere. These sources are typically checked by the project manager during visits to the site.

Historical topographic maps A complete file is maintained by the ISGS. Maps dating back to the early 1900s are available for some areas of Illinois; however, some quadrangles were not mapped at a scale of 1:24,000 until the 1980s. Many quadrangles have been periodically updated, typically about every 10 to 20 years. Historical topographic maps provide a reference for temporal changes in development in the project area. A few examples of common changes depicted by a sequence of topographic maps include expansion of municipal boundaries, name changes, construction of new roads and highways, appearance or abandonment of railroad lines, and size and appearance of quarries, wetlands, surface impoundments, and surface water.

Aerial photographs are used to determine historical land use and developmental change through time. They are available by county, typically for each decade starting in the late 1930s and extending to 1993, at the University of Illinois Map and Geography Library and at other libraries in the state. Unlike topographic maps, which are somewhat generalized, aerial photographs depict all existing features in an area. Land disturbances, such as stressed vegetation, landfill activity, and flooding can be examined, as well as excavation and construction in progress when the photographs were taken. The distinction among agricultural, residential, or urban land use also can be easily determined. As with the historical topographic maps, a sequence of aerial photographs provides an estimate of the timing of construction or land disturbance. In addition, the viewer can often determine the nature of a structure by its shape or configuration. For example, the typical configuration of a gasoline station with circular drive, dispenser island, and small main structure is easy to identify.

Illinois Manufacturers and Services Directories (IMDs) provide information on manufacturers. This information is supplied by participating manufacturers, and not all manufacturers are included. The University of Illinois Library contains selected years of these directories from 1941 to the present. Entries include the street address of an industry, year of establishment, product manufactured, and Standard Industrial Classification (SIC) code. The type of product and the SIC code provide information that can be used to determine the types of regulated substances and wastes that may be used or generated by the facility.

Similar in scope to the IMDs are the Illinois Services Directories (ISDs), which are available for selected years from 1980 to the present at the University of Illinois Library. These books provide similar information on service industries, some of which may use regulated substances. Examples of service industries of potential concern are auto repair shops, dry cleaners, building contractors, landscape design firms, and photo processing shops.

Regulated substance investigation Resources used to determine the types of regulated substances that may be or may have been used or stored at industrial sites include the Historical Hazardous Substances Database (HHSDB), industry overview sheets, chemical information sheets, and the *Handbook of Environmental Contaminants: A Guide for Site Assessment* (Shineldecker 1992). The HHSDB, last updated in 1992 by the Illinois State Museum, lists the potentially hazardous chemicals that may have been used by various industries. HHSDB information is classified by SIC code. Industry overview sheets and manuals on pollution prevention, prepared by the U.S. Environmental Protection Agency (USEPA 1990–1991), describe, in broader terms, the kinds of potentially hazardous materials commonly used in certain types of industries. The *Handbook of Environmental Contaminants: A Guide for Site Assessment* (Shineldecker 1992) is a comprehensive reference source of chemicals that are potentially associated with specific industries, activities, and manufacturing processes. Chemical information sheets, prepared by the IEPA (1987-1989), provide details on properties of specific chemicals.

County collection Compiled and housed in the Environmental Site Assessments Section of the ISGS, this collection of files contains environmental and geologic information pertaining to specific counties. These materials include newspaper articles, excerpts from IEPA's *Cleaning Illinois: Status of the State's Hazardous Waste Clean-up Programs* (IEPA 1989), information on local environmental contacts, notices of IDOT public meetings regarding specific projects, IEPA permit application approvals or denials, and citations for applicable ISGS *Geology for Planning* reports.

Coal mining information Mined-out area maps, produced by ISGS by county, show locations of active and abandoned surface and underground coal mines. Included are the approximate locations of production mine shafts and the index numbers of the mines. Accompanying directories include the names of mine owners or operators and years of mine operation. These maps are revised every two years. If a coal mine is near the project area, further information can be obtained from detailed mine maps, which may depict, for example, the exact location of the mine shafts and the extent of undermining. These maps are available on microfilm in the ISGS Coal Section, and some are in paper copy in the ISGS Library. The official repository for mine maps in Illinois is the Department of Natural Resource's Office of Mines and Minerals. Specific mine notes, contained in county log books in the ISGS Coal Section, give detailed descriptions of some of the mine's characteristics. Depth to coal and coal seam thickness can also often be determined from well logs.

Evaluation of the Potential for Damage from Subsidence of Underground Mines in Illinois (Treworgy et al. 1989) provides information on subsidence potential related to coal and noncoal mines. Another source of information, particularly concerning the effects of coal mine wastes on surface lands, is the *Illinois State Reclamation Plan for Abandoned Mined Lands: Resource Document* (Nawrot et al. 1982). In 1983, a geologic study of longwall sites in northern Illinois provided detailed descriptions of mine wastes in that region (ISGS 1983).

Government Lists and Databases

Various lists and databases prepared and updated periodically by state and federal agencies are consulted for each project site. Properties that appear on any of the following lists or databases and that are suspected to be near the project area are investigated as potential sources of regulated substance contamination. (*Nearness* is defined by the project manager on the basis of site geology, topography, and other conditions.) If a site on which the IEPA maintains records is discovered to be near the project area, the project manager submits a Freedom of Information Act (FOIA) request to the IEPA for the site file. These lists and databases include:

Hazardous Waste Research and Information Center (HWRIC) database This database is maintained by HWRIC using the Illinois Geographic Information System. The database, which details approximate locations of landfills, Comprehensive Environmental Response, Compensation and Liability Information System (CERCLIS) sites, surface impoundments, and special waste handler sites, was last updated in 1989. The listings for special waste handlers are classified into specific categories, such as transporters, generators, landfills, underground injection areas, recycle or reclamation areas, and drum storage areas.

Underground Storage Tank list The Office of the State Fire Marshal's Underground Storage Tank (UST) list contains all reported or known sites that have or once had one or more registered USTs on the property. Information provided on this list includes owner, location, contact name and phone number, status, and number of tanks on the property. This document is updated every two months.

Leaking Underground Storage Tank list The IEPA list of Leaking Underground Storage Tank (LUST) Incident Reports contains all sites at which a release associated with an UST has been reported. Information on this list includes owner, location, Illinois Emergency Management Agency (IEMA) incident number, and IEPA case number. This document is currently updated about every six months.

CERCLIS site/event list This list is a component of the Comprehensive Environmental Response, Compensation and Liability Information System (CERCLIS), and contains names, addresses, and status of evaluation, remediation, and disposition for Federal CERCLA (Superfund) sites within the state of Illinois. The list, available from the USEPA, is updated periodically.

CERCLIS archive list This list includes sites removed from the CERCLIS list (above) because no further action was deemed necessary. The list, also available from USEPA, is updated periodically.

IEPA hazardous waste semiannual update report This report is a summary list that consists of the following general site categories.

- ***Response Action Sites*** either pose an immediate threat or endangerment to public safety, or they are abandoned and no responsible party can be identified. IEPA must remediate these sites.
- ***National Priority List*** (NPL) sites are the most severely contaminated. They are eligible for federal funds to finance cleanup.
- ***Proposed NPL Sites*** have been recommended for, but not yet placed on the NPL.
- ***Noticed/Pre-Noticed*** (N/PN) comprises sites issued a 4Q (cleanup) notice, which informs the responsible parties that an environmental problem has been identified and requests them to investigate. Also included are sites that have not been issued a 4Q notice, but are being remediated voluntarily.
- ***Cleanups Started or Completed*** is a general category for sites where remediation is in progress or completed.

Companies that generate, treat, dispose of, or recover hazardous waste Published annually by IEPA, this report is presented in two sections: (1) companies that generate hazardous waste and ship it off-site for management and (2) companies that generate and manage on-site and companies that manage hazardous waste received from off-site. The list includes generator and facility names and addresses, amounts of Resource Conservation and Recovery Act (RCRA) waste reported, and management categories, such as metals recovery, sludge treatment, and fuel blending.

IEPA solid waste disposal sites This is a collection of lists of the following types of landfills.

- Unpermitted landfills
- Landfills permitted to accept petroleum-contaminated soils
- Landfills permitted to accept nonhazardous special waste, but require a special permit to accept petroleum-contaminated soils
- Landfills permitted to accept general solid waste and construction demolition debris
- Landfills subject to a state surcharge
- Landfills permitted to accept hazardous waste

IEPA-Permitted Storage, Treatment, Recovery, Incinerating, and Processing Facilities (STRIP) list This list includes names and addresses of facilities holding permits to store, treat, recover, incinerate, or otherwise process wastes, as well as information on the type of waste handled and treatment process used. Facilities listed include solvent reclaimers, recoverers of precious metals, waste oil recyclers, aqueous treaters and recyclers, secondary fuel blenders, and incinerators.

Coal gasification sites Historically, gas for lighting and heating was produced from coal by numerous power companies and municipalities. By-products of gas manufacturing included coal tar (containing polynuclear aromatic hydrocarbons, or PAHs) and benzene. Commonly these and other wastes associated with gas manufacturing were left on-site, both above ground and underground. Coal gas manufacturing plants are now recognized as potential sources of soil and groundwater contamination, posing a significant threat to public health and the environment.

The street addresses of former coal gas manufacturing plants throughout the state can be obtained from the IEPA's Bureau of Land, Remedial Project Management Section. In addition, Sanborn Fire Insurance maps sometimes identify these sites. The Illinois State Museum has compiled a report on coal gas works using the Sanborn maps as its reference source.

Injection well inventory In conjunction with the Safe Drinking Water Act of 1974, an inventory of injection wells in Illinois was performed by IEPA and USEPA, and the resulting information was entered into a database (latest version August 1995). The purpose of this inventory was to provide information regarding the type, depth, construction, and other aspects of these wells, with the ultimate goal of protecting underground sources of drinking water from this source of contamination. Class I and Class V wells were identified in this inventory.

Class I wells are used to inject regulated substances beneath the lowermost formation containing an underground source of drinking water. Only a few Class I wells were identified in the inventory. Class V wells are defined as shallow wells used to inject nonhazardous fluids. Class V wells are classified into geothermal reinjection wells; domestic wastewater disposal wells; drainage wells; recharge wells; mineral and fossil fuel recovery-related wells; industrial, commercial, or utility disposal wells; oil field production waste disposal wells; and miscellaneous wells. The injection well database includes facility name and address, legal contact and phone number, and type of fluid injected into the well.

Regulated Substance Incidents near Project Right-of-Way

Information regarding incidents of regulated substance releases near the project ROW may be useful in interpreting results of soil gas analysis and determining additional sites for subsurface testing. Types of incidents include spills, leaks, and other releases to the land, water, or air. Typically, only releases of reportable quantities of regulated substances will be documented. Sources of information for regulated substance incidents are discussed below.

Local information sources Information on incidents of regulated substance releases near the project ROW can sometimes be obtained from the local governmental offices in whose jurisdictions a project route is located. City fire departments are the most likely source of information about incidents occurring within city limits, but in some towns, this information is handled by other municipal departments. Larger cities may have an environmental inspector or individual with similar responsibilities. For rural areas, information can usually be obtained from the township clerk, volunteer fire protection district, county sheriff, county highway department, or the county office of the Illinois Emergency Management Agency (formerly the Illinois Emergency Services and Disaster Agency, a term still used by many county-level agencies). Often the fire department of the nearest city can direct the caller to the best source of this information for the outlying areas. If a local source indicates that a spill or other incident has occurred near the project area, any available information regarding the release and its remediation are noted.

Toxic release inventory (TRI) database The TRI database lists companies that have had reported releases of toxic materials to the environment. It is currently available from USEPA for the years 1987 through 1992. The TRI includes the address of the company, the chemical released, the medium the chemical was released into (air, water, land), the route by which the chemical entered the environment (such as an air stack or public sewage treatment plant), the amount of the release (if known), what chemicals are stored at the facility, and what chemicals are shipped off-site.

IEPA incident database The IEPA Office of Chemical Safety (OCS) maintains a database of regulated substance spills or releases; records date from 1972 to the present. Information that may be contained in this database includes the location of the incident, responsible party, date of incident, type and amount of material spilled, and a LUST indicator, if appropriate. Information on pipeline spills is also included in this database.

Illinois Emergency Management Agency (IEMA) is the official repository of information on regulated substance use and presence at commercial and industrial facilities. It has kept records regarding regulated substance spills since 1987. Information on pipeline spills is also included in IEMA records. A request for information regarding spill incidents is sent to IEMA for every project. IEMA may also have information submitted to it as part of Community Right-to-Know legislation.

Railroad ROW spills Either active or abandoned railroad ROW may be a potential source of contamination as a result of regulated substance spills. The Railroad Section of the Illinois Commerce Commission (ICC) maintains information about spills that have been reported on railroad ROW since 1988, the first year for which records are available within this agency. For abandoned railroads, the IDOT Bureau of Railroads can provide the date of abandonment and other historical information. Railroad yards and roundhouses are also often sources of contamination due to regulated substance spills, dumping, and releases from USTs. These sites are often included on plat and Sanborn Fire Insurance maps.

Natural Hazards

The natural hazards of flooding and the presence of wetlands, as described below, are investigated by ISGS in the PESA process primarily as a check and balance for more detailed surveys performed by other agencies.

Flood maps depict areas at potential risk from flooding. They include the Flood Insurance Rate Maps (FIRM) and the Flood Hazard Boundary Maps (FHBM) prepared by the Federal Emergency Management Agency (FEMA). A set of FIRM and FHBM are housed in the Environmental Site Assessments Section of the ISGS and at the Illinois State Water Survey. These maps, available for most of Illinois, cover both incorporated and unincorporated areas. For areas not covered by FIRM and FHBM, Flood Prone Area Maps, prepared by the U.S. Geological Survey, are available on 7.5- or 15-minute quadrangle sheets.

National Wetlands Inventory maps depict the location and classification of wetlands in Illinois on a 7.5-minute quadrangle base (1:24,000). These maps were compiled by the U.S. Department of the Interior's Fish and Wildlife Service from aerial photographs taken in the early to mid 1980s. Both digital and paper copies are available. Wetland areas are of potential concern because they are susceptible to contamination from upgradient source areas, and because a project that impacts wetlands will have additional permit and mitigation requirements. Avoidance of wetlands is generally preferred.

Landslide inventory The *Landslide Inventory of Illinois* (Killey et al. 1985) map depicts the locations of documented rock falls, rock slumps, earth slumps, earth flows, rock creep, and unclassified landslides, and indicates whether the cause was natural or human-induced. Further documentation on specific slides, including more detailed locational information, is contained on Landslide Information Report forms in ISGS files. Landslide activity has obvious implications for construction engineering practices. Additionally, project managers assigned to the PESA program carry landslide reporting forms during field work and collect data on landslides as they are encountered.

Seismic risk Magnitude of seismic risk potential in Illinois is depicted on the *Seismic Risk Map of the United States* (International Conference of Building Officials 1991), which identifies generalized zones for potential earthquake damage. Corresponding intensities on the Modified Mercalli scale were identified in earlier versions of the Uniform Building Code (International Conference of Building Officials). These zones indicate risk of damage ranging from none in the northern part of Illinois (Zone 0) to major in the southern tip of the state (Zone 3). *Estimation of Earthquake Effects Associated with Large Earthquakes in the New Madrid Seismic Zone* (Hopper 1985) depicts areas of moderate to high liquefaction potential in Illinois, along with their corresponding expected Modified Mercalli scale values for an event similar to the large 1811-1812 New Madrid earthquakes at the same epicenters. Detailed assessments of seismic risk, which require the use of Quaternary geologic maps and other information, are not performed for the PESAs by ISGS.

Alternative Historical Information Resources

In addition to the above materials, other resources may be used to obtain more detailed information concerning a specific parcel. Many of these sources are local and require an increasingly intensive effort to locate and acquire. These resources are not used as part of a routine site assessment by ISGS, but they may be consulted as needed for a particular project. It should also be noted that in large metropolitan areas, such as Chicago, additional information may be available due to the specialized nature of the urban setting. Following is a list of some of the alternative resources that may provide additional historical data.

Local libraries may contain publications pertaining to early historical development of a town, especially commercial and industrial development. They also typically house historical collections of local newspapers and city directories.

Local and county historical societies may have information on the historical development of a town and its neighborhoods. Employees at these organizations often have extensive personal knowledge of the area as well.

Local planning agencies may have information on local land use and past waste disposal and sewage treatment practices.

Property tax files often include records of past ownership, appraisals, maps, and photos of a property.

Title searches provide information on ownership, leases, and easements. They are often kept on file at the municipal or county clerk's office. These records can also be obtained through a title search company. This source is limited because it often provides only the names of past owners or lessees and no information about the corresponding uses of the property.

Building permits can provide records of building construction, demolition, alteration, or modification. They are usually kept by the building department of a municipality or county.

Zoning records indicate land uses permitted by local government and changes in land use over time. They are usually kept by the planning department of a municipality or county.

Public health or sanitation departments may have file information on historical landfills, uncontrolled dumps, and other waste disposal and sewage treatment issues, as well as records on contaminated drinking water wells that indicate a source of contamination in the area.

FIELD INVESTIGATION TECHNIQUES

The field investigation for a PESA is divided into two phases: an initial reconnaissance of the site (initial site visit) and an investigation into subsurface conditions. The purpose of the initial site visit is to verify the geological character of the area, confirm present land use, collect addresses for address-based database searches and for updating other agencies' databases, identify man-made and natural hazards, and target areas for subsurface investigations. Subsequent visits are used to collect more detailed information including determination of the depth to water, soil description, soil gas sampling and analysis, screening for chlorinated compounds such as polychlorinated biphenyls (PCBs), screening for heavy metals, and geophysical screening for buried objects. Other investigations are conducted as required.

Initial Site Visit

The initial site visit (ISV) or site reconnaissance is conducted early in the project history. Typically, the basic historical research is substantially completed prior to the ISV, so that the project manager can investigate beyond present land use for potential environmental problems. Depending on the length and complexity of the project, an ISV may consist of a complete "walk-over" of the site or a slow drive along the project area with stops to investigate parcels of interest. The following elements are included in an ISV.

Preparation The first step in preparing for the initial site visit is a careful review of the IDOT project survey request. If there is any question as to the location or nature of the project, the IDOT district environmental coordinator is contacted for clarification. Historical materials are reviewed, and items that require field checking are identified.

The following investigations are performed at the site. The initial field survey checklist (appendix B of the appendix), which enumerates the physical and environmental conditions pertinent to the PESA process, is used to investigate items checked for every project. Site-specific information is recorded in field notebooks or on site maps.

Topography The direction of surface water flow is noted. Closed depressions are identified, as well as microdrainages that may not show up on a topographic map. Irregularities in the topography, such as mounds or unnatural depressions, are noted.

Water quality Surface water is checked for foam, bubbles, slicks, or sheens. The presence or absence of plant and animal life in the water is noted.

Biota The area is checked for animal life and the general health of vegetation. Obvious areas of stressed vegetation are noted.

Parcel-specific characteristics Addresses and present uses of buildings along the project route are recorded. Any clues that past use may have been different than the present one are noted. Items checked for include stains or discolorations on or around buildings and lots; tanks, debris, drums, and dumped materials; and unusual odors. Particular care is taken to identify former gasoline stations. Evidence for past use as a gasoline station may include dispenser islands, outlines of islands (new asphalt or concrete in the shape of an island), new asphalt or concrete along former piping areas, filler caps, vent pipes that are freestanding or along the building, large overhead garage doors, service bays, pillar and canopy-type architecture, pipes protruding from the ground, tank-sized gravel areas on the lot (these may have subsided as the gravel has settled), and lighting characteristic of gasoline stations, among other features.

Photography Areas that may require subsurface testing are photographed, as well as other features of potential concern or interest.

Other features The locations of natural gas or petroleum pipelines, and other utilities in the area are noted. Transformers and capacitors, both on and above the ground, are identified. Former and current railroad right-of-way and dead-end roads are noted, and these areas are checked for dumping.

Personal interviews with local government officials, employees of businesses, and long-time residents near the site are particularly valuable sources of information. The nature of the interview depends on the project. Inquiries about an active gasoline station, for example, might include

- How long the property has been a gasoline station;
- Whether other gasoline or fuel stations were present earlier;
- Where the tanks were formerly or are currently buried;
- How many tanks are on the property;
- Whether the tanks are the originals;
- Whether there is an underground storage tank for waste oil;
- Size of the tanks;
- Type of fuel (diesel, gasoline, kerosene).

For a former (or suspected former) gasoline station, the interview questions might include

- Whether or not the property was ever a gasoline station;
- For how long and how long ago;
- What was located at the site between the time of the gasoline station and the present facility;
- Whether more than one gasoline station was present;
- Whether and when the tanks were removed or abandoned in place;
- Where the tanks are or were;
- Whether the former owner or operator still resides in the area.

Verification and further collection of historical information The background and historical information is checked for its relevance to the project. Locations and addresses are verified, and distances from the proposed project are noted. Local libraries are checked for additional local information sources, such as city directories. The fire and planning departments, or other local government offices may be contacted.

Delineation of sites for subsurface investigations Before leaving the site, investigators make a preliminary listing of properties at which subsurface testing will likely be required. (This list may change as additional historical information is collected.) Depending on the project schedule, the proposed testing sites may also be flagged at this time for verification of utility location by the Joint Utility Locating Information for Excavators (JULIE), or by DIGGER for sites within the Chicago city limits, as well as by any other necessary authorities.

Asbestos-containing materials In buildings constructed prior to about the mid 1970s, asbestos-containing materials may be present. These materials may be a component of floor tiles, wall and pipe insulation, roof materials, patching or painting compounds, ceiling materials, or stove and furnace insulation. They may also be present in areas where demolition debris is noted. Buildings containing such materials may require more costly methods of demolition and removal of demolition debris. Estimates of approximate age for buildings scheduled for demolition are made from historical background information (particularly Sanborn Fire Insurance maps, historical topographic maps, and aerial photographs, all of which can show the configuration of buildings) and from on-site interviews. If buildings are determined to be at risk for asbestos-containing materials because of their estimated ages this information is made part of the final report. Areas where demolition debris is observed are also delineated.

Subsurface Investigation

Work plan After an ISV is conducted and all historical information is collected, and prior to any subsurface investigation, a work plan is prepared and submitted for review. The work plan consists of

- A description of the project, including nature and extent of the work and depth of excavation planned by IDOT.
- A large-scale map or set of engineering drawings of the project area, annotated with descriptions of all features observed during the initial site visit.
- A description of all sites at which subsurface testing is to be performed. The description includes the number and locations of boreholes at each parcel and the planned depth of boreholes. The geology and estimated groundwater gradient and depth are discussed to the extent that these affect borehole placement. The locations of holes should reflect the potential for identifying environmental problems as indicated from historical or current land use. The number of holes per parcel depends on parcel size, facilities located on the parcel, and any dynamic results of actual sampling. For example, if VOCs are found in the first borehole drilled on a parcel, generally no further holes are drilled. However, in most cases more than one hole per potentially contaminated site is required.
- A listing of all sites at which it might be expected that subsurface testing would be performed, but which will not be tested, and the reasons that testing will not be conducted. Such reasons might include the distance of the facility from the proposed project, information from regulatory agencies on site status, the estimated or known groundwater gradient, or the existence of geologic materials between the site and the project that would impede contaminant migration.

Following approval of the work plan, the subsurface investigation is conducted under the direction of the project manager. This investigation typically includes the following.

Location of subsurface utilities Locations that will require an underground utility check are noted during the initial site visit. The utility check is either performed by area utilities prior to ISGS arrival for subsurface testing at the site, or an on-site meeting with all area utility locators is arranged prior to the testing. If water, sewer, traffic signal, street lighting, or private utility systems are not included in the participating JULIE/DIGGER utilities, checks for these utilities must be arranged separately through the city public works departments or other authority. Also, not all natural gas and petroleum pipelines are included in JULIE/DIGGER; phone numbers for these companies are generally located on pipeline marker signs. Most utility locate requests require 48 hours notice between the time of the request and the completion of the locate job; an additional 48 hours are required following a joint meeting with utility representatives.

Notification of property occupants On arrival at the site, the project manager informs the owner or occupant about the nature of the work, the length of time anticipated to complete the work, and whether sampling is proposed on the owner's property or on IDOT ROW. If the owner or occupant is not present, or if access to the property is refused, sampling is restricted to the IDOT ROW only. If there is confusion regarding which land is ROW and which is private property, and permission to sample is refused, the name, address, and phone number of the owner or occupant are taken and ISGS personnel leave the site. IDOT is then asked to send a right-of-access letter by registered mail to the property owner. When the field staff returns, a copy of this letter is taken along. If further problems regarding access to a site are encountered, IDOT is informed so that it can initiate additional action to gain access.

Observation of general site conditions The project number, date, time, temperature, weather, barometric pressure, personnel, location, and any other pertinent information are noted in a field notebook or on field data sheets.

Immediate survey of site conditions If an immediate or surficial hazard is believed to be present, the organic vapor analyzer (OVA) is started, and the ambient air is surveyed for the presence of volatile organic compounds (VOCs). Additionally, the site is checked for any immediate potential safety hazards, such as open pits and drums.

Geophysical screening of site If the status of USTs on a parcel cannot be resolved through historical research, site inspection, or consultation of owner or fire department records, the parcel is swept with a metal detector or a magnetometer. Other uses of geophysical screening include location of buried drums or piping, and verification of the positioning of the utility location marks. The magnetometer and the metal detector sense the presence of buried metal, and cannot unequivocally determine that an anomaly is caused by an UST. (However, anomaly shape, along with other property indicators such as past use, may indicate the presence of an UST.) Also, deeply buried USTs, or USTs made of fiberglass, cannot be detected with these devices. Size and shape of an UST or other object, such as a pipe, may also cause difficulties in detection.

Documentation of testing site For each borehole, a sketch map is made of the parcel, indicating locations of buildings, ROW, tanks and dispensers (if any), borehole(s), and any other pertinent features. A tape measure or measuring wheel is used to determine the distance of the borehole from landmarks, such as road centerlines or IDOT survey stations. The borehole locations and other pertinent site features are photographed. Changes in conditions since previous site visits are noted.

Drilling of boreholes Several types of equipment are used by ISGS to drive boreholes. These include hand-held power drills, augers, and soil probes. A discussion of each type of equipment and the conditions under which it is used is presented in the section on soil penetration equipment. For all methods, the power drill and drill bit, soil probe, or auger is used to drive the penetration equipment to its maximum extent or to the first sampling depth. Extensions are added until each desired depth is reached. For a typical potential subsurface hazard (such as an underground storage tank), testing is performed at 0.9, 1.8, and 2.7 meters (3, 6, and 9 ft) below the surface.

Regardless of technique used, all boreholes are driven to a maximum final depth of 2.7 meters (9 ft), unless one or more of the following conditions apply.

- The IDOT scope of work calls for shallow excavation only (such as in a resurfacing project).
- Subsurface water is known from nearby boreholes to occur less than 2.7 meters (9 ft) below the surface.
- The suspected source of contamination is at or near the surface (such as a spill).
- VOCs above background levels or other visual or olfactory indications of contamination are detected.

Testing at selected depth intervals is used to determine the approximate depth at which contaminants first occur. When each desired depth is reached, the entire equipment assembly is jacked or pulled out of the ground.

Sampling soil gas from the borehole A well point sampler is assembled as follows. A length of plastic tubing slightly longer than the anticipated depth of the borehole is connected to a disposable well point by way of a short (1.3–1.9 cm [0.5–0.75 inch]) flexible sleeve that is inserted into the well point. Another short sleeve is attached to the opposite end of the tubing to connect onto the organic vapor analyzer (OVA) intake. After the borehole has been drilled and the rod assembly has been removed, the well point sampler is carefully lowered down the hole. If the hole has collapsed, the assembly is removed, and the hole is redrilled. The OVA is calibrated with a methane standard (typically 90–100 ppm) and attached to the well point sampler assembly. The soil gas is sampled, and the OVA meter is read. If volatile organic compounds (VOCs) are detected at concentrations significantly above background levels, a charcoal filter may be used to screen for nonmethane compounds. Otherwise, the gas chromatograph (GC) mode of the OVA can be utilized by immediately injecting the sample through the GC column. If readings are still ambiguous, further GC work on soil gas or soil or water headspace samples can be performed using a calibrated portable photoionization GC.

During testing, the project manager or field support staff member monitors the OVA for any indications that water may be entering the instrument. If the well point is below water level, water will be pulled up into the tubing, requiring replacement of the tubing and well point. The well point is lowered to just above the water level and resampled, and the depth to water is noted. Where possible, when groundwater is encountered, it is pumped up from the borehole and placed into a vial, and the headspace is analyzed for the presence of VOCs. If a soil probe or auger is used, a soil sample may be brought up from the hole and its headspace analyzed for the presence of VOCs. A soil probe may also be used in a drilled hole to collect a soil sample.

Headspace testing In some situations, retrieving a soil or water sample is indicated. Testing of such samples is accomplished by use of the headspace method. Headspace testing can be accomplished by placing a sample of the soil or water into a specially capped container that allows for extraction of a proper volume of sample through a septum. Soil samples can be heated or saturated with distilled water. The sample, soil or water, is agitated to establish equilibrium or near-equilibrium of gas phases in the air or "head" space above the liquid or soil, and a gas sample is obtained for GC analysis.

Removal of assembly After sampling, the well point sampler assembly is removed. If VOCs were not detected, the tubing, well point, and rods are ready to be used at the next hole. If VOCs were found, the tubing is discarded, and the well point is set aside for cleaning. If VOC levels are too high to permit successful decontamination at the site, the apparatus is brought back to the office for cleaning. Otherwise, the rod assembly is cleaned at the site using a commercial cleanser and water.

Filling of holes After removal of the well point sampler assembly, the hole is backfilled with drill cuttings, gravel, or other loose material until the hole is about 10 centimeters (4 inches) deep. It is then filled with soil, asphalt, or cement until it is level with the original surface.

Site photography After their completion, most boreholes are documented by photography. Key elements of this photography include a unique, readily visible marker for the borehole (typically an orange traffic cone), sufficient distance to observe the relation of the borehole to characteristic site features, and documentation of the date, time, and direction of view of the photograph. These photographs can be helpful if a borehole needs to be precisely relocated during subsequent site investigations or review.

Other Tests

Screening for chlorinated compounds Areas where polychlorinated biphenyls (PCBs) may be present include electrical transformer sites at power substations, at large buildings, and on utility poles. Until the mid 1970s, electrical transformers commonly contained PCBs in cooling oils. Other possible locations where PCB contamination may exist include junkyards, transformer manufacturers, pipeline pumping stations, railroad signal boxes, parcels where old appliances may have been dumped, and areas of discolored soil when the material is unknown. Where PCB contamination is suspected, a screening test is performed. If discolored soil is present, it is sampled for the analysis. Otherwise, soil from within 15 centimeters (6 inches) of the surface is collected and used for the analysis.

Alternative Field Methods

Several other techniques are possible for delineating subsurface environmental hazards. In particular, several geophysical methods are available that may be useful for detecting buried objects, such as tanks, drums, and pipes. The methods described below may be useful in site-specific cases, under ideal conditions, but they were considered not efficient or effective for routine use in highway assessment projects. Assessment of some of these methods is still ongoing.

Electromagnetic induction In the electromagnetic induction method, subsurface conductivity is measured as a low-frequency electromagnetic signal is sent through the subsurface. Variations in conductivity are generally a result of variations in soil porosity and composition, amount of water saturation, and composition of subsurface fluids, among other factors. As a result, lateral variations in conductivity may be used to infer the presence of buried objects such as drums or tanks. Limitations of the method include interference caused by buried utilities, nearby buildings, overhead power lines, and metallic objects such as automobiles.

Electrical resistivity Electrical resistivity involves the measurement of subsurface resistivities as an electrical current is transmitted into the subsurface. The resistivity of a material is the reciprocal of its conductivity, so the factors listed above that affect the conductivity of a material also determine its resistivity. Limitations of this method are similar to those of electromagnetic induction techniques, and they include interference caused by the presence of metallic objects and power lines. In addition, this method requires that steel electrodes be driven into the ground to transmit the electrical current, an action that makes this method relatively impractical for use in paved areas.

Ground-penetrating radar Ground-penetrating radar involves the radiation of short-duration pulses of electromagnetic energy into the subsurface to produce an image of subsurface conditions. The method is extremely sensitive to the conductivity of the subsurface material and works best in dry sandy soils (low conductivity). In areas of wet clayey soils (high conductivity), the radar energy is rapidly dissipated and the probing depth is severely restricted. Where contrasts between clayey soil and sands occur (such as commonly occurs in backfilled UST pits in the native, typically clayey, surficial materials of Illinois), ground-penetrating radar may be effective in locating USTs and their pits. The ISGS is currently evaluating its use for PESA work.

FIELD EQUIPMENT

As part of the PESA program, ISGS uses and continually evaluates various types of field equipment. This equipment ranges from typical geological field tools, such as augers and soil probes, to more complex analytical instruments, such as portable gas chromatographs. In this section, the field equipment used by the ISGS is discussed and evaluated for its applicability to the site assessment work associated with IDOT highway projects.

As previously discussed, the ISV is conducted as a reconnaissance of the project area. Basic equipment is required for an ISV and subsequent field work. These items include a field notebook, project file, camera, tape measure or measuring wheel, safety equipment, soil auger or probe, Munsell Soil Color Chart, magnetometer, miscellaneous hand tools such as shovels, and an organic vapor analyzer (OVA). Additional items, including a weather radio, binoculars, Geiger counter, soil pH meter, thermometer, and chlorinated-compound test kits may also be used during the ISV. When the utility check procedure is performed as discussed earlier, flags, stakes, and spray paint for marking subsurface testing locations are included in the assembled field kit.

After the ISV, subsurface data collection involves the use of soil probe rods, electric hammer or drill, electric generator, barometer, cleaning materials, tool kit, borehole fill material, sample collection materials, and the appropriate analytical devices (e.g., organic vapor analyzer, portable gas chromatograph, or Geiger counter). A discussion of the equipment used for this project follows.

Safety Equipment

During field operations, several aspects of personal safety must be considered. First, hazards associated with working on highway projects include those posed by the necessity to work in and around traffic areas, some of which are high-volume or high-speed zone areas. Even during the ISV, staff may need to travel in the vehicle at speeds slower than the surrounding traffic or park along the shoulder of the highway. The equipment necessary for these activities includes the vehicle's warning flasher system, a yellow strobe light placed atop the vehicle, orange traffic cones, and personal orange safety vests. Depending on the area, hard hats and eye and hearing protection may also be required.

Second, hazards associated with the use of electrical power equipment in the sampling process must be considered. Safety glasses and hearing protection are necessary, whereas other items, such as steel-toed footwear, heavy gloves, and protective clothing, may be desirable.

Finally, hazards from contact with potentially hazardous compounds require the use of personal protective equipment (and procedures): chemically resistant gloves and boots, coveralls, and protective eye wear.

Two additional items that impact safety include working in high-crime areas and potential on-site medical emergencies. Field work in high-crime areas may require additional staff (including security staff) and the use of two-way radios or cellular telephones. A properly sized and fully equipped first-aid kit should be available at all times, and staff should note the location of the nearest medical facilities.

Soil Penetration Equipment

Excavation is necessary to examine and characterize the type and condition of the soil, sample the soil, and provide a pathway for sampling soil gas or water. Several methods used to penetrate the subsurface were discussed earlier. Below is a discussion of the soil penetration equipment and the conditions under which each is used.

Soil probe A hand-driven soil probe is used in sediments that are cohesive enough to maintain an open hole. It is used to deliver a continuous sample of the soil. Continuous sampling allows for approximate determination of soil horizon boundaries and a more specific description of soil characteristics since vertical continuity is not interrupted as with an auger or drill. Probe rods are usually 2.5 centimeters (1 inch) in outside diameter and produce a sample that is 2.2 centimeters (7/8 inch) in diameter. The depth of the sample taken is limited by the type of soil material being probed and, to some extent, the strength of the user. Typical probe depths range from 1.5 to 2.7

meters (5–9 ft). The effectiveness of probes is limited in very sandy or dry soils since the nature of the material prevents the collection of a cohesive sample.

The advantage to this technique is that materials can be examined nearly intact as they are removed from the hole. Subsurface material can also be inspected for visual signs of contamination, such as soil discoloration. The soil probe is also selected to avoid using a power drill in areas densely concentrated with utilities or other potential subsurface hazards, or on parcels that are not close to any roads, where it might be difficult to bring in heavy power equipment. Unless other considerations apply, the soil probe is generally the preferred tool because it provides immediate visual feedback on soil conditions.

Bucket auger A hand-powered auger may be used where a larger hole is desired, or where a more detailed soil description is to be obtained. A hand-driven bucket auger is useful for the PESA project. The bucket auger is used to excavate a hole of approximately 5 to 10 centimeters (2–4 inches) in diameter and up to approximately 3.7 meters (12 ft) deep. Actual depth is determined by the type of material, depth to water, and length of extensions to the tool. It is a relatively simple tool to use since no electrical power is required. An auger is the optimum tool when the main purpose of the borehole is to describe the general soil characteristics (including color, grain size, pH, odor, and texture). The relatively large diameter of the hand-augered hole is also well suited to locating subsurface water, especially if water was not encountered in drilled or probed boreholes.

Gasoline-powered augers, also evaluated for the PESA project, were determined to be quite difficult to manipulate and extract when used in the clayey soils prevalent throughout much of Illinois.

Impacting drill A hand-held electric impacting drill is also used to drive sampling equipment into the ground. It is powered by electricity produced by a portable gasoline-powered generator. A 3.8-centimeter (1.5-inch) masonry bit is used to drill through layers of concrete, asphalt, other solid material, or debris. Hardened or stainless steel solid rods, 2.5 centimeters (1 inch) in diameter and 0.9 meters (3 ft) long, are assembled as needed to drive to the desired depth. At the end of the rod assembly is a drive point selected on the basis of the type of soil and subsurface materials at the site. A rounded clay drive point is used for clayey and silty materials, and a pointed sand drive point for sands. The upper end of the rod assembly has an adaptor that connects to the impacting drill. Rods are extracted with a large lever-jack specially adapted for this purpose. The sample is then taken from the hole created by the jacked-out rod assembly.

The power drill is most commonly used where materials are extremely cohesive, where there are large amounts of fill, or where extensive pavement covers the testing location.

Well point sampling assembly Once the borehole is placed to the desired depth, miniature well points are used at that depth to sample soil gas (or groundwater). These are usually slotted aluminum points that can be driven or lowered into a previously established borehole. The points can be reused if properly cleaned and decontaminated when necessary. Polyethylene, polyethylene with Teflon lining, polypropylene, or Teflon tubing is attached to the point to deliver the sample to the surface.

Gas sample bags A Mylar sample bag with a Teflon interior lining may be used to collect soil or headspace gas for later analysis. A hand-held air pump, preferably a systolic pump, is used to fill the bag. The bag is constructed with a rubber septum through which a syringe can be inserted and an appropriate volume of gas extracted for analysis. Because the bags are not perfectly impermeable, such samples in bags have a limited lifespan, and controlled tests on bags should be performed to determine the lifespan for the type of bag used.

Analytical Equipment

Organic vapor analyzers Organic vapor analyzers (OVAs) are used to screen for volatile organic compounds. These devices measure the total amount of ions within a limited ionization range. The analyzers used by ISGS have two types of detectors.

- Photoionization detectors (PIDs) use an ultraviolet light source to ionize compounds of ionization potentials less than that of the source. This type of instrument is sensitive to aromatic compounds such as benzene, toluene, ethyl benzene, and xylene (BTEX), which are found in gasoline and other fuels. PIDs are insensitive to compounds with ionization potentials greater than that of the source. These types of detectors are sensitive to changes in relative humidity and other variables, such as temperature, pressure, and airflow rate.

- Flame ionization detectors (FIDs) combine the sample with hydrogen gas and ignite the mixture to produce ions whose concentrations are measured. FIDs are sensitive to the lighter molecular weight organic compounds such as methane, and thus are potentially quite useful in Illinois, where biogenic methane concentrations can be quite high. However, extremely high methane concentrations can mask the presence of other VOCs. FIDs are less sensitive than PIDs to humidity, carbon monoxide (CO) and carbon dioxide (CO_2) concentrations, temperature, pressure, and airflow rate.

Both types of OVA record the ionization potential as voltage, usually millivolts, which is converted by the instruments to parts per million (ppm) when the instrument is detecting the compound to which the instrument was calibrated. However, in field applications, the instrument typically detects an unknown compound or compounds; therefore, the reading cannot be directly interpreted as ppm. The reading should be identified as meter units.

Each instrument is calibrated on initial power-up and when conditions indicate the possibility that calibration parameters may have changed. Calibration is referenced to a known concentration of calibration gas. Typically, the calibration gas for the FID is methane at a concentration of 90 to 100 ppm, whereas for the PID, isobutylene is commonly used. "Zero" air (containing zero ppm total VOCs) is also used to establish the baseline from which both relative and actual readings can be made depending on the calibration technique.

In addition to the detection of total VOCs, which may also be reported as total petroleum hydrocarbons (TPH), the devices may be used for semiqualitative or quantitative analysis. These functions are entirely dependent on the individual instrument capabilities. Thus, OVAs are used for both screening purposes and a more specific determination of VOCs. An OVA cannot always provide an adequate determination or identification of the specific types and amounts of VOCs present in a given sample. More detailed information is obtained through the use of gas chromatography.

Gas chromatography Portable gas chromatographs (GC) can detect a range of compounds such as aliphatic or aromatic hydrocarbons, halohydrocarbons, alcohols, ketones, aldehydes, ethylene oxide, arsine, phosphine, totally reduced sulfide components (including hydrogen sulfide), and glycol ether solvents. GCs can utilize either a flame or photoionization detector. These instruments have a chromatographic column that separates the various compounds and "sees" each as an ionization potential given off at discrete time intervals (retention times). These signals are temporally distinct and repeatable at a constant column temperature. Not all field GCs have the capability of maintaining constant and known column temperature. Data gathered with a GC that does not maintain a controlled column temperature are difficult to interpret, since the user must extrapolate the retention times using the approximate temperature in the column. If the probability of encountering complex or less common organic compounds is high, or if accurate determinations are required, a GC with an internal isothermal oven to heat the column is preferred. This allows retention times for the field sample to be directly compared to standards previously used to calibrate the instrument.

The gas chromatograph utilized by the ISGS is calibrated by analyzing known compounds at known concentrations to establish an instrument library. For the PESA work performed by ISGS, the most commonly used calibration compounds are benzene, ethyl benzene, toluene, and o-xylene. These compounds, which are characteristic of petroleum compounds, were chosen since the most common potential subsurface environmental hazard to proposed highway construction has been determined to result from leaks from underground gasoline storage tanks.

The samples injected into the GC are gas samples and are obtained from soil gas, the headspace above a water sample, or a water-saturated or heated soil sample. The GC used by the ISGS separates the injected sample gas by means of a capillary column lined with a VOC-sensitive chemical. The suite or pattern of signals from a sample containing unknown VOCs is compared to those generated by the known compounds (standards), given that the temperature and other variables are also known. In addition to the qualitative analysis, signal peaks register on a linear meter and can be recorded. The area under each peak is proportional to the concentration of that compound in the gas sample, and a quantitative estimate is reported when this area is compared to the area of a standard compound. If column temperature is unknown or is not constant, then the signal pattern can be interpreted by estimating the retention times expected for the ambient temperature of the instrument. However, without a comparative peak signal of known concentration, the quantity of the compound identified cannot be determined, and any estimate has a high degree of probable error.

Chlorinated-compound testing kits The ISGS uses two types of testing kits to screen for chlorinated compounds (including PCBs). Both kits function on the basis of chemical reactions that result in color changes. One kit uses an immunoassay with a photometer to compare the color of a treated sample of unknown PCB content with a standard of known concentration. The test determines whether PCB concentrations exceed or are less than 1 part per million (ppm), the test detection limit. This kit requires that the standards, samples, and color-change reagents be added to test tubes specially coated with a chemical specific to PCBs. As the use of this kit is relatively time-intensive, it is typically used on soil samples brought back to the laboratory for analysis after they have tested negative using the kit described below.

The other kit is capable of detecting chlorinated-compound concentrations less than or greater than 50 ppm. As in the first method, a chemical test that results in a color change is the basis for determination of the presence of such compounds. In this method, however, the reactive element is chloride; therefore, the determination is the concentration of total chlorinated compounds rather than PCB concentration specifically. After removal of inorganic chlorine during a filtration step, the process strips organic chlorine from the chlorinated-compound molecule and transfers it to the aqueous phase. After addition of a precise amount of mercuric nitrate and indicator solution, a chemical reaction ensues that results in color or no color. Color indicates the absence of organic chlorine, whereas a colorless solution indicates a level of 50 ppm or greater. Since the determination is for organic chlorine and is not specific for PCBs, this method can result in a false positive finding. This kit, relatively simple and quick to use, is used for a field screening test. If a sample tests positive at greater than 50 ppm, these results are reported as is. If a sample tests negative at 50 ppm, it is returned to the laboratory for analysis using the immunoassay kit. In general, using both kits on sites of possible PCB occurrence enables the levels of PCBs, if present, to be constrained between the following approximate ranges: less than 1 ppm, 1 ppm to 50 ppm, and greater than 50 ppm.

X-ray fluorescence spectroscopy Portable X-ray fluorescence spectroscopy (XRF) is a relatively new technique used to screen for soil and water contamination. XRF is an analytical technique for the qualitative and quantitative determination of the elemental composition of a material. X-rays are used to excite a sample, which then emits characteristic signals from elements in the sample. The wavelengths of these fluorescent X-rays are measured to make a qualitative elemental analysis. The number of X-rays at a given wavelength (area under a peak) is used to make a quantitative analysis of elemental concentrations. Using different X-ray probes or X-ray sources enables a variety of materials to be analyzed for heavy metals (Pb, As, Cr, Cd), nonmetallic elements (S, Ca, Br), and, to a lesser extent, chlorinated compounds such as PCBs. The XRF is designed to measure relatively high concentrations of metals, and therefore is most useful as a screening tool in areas where metal concentrations are expected to be considerable. These areas may include industrial sites, such as foundries and metal fabrication plants.

Soil pH meter A soil pH meter can be used to determine in-situ pH of soils at the site. Determining pH may be desirable in areas where soil pH is expected to be lower (such as at battery manufacturing facilities) or higher (such as at alkaline fly ash disposal sites) than normal. The instrument used by the ISGS allows for the determination of relative humidity as well as pH. In-situ pH measurement is preferable to a later analysis of a sample taken to a laboratory, because conditions specific to the site's geology and geochemistry are highly prone to change upon removal of a soil sample from the site. This device provides a relatively accurate, although general, measure of pH. Since unit increases in pH represent logarithmic steps, readings can be accepted as reasonably precise. If the soil is very dry, however, deionized water must be added to enable the device to measure correctly.

Passive soil gas collection and analysis The ISGS evaluated and rejected the technique of placing passive collectors in the subsurface. The rationale for investigating this technique was that under certain conditions, instant sampling of soil gas using the methods described earlier is not practical or may not yield usable results. Passive collection can be used in situations when many contaminants, known or unknown, are suspected, or when contaminants are suspected for which standards are not available in the comparison library stored in the portable GC. Passive collectors may also be favored in extreme weather conditions, especially winter weather. During winter months, high pressure generally dominates the weather system in the upper Midwest. In addition to high pressure dominance, soil temperatures are greatly depressed and the soil's upper approximately 75 centimeters (30 inches), depending on latitude, is generally frozen. Both pressure and temperature affect the volatilization of organic compounds, the relative viscosity of gases released, and the subsequent movement of the gas phase volatiles through the soil. In addition to the general conditions of winter, diurnal fluctuations of pressure and temperature complicate soil gas sampling. If semivolatile organic compounds are also present, an active, real-time or instant sampling under these less than ideal conditions may prevent accurate determinations. Passive collection allows for a collection device, consisting of a ferromagnesium wire coated with activated carbon, to be placed in the subsurface for a period of days, after which the collector is sent to a lab for mass spectrometer analysis and interpretation. This technique was found to be generally unsuitable for PESA work because of the lack of real-time feedback regarding sampling results.

Ancillary Field Equipment

Magnetometers or magnetic locators are used to detect buried iron and steel objects and trace underground cables and pipes. For this project, two different models, each of which reflects different applications or theoretical approaches, were used and evaluated. One device measures magnetic field strength around an object that interferes with the Earth's natural magnetic field, whereas the other induces an electromagnetic (EM) field and measures disruptions in this field produced by metallic objects. Other inductive EM devices are available that measure ionic interference with the induced signal. These devices have not been used for PESA applications in this program.

The manufacturer refers to the first model mentioned above as a magnetic and cable locator. This dual-mode instrument consists of a transmitter and dual-function receiver. When used as a cable or pipe locator, the transmitter is placed over and in line with the target pipe or cable. An alternating current is induced that produces a signal detected by the receiver. Basically, the induced current generates an alternating circumferential field around the cable or pipe. This field is picked up and converted to an audio signal as the receiver is moved back and forth across the cable. This particular device is also used as a magnetic locator by responding to magnetic field strength as measured by two sensors placed 20 inches (51 centimeters) apart in the instrument. When magnetic field strength is uniform, a neutral or normal idling frequency of 40 Hz exists between the two sensors. When the field is interrupted by an iron or steel object, the magnetic field of the object is stronger at the lower sensor than at the higher sensor, and the frequency generated is higher than the idling frequency. This frequency change is manifested as an audible signal that indicates the presence of the object. Interpretation of signal variation allows for an estimation of the location and size of the object. Altering the angle of the sensor antenna also enables the depth of the object below the surface to be estimated.

The second device used is more properly an EM instrument since it induces an electromagnetic signal into the subsurface. As with the preceding device, this instrument consists of a transmitter and receiver. It can also be used as an inductive or conductive detection device. As an inductive device, the transmitter has two modes: locating and tracing. Both modes operate on the same principle of electromagnetic induction into the subsurface by the transmitter at one end of a rod carried by the user, and the reception of the signal by the receiver at the other end of the same rod. When the device is used for locating an object, the user establishes a search pattern to determine the location and size of the object by an interpretation of the audible or analog signal change that represents the induced current. For tracing an object, the user places the transmitter over the pipe or cable, and uses the receiver to determine the path of the installation beneath the surface.

The conductive method is used for tracing pipe or cable, especially when other pipes, cables, or metallic objects are nearby. In this method, an energized cable from the transmitter is connected directly to the cable or pipe, and the signal is traced by use of the receiver and interpretation of the appropriate signal, in this case a "null" signal. As with the magnetic and cable locator, techniques exist to enable the user to determine the approximate depth of the object located.

Although very useful instruments, both devices used for this project are subject to limitations from interferences caused by other buried utilities, buildings, metallic objects such as parked cars, fences, power lines, and reinforced concrete. In urban areas where they are most needed, conditions generally inhibit their use for locating buried objects, and the best use is for tracing of known pipes or cables by the conductive method.

Barometer/altimeter/thermometer These three measurement devices are grouped together because they provide integrated information useful for interpretation of soil gas data collected from the subsurface. Although each may be a separate instrument, they can be combined into one device, and ISGS staff use a combination device in concert with a digital thermometer. Since pressure and temperature influence the vaporization of organic compounds that a PESA may be concerned with, knowledge of atmospheric conditions at the time of sample collection is necessary to accurately interpret the results.

RISK ASSESSMENT METHODOLOGY

Risk assessment is the method used to assign a relative risk factor to the probability and likely consequences of encountering man-made or natural hazards at a project site. A hazard can be defined as a set of inherent properties believed to be dangerous to the environment. The risk assessment rating determined by ISGS indicates the level of hazard that might be encountered during IDOT construction activities. It provides to IDOT an explicit description of potential hazards, which trigger specific actions such as avoidance, mitigation, or remediation of the hazards.

Upon completion of field investigations for an IDOT PESA, a risk assessment rating is determined for the entire project. Individual parcels are not assigned a risk assessment, although each parcel of potential concern is discussed separately in the body of the report. The ISGS, in consultation with IDOT, has established four levels of risk assessment for use on IDOT PESAs. The levels and current definitions below are also stated in individual reports.

NO After a review of all available information, there is no indication of the presence of regulated substances or involvement with natural hazards in the project area.

LOW Current or former land use may include a facility that treats, stores, disposes of, transports, or is otherwise involved with regulated substances. The project may be located on a floodplain or have geologic materials conducive to movement during seismic activity. However, based on all available information, there is no reason to believe there would be any involvement with regulated substances of significant quantity. This is the lowest possible rating a gasoline station operating within current regulations could receive.

MODERATE After a review of all available information, indications are found that identify a potential for soil or water contamination or other environmental hazard; however, the hazard was not verified by ISGS testing. The area could have a long history of industrial or commercial use, or a CERCLIS or LUST site may be present along the project ROW. This is the lowest possible rating if anticipated construction intersects an UST.

[The MODERATE ranking for an UST that appears to be sound applies only if the probable UST location is within existing or proposed ROW; the risk of possibly breaching an otherwise sound UST during construction drives the MODERATE ranking.]

HIGH A HIGH risk is based on the presence of potentially hazardous compounds, either as detected by ISGS testing or as documented by the Illinois Environmental Protection Agency. The specific presence and levels of regulated substances, to the extent that they are known, will be incorporated in the report. Further investigation may be desired to determine the nature, source, and extent of the problem. A Hazard Ranking System value will be calculated and reported if requested by the District.

A well-defined and substantiated risk assessment rating provides IDOT with the capability to make an informed decision as to the need for additional investigations at the site, appropriate mitigation activities, or potential alignment adjustments.

REPORT DEVELOPMENT

Final Reports

Three main factors are essential in completing written reports. First, the report should communicate clearly and effectively the results of the assessment. Therefore, the report must be comprehensible to readers not necessarily conversant with geological and environmental terminology.

Second, the report format must be structured such that individual writing styles are not discernible, since many staff members contribute to reports. A standard report format was designed to provide continuity across time and changing staff assignments. Regardless of the number of staff that contributes to each report, one staff member is responsible for completing the final draft and ensuring that all of the components are smoothly integrated.

Third, although the data and their interpretations are assembled over time, the report should contain all information gathered at any stage of the assessment process. This ongoing accumulation of information allows for the production of an interim report at any stage of the assessment process and gives ISGS or IDOT staff the ability to evaluate potential impact to the project on the basis of information gathered up to that point. Basic environmental information gathered during historical research may provide sufficient reason to discontinue, reschedule, or redesign the project because of inherent high risk due, for example, to the potential acquisition of a site listed on the National Priority List (federally funded cleanup sites) of the USEPA.

The report form has evolved significantly since the initial report was written, as the result of interaction between ISGS and IDOT staff members. The reports are prepared for IDOT's use and, therefore, IDOT's needs drive the report format. The appendix gives the present report structure. This basic framework shows some, but not all, of the "boilerplate" items and phrases that are key to maintaining the continuity of style.

The elements of the report are presented in an order that reflects their relative importance to project needs. The cover of the report presents the key identification information including the project number, the date the request for the report was received by ISGS, and the anticipated design approval date supplied by IDOT. Geographical information about the project site is presented both as text and as a figure showing the location within an outline of the state. After the Table of Contents, the report elements include the following.

- PRELIMINARY ENVIRONMENTAL RISK ASSESSMENT is the "bottom line" of the report. It functions as a type of executive summary because it states the level of risk assigned and the primary reason for the assignment. If the assigned risk assessment rating is HIGH, a Hazard Ranking System (HRS) score may be provided on the same page, if requested by the IDOT district.
- RESPONSIBLE PROPERTY TRANSFER ACT (RPTA) compliance information lists properties along the project ROW that may be subject to RPTA, and the reason RPTA may apply to those properties.
- INTRODUCTION provides a detailed description of the project location and scope of work.
- GEOLOGY and HYDROGEOLOGY sections provide basic information on the geologic setting of the project. Geologic and hydrogeologic characteristics may influence the movement of regulated substances through the subsurface.
- MAN-MADE HAZARDS section includes descriptions of sites of potential concern to the proposed project, and information regarding potential sources of regulated substances such as reported leaking underground storage tanks, a history of industrial occupation of the property, or reported releases or spills.
- NATURAL HAZARDS section reports on the potential for hazards resulting from landslides, floods, earthquakes, and other geologic events.
- FINDINGS summarize the data and their interpretations, and are the foundation for establishing the risk assessment rating. Key findings, arranged in a concise list, describe potential hazards associated with the project. Additional investigations may be warranted to fully delineate the impact of these potential hazards on the proposed project.
- ENDORSEMENTS identify the author of the report and the senior staff who reviewed and approved the results.
- INFORMATION SOURCES section lists the materials used in compiling the geology, hydrogeology, and other background and historical information
- APPENDICES A and B show the items investigated during the assessment process.
- LIST OF ATTACHMENTS details figures, tables, and photographs associated with the report.

Interim Reports and Letters

As discussed earlier, IDOT distinguishes between two types of projects: those that require an environmental impact statement or environmental assessment be prepared by IDOT (EIS/EA projects), and those that receive a categorical exclusion from having these assessments (CE projects). For the EIS/EA projects, an interim report that provides useful information for these projects is submitted in early planning stages. The interim report includes information on general geology, hydrogeology, and inventoried facilities such as registered underground storage tank sites, as well as other information from historical research and an initial site visit. For projects that receive categorical exclusion, interim reports are submitted only on request from IDOT. For any project, if sites of potential major hazard (such as CERCLIS sites) are identified, an interim letter is written to IDOT identifying these sites as early in the process as possible. Such sites may be time-consuming for IDOT to handle; therefore they are flagged early by ISGS.

Historical-Only Reports

Some projects, determined by IDOT, require only background research to determine historical and present use of property. Site visits, interviews, and field testing are not performed for these projects. Results of the background investigations are summarized in letter reports.

The current report format has generally evolved from the interaction between ISGS and IDOT staff. The reports are prepared for IDOT's use; therefore, the needs of IDOT affect the report format. Likewise, the ISGS believes that certain report elements need to be focused on so that the process that brings together many elements can be efficient and effective in allowing for an understanding of the results of the assessment summarized in the risk assessment rating.

SUMMARY

Environmental site assessments for highway projects differ considerably from the types of assessments or audits commonly completed for a single-parcel land purchaser. Commonly, the Department of Transportation must proceed with the acquisition of environmentally damaged property and may bear the major cost of remediation. Delays and added construction costs due to intersecting contaminated soil and water impact limited transportation budgets. A qualitative risk assessment rating defines the level of hazard that may be encountered during construction activities and provides guidance for proceeding with the project. These ratings must be based on specific site findings evaluated in terms of the project's proposed scope of work. The ratings must also reflect the potential for impact from actual or highly probable environmental conditions.

This manual outlines a process for preparing Preliminary Environmental Site Assessments for highway projects. A standard operating procedure has been developed to ensure consistent collection and presentation of the data. Employment of individuals specifically educated and trained to collect and evaluate historical and physical evidence used for risk assessment ratings is critical to a successful program. The procedures to be followed for data gathering and interpretation must be clearly stated and uniformly applied so that all assessments have the same relative value and can be correlated from project to project. Knowledge of problematic environmental conditions prior to project implementation allows for proper planning and mitigation of conditions that might otherwise create significant impacts.

ACKNOWLEDGMENTS

We acknowledge the efforts of Paul DuMontelle, Peter Frantz, Christopher Stohr, and John Washburn in the initiation and implementation of the ISGS-IDOT property assessments program. Many resources and techniques in historical research and field sampling described in this manual were discovered, derived, or adapted through the innovative work of the ISGS field support, data support, and project management staff who have worked on the IDOT assessment program. We appreciate the efforts of this property assessments team. This manual benefited from reviews by Paul DuMontelle, Jonathan Goodwin, Michael Vanderhoof, John Washburn, the IDOT district environmental coordinators, and the IDOT property assessments staff at the ISGS.

INFORMATION SOURCES

American Society for Testing and Materials, 1994, Standard Practice for Environmental Site Assessments—Phase I Environmental Site Assessment Process: ASTM, Philadelphia, PA, Practice E-1527-94, 24 p.

American Society for Testing and Materials, 1993, Standard Practice for Environmental Site Assessments—Transaction Screen Process: ASTM, Philadelphia, PA, Practice E-1528-93, 31 p.

Berg, R.C., J. P. Kempton, and K. Cartwright, 1984, Potential for Contamination of Shallow Aquifers From Land Burial of Muncipal Waste [map], *in* R.C. Berg, J.P. Kempton, and K. Cartwright, Potential for Contamination of Shallow Aquifers in Illinois: Illinois State Geological Survey, Circular 532, 30 p., Scale 1:500,000.

Berg, R.C., and J.P.Kempton, 1988, Stack-Unit Map of Geologic Materials in Illinois to a Depth of 15 Meters, *in* R.C. Berg and J.P.Kempton, Stack-Unit Mapping of Geologic Materials in Illinois to a Depth of 15 Meters: Illinois State Geological Survey, Circular 542, 23 p., Scale 1;250,000.

Fehrenbacher, J.B., I.J. Jansen, and K.R. Olson, 1986, Total Loess Thickness in Illinois [map], *in* J.B. Fehrenbacher, I.J. Jansen, and K.R. Olson, Loess Thickness and Its Effect on Soils in Illinois: University of Illinois at Urbana–Champaign, College of Agriculture, Agricultural Experiment Station, Bulletin 782, 14 p., Scale 1:1,647,360.

Hazardous Waste Research and Information Center, 1989, Comprehensive Inventory of Special Waste Handlers; Inventory of Land-Based Waste Disposal Sites; Inventory and Assessment of Surface Impoundments; and CERCLIS Site Database.

Herzog, B.L. et al., 1994, Buried Bedrock Surface of Illinois [map]: Illinois State Geological Survey, Illinois Map 5, Scale 1:500,000.

Hopper, M., 1985, Estimation of Earthquake Effects Associated with Large Earthquakes in the New Madrid Seismic Zone: U.S. Geological Survey, Open File Report 85-457, 186 p.

Illinois Environmental Protection Agency (IEPA) Division of Land Pollution Control, 1989, Cleaning Illinois, Status of the State's Hazardous Waste Clean-Up Programs, Summer 1989: IEPA, Springfield, IL, IEPA/LPC/89-200, 61 p.

Illinois Environmental Protection Agency, Division of Land Pollution Control, Companies that Generate, Treat, Dispose, or Recover Hazardous Waste—Annual Report: IEPA, Springfield, IL.

Illinois Environmental Protection Agency Division of Public Water Supplies (unpublished list), Groundwater Monitoring Raw Source Location Report.

Illinois Environmental Protection Agency, Division of Public Water Supplies, 1989–Present, Well Site Survey Report...(by community): IEPA, Springfield, IL.

Illinois Environmental Protection Agency , 1992, Hazardous Waste Disposal Sites.

Illinois Environmental Protection Agency, 1992, IEPA-Issued Generic Landfill Applications.

Illinois Environmental Protection Agency, 1993, IEPA-Permitted Storage, Treatment, Recycling, Incinerating, and Processing Facilities.

Illinois Environmental Protection Agency, 1994, Illinois Manufactured Gas Sites.

Illinois Environmental Protection Agency, Division of Land Pollution Control, Leaking Underground Storage Tank (LUST) List: IEPA, Springfield, IL, semiannual updates.

Illinois Environmental Protection Agency, Office of Chemical Safety, 1987-1989, Chemical Information Sheets, IEPA, Springfield, IL, (IEPA/ENV/Nos.).

Illinois Environmental Protection Agency, Office of Chemical Safety, 1972–Present, Incident database: IEPA, Springfield, IL.

Illinois Environmental Protection Agency, Semiannual Hazardous Waste Update Report.

Illinois Environmental Protection Agency, 1995, Solid Waste Landfills Subject to State Surcharge.

Illinois Environmental Protection Agency, 1989, Solid Waste Site List.

Illinois Environmental Protection Agency, 1990, Special Waste Site List.

Illinois Environmental Protection Agency, 1995, State Underground Injection Control Inventory.

Illinois Environmental Protection Agency, 1992, Unpermitted Landfills.

Illinois Manufacturers Directory, various dates: Manufacturers' News, Chicago, IL.

Illinois Services Directory, various dates: Manufacturers' News, Chicago, IL.

Illinois State Geological Survey, 1991, Directory of Coal Mines in Illinois...County: Illinois State Geological Survey, 73 v. Accompanies Illinois Coal Mines...County [maps].

Illinois State Geological Survey, 1976, Geologic Materials to a Depth of 20 Feet, Cook County, North Part [map]: ISGS Open File Series 1976-5N, Plate 1, Scale 1:62,500.

Illinois State Geological Survey, 1976, Geologic Materials to a Depth of 20 Feet, Cook County, South Part [map]: ISGS Open File Series 1976-5S, Plate 1, Scale 1:62,500.

Illinois State Geological Survey, 1976, Geologic Materials to a Depth of 20 Feet, Kane County, [map]: ISGS Open File Series 1976-2, Plate 1, Scale 1:62,500.

Illinois State Geological Survey, 1976, Geologic Materials to a Depth of 20 Feet, Lake County, [map]: ISGS Open File Series 1976-4, Plate 1, Scale 1:62,500.

Illinois State Geological Survey, 1976, Geologic Materials to a Depth of 20 Feet, McHenry County, [map]: ISGS Open File Series 1976-3, Plate 1, Scale 1:62,500.

Illinois State Geological Survey, 1976, Geologic Materials to a Depth of 20 Feet, Will County, East Part [map]: ISGS Open File Series 1976-6E, Plate 1, Scale 1:62,500.

Illinois State Geological Survey, 1976, Geologic Materials to a Depth of 20 Feet, Will County, West Part [map]: ISGS Open File Series 1976-6W, Plate 1, Scale 1:62,500.

Illinois State Geological Survey, 1977, Geologic Materials to a Depth of 20 Feet, Du Page County [map]: ISGS Open File Series 1977-1, Plate 1, Scale 1:62,500.

Illinois State Geological Survey, 1977, Geologic Materials to a Depth of 20 Feet in Northeastern Illinois [map]: ISGS Open File Series 1977-2, Plate 1, Scale 1:120,000.

Illinois State Geological Survey, 1983, Geologic Study of Longwall Sites in Northern Illinois: Abandoned Mined Lands Reclamation Council, Springfield, IL, 6 parts.

Illinois State Geological Survey, various dates, Illinois Coal Mines...County [maps]:Illinois State Geological Survey, Scale 1:100,000. Accompanies Directory of Coal Mines in Illinois.

Illinois State Geological Survey,1993, Publications of the Illinois State Geological Survey, 168 p.

Illinois State Museum, 1992, Historical Hazardous Substances Database.

Illinois State Museum, 1994, Historical Hazards GIS; Site History Report on Coal Gas Works, 1883-1950.

Illinois State Water Survey, 1993, Public Water Supply Database.

International Conference of Building Officials, 1991, Seismic Risk Map of the United States, *in* Uniform Building Code: International Conference of Buidling Officials, Whittier, CA.

Keefer, D.A., and R. C. Berg, 1990, Potential for Aquifer Recharge in Illinois (Appropriate Recharge Areas) [map]: Illinois State Geological Survey, Scale 1:1,000,000.

Killey, M.M., J.K. Hines, and P.B. DuMontelle, 1985, Landslide Inventory of Illinois: Illinois State Geological Survey, Circular 534, 27 p.

Nawrot, J.R. et al., revised, 1982, Illinois State Reclamation Plan for Abandoned Mined Lands, Resource Document: Abandoned Mined Lands Reclamation Council, Springfield, IL, 235 p.

Office of the State Fire Marshal (updated every two months). Underground Storage Tank (UST) List.

Piskin, K., and R.E. Bergstrom, 1975 (reprinted in 1994), Thickness of Glacial Drift in Illinois [map], *in* K. Piskin and R.E. Bergstrom,Glacial Drift in Illinois—Thickness and Character: Illinois State Geological Survey, Circular 490, 34 p., Scale 1:500,000.

Sanborn Map Company, various dates, Sanborn Fire Insurance Maps—Illinois [microfilm]: Chadwyck-Healey Inc., Teaneak, NJ.

Sanborn Map Company, various dates, Sanborn Fire Insurance Maps—Illinois [microfilm]: University Publications of America, Bethesda, MD.

Shineldecker, C.L., 1992, Handbook of Environmental Contaminants—A Guide for Site Assessment: Lewis Publishers, Inc., Chelsea, MI, 371 p.

Treworgy, C.G. et al. ,1989, Evaluation of the Potential for Damage from Subsidence of Underground Mines in Illinois: Illinois State Geological Survey, Open File series 1989-2, 246 p.

U.S. Department of Agriculture, Natural Resources Conservation Service Soil Database, various dates, Hydric soils lists.

U.S. Department of Agriculture, Natural Resources Conservation Service Soil Database, 1995, Prime farmland lists.

U.S. Environmental Protection Agency Superfund Program, updated periodically, Comprehensive Environmental Response and Compensation Liability Information System (CERCLIS) List 8, Site/Event Listing and CERCLIS Archive List: USEPA Superfund Program, Washington, DC.

U.S. Environmental Protection Agency,1987–1993, Toxic Release Inventory for Illinois.

U.S. Environmental Protection Agency, Office of Research and Development, 1990-1991, Guides to Pollution Prevention [by industry]: USEPA, Cincinnati, OH.

U.S. Environmental Protection Agency, Industry Overview Sheets [by Industry]: EPA/530-SW-90-027X.

U.S. Federal Emergency Management Agency (FEMA), Flood Hazard Boundary Maps (Illinois): U.S. FEMA, Washington, D.C., Scales vary. Earliest maps published by U.S. Department of Housing and Urban Development Federal Insurance Administration.

U.S. Federal Emergency Management Agency (FEMA), Flood Insurance Rate Maps (Illinois): U.S. FEMA, Washington, D.C., Scales vary.

U.S. Department of the Interior, Fish and Wildlife Service, various dates, National Wetlands Inventory Maps, Scale 1:24,000.

Willman, H.B., et al.,1967, Geologic Map of Illinois: Illinois State Geological Survey, Scale 1:500,000.

APPENDIX REPORT FORMAT

IDOT: ISGS:

PRELIMINARY ENVIRONMENTAL SITE ASSESSMENT

FINAL REPORT

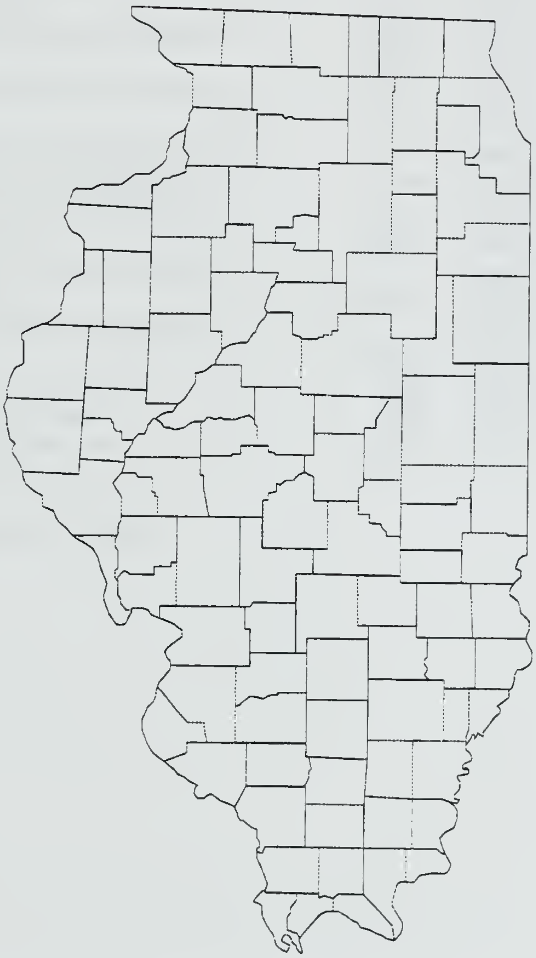
DATE:

IDOT DESIGN DATE:

DATE REQUEST RECEIVED:

LOCATION:

[The general project location is noted with a star on the map below.]



CONTENTS

GLOSSARY OF ACRONYMS

ACM	Asbestos-containing materials
AST	Aboveground storage tank
ASTM	American Society for Testing and Materials
BTEX	Benzene, toluene, ethyl benzene, and total xylenes
℄	Centerline
CERCLA	Comprehensive Environmental Response,Compensation, and Liability Act
CERCLIS	Comprehensive Environmental Response, Compensation, and Liability Information System
FEMA	Federal Emergency Management Agency
FHBM	Flood Hazard Boundary Maps
FID	Flame Ionization Detector
FIRM	Flood Insurance Risk Maps
GC	Gas Chromatograph
HRS	Hazard Ranking System
HWRIC	Hazardous Waste Research and Information Center
ICC	Illinois Commerce Commission
IDOT	Illinois Department of Transportation
IEMA	Illinois Emergency Management Agency
IEPA	Illinois Environmental Protection Agency
IMD	Illinois Manufacturers' Directories
ISD	Illinois Services Directories
ISGS	Illinois State Geological Survey
ISV	Initial Site Visit
JULIE	Joint Utility Locating Information for Excavators
LUST	Leaking Underground Storage Tank
µg/kg	micrograms per kilogram
µg/l	micrograms per liter
mg/kg	milligrams per kilogram
mg/l	milligrams per liter
M.P.	Milepost
MSDS	Material Safety Data Sheet
NFA	No Further Remedial Action
NIPC	Northern Illinois Planning Commission
NPL	National Priority Listing
NRCS	Natural Resources Conservation Service (formerly Soil Conservation Service)
OSFM	Office of the State Fire Marshal
OSHA	Occupational Safety and Health Administration
OVA	Organic Vapor Analyzer
PAH/PNA	Polynuclear Aromatic Hydrocarbons
PCB	Polychlorinated Biphenyls
PESA	Preliminary environmental site assessments
PID	Photoionization Detector
POTW	Publicly-owned treatment works
ppb	parts per billion (equivalent to µg/kg for solids, and µg/l in liquids)
ppm	parts per million (equivalent to mg/kg in solids, and mg/l in liquids)
PRP	Potentially Responsible Part
RCRA	Resource Conservation and Recovery Act
RPTA	Responsible Property Transfer Act
ROW	Right-of-Way
SDWA	Safe Drinking Water Act
SIA	Surface Impoundment Assessment
SIC	Standard Industrial Classification
TRI	Toxic Release Inventory
TSCA	Toxic Substances Control Act
USDA	United States Department of Agriculture
USEPA	United States Environmental Protection Agency
USGS	United States Geological Survey
UST	Underground Storage Tank
VOC	Volatile Organic Compound
XRF	X-ray Fluorescence Spectroscopyy

PRELIMINARY ENVIRONMENTAL RISK ASSESSMENT[1]

Based upon the following and as of __________, the date of the last physical examination of the project area, it is determined that this site has _____ (defined below) risk for the occurrence of regulated substance or natural hazards.

NO After a review of all available information, there is no indication of the presence of regulated substances or involvement with natural hazards in the project area.

LOW Current or former land use may include a facility that treats, stores, disposes of, transports, or is otherwise involved with regulated substances. The project may be located on a floodplain or have geologic materials conducive to movement during seismic activity. However, based on all available information, there is no reason to believe there would be any involvement with regulated substances of significant quantity. This is the lowest possible rating a gasoline station operating within current regulations could receive.

MODERATE After a review of all available information, indications are found that identify a potential for soil or water contamination or other environmental hazard; however, the hazard was not verified by ISGS testing. The area could have a long history of industrial or commercial use, or a CERCLIS or LUST site may be present along the project ROW. This is the lowest possible rating if anticipated construction intersects an UST.

HIGH A HIGH risk is based on the presence of potentially hazardous compounds, either as detected by ISGS testing or as documented by the Illinois Environmental Protection Agency. The specific presence and levels of regulated substances, to the extent that they are known, will be incorporated in the report. Further investigation may be desired to determine the nature, source, and extent of the problem. A Hazard Ranking System value will be calculated and reported if requested by the District.

---

[1] Risk Assessment is the method used to assign a relative risk factor to the probability and likely consequence of encountering man-made and natural hazards. A hazard is the set of inherent properties known to be dangerous to the environment. This rating has an implication for the level of hazard that might be encountered. However, a MODERATE or HIGH risk site might also be easily mitigated by proper methods.

RPTA COMPLIANCE INFORMATION

The following listed properties within the proposed project require RPTA compliance. The reason(s) for this action is noted and described in the RPTA Compliance Key on the next page.

Parcel/Address	Reason

This site assessment determined that none of the property affected by this project requires RPTA compliance as defined by elements listed in the RPTA Compliance Key.

RPTA COMPLIANCE KEY

The decision as to whether property is subject to RPTA compliance is based on several considerations. The following is a key to the reason parcels identified in the report are subject to RPTA compliance.

1. This parcel contains a facility that is required to prepare or have available a Material Safety Data Sheet for a hazardous chemical, as defined under the OSHA Hazard Communication Standard and falls under one of the following categories:

    A. Hazardous chemicals on the parcel are present in amounts equal to or greater than 4,536 kg (10,000 pounds).

    B. Extremely hazardous substances on the parcel are present in amounts greater than or equal to 227 kg (500 pounds) or their threshold planning quantity, whichever is less.

2. This parcel contains a registered UST as reported to the OSFM.

3. This parcel contains an UST that does not appear on the OSFM's UST list but that may be subject to RPTA.[2]

4. This parcel may be subject to RPTA compliance upon further investigation. Present information is inadequate, inconclusive, or suggests caution. See report for details.

---

[2] USTs/facilities exempt from RPTA are:

- Farm or residential tank of 4,164 liters (1,100 gallons) or less capacity used for storing motor fuel for noncommercial purposes;
- Tank used for storing heating oil for consumptive use on the premises where stored;
- Septic tank;
- Pipeline facility (including gathering lines) regulated under the Natural Gas Pipeline Safety Act of 1968, the Hazardous Liquid Pipeline Safety Act of 1979, or which is an intrastate pipeline regulated under comparable state laws;
- Surface impoundment, pit, pond, or lagoon;
- Stormwater or wastewater collection system;
- Flow-through process tank;
- Liquid trap or associated gathering lines directly related to oil or gas production and gathering operations;
- Storage tank situated in an underground area (such as a basement, cellar, mine working, drift, shaft, tunnel) if the storage tank is situated above or upon the surface of the floor.

BACKGROUND

INTRODUCTION

This is the **Final Report** of a preliminary environmental assessment by the ISGS of natural and man-made hazards that may be encountered for this project. This report identifies and evaluates known or potential regulated substance problems and natural hazards.

This assessment was prepared using historical and geological information including aerial photographs, U.S. Geological Survey topographic maps, plat maps, file information of the ISGS and other state agencies, and various other sources of information. An on-site investigation has been completed. The specific methods used to conduct the assessment are contained in *A Manual for Conducting Preliminary Environmental Assessments for Highway Projects* (Erdmann et al., in preparation). Natural and man-made hazards have been identified and other potential detriments or considerations have been listed as are suitable within the scope of this preliminary survey. If new environmental information is received concerning this site, this report will be updated accordingly and the information made part of the permanent file. If such information is considered to have a significant impact on the findings of this report, the report will be corrected by addendum and resubmitted to IDOT Bureau of Design and Environment.

GEOLOGY

Soils

Surficial geology

Bedrock geology

HYDROGEOLOGY

Drainage direction

Depth to water in project boreholes

Surficial public water supplies

Groundwater recharge

Groundwater protection areas

Potential for contamination of shallow aquifers

Well log information

DISCUSSION

MAN-MADE HAZARDS

NATURAL HAZARDS

Wetlands

Floodplains

Seismic risk

Landslides

FINDINGS

ENDORSEMENTS

Project Manager: ______________________________ **Date:** __________

Approved: ______________________________ **Date:** __________

INFORMATION SOURCES

The material listed below should be consulted if more detailed information is desired. Additionally, copies of plat maps, aerial photographs, and other useful documents specific to this site assessment are on file in the Environmental Site Assessments Section of the ISGS.

Bibliography

Government Lists

Maps

Photographs

Other

APPENDIX A
ISGS PRELIMINARY ENVIRONMENTAL PROPERTY ASSESSMENT CHECKLIST

IDOT: ____________________ ISGS: ____________

County: ____________________

Nearest City/Town: ____________________

Location Coordinates: ____________________ Length: ____________

IDOT District Contact: ISGS Lead: ____________

Name: ____________________

Phone: ____________________

Task	Status*	Date	By
Original Material Copied:			
Current Topographic Map(s): Historical Topographic Map(s):			
Other Projects in Vicinity:			
Street Map(s) ▸ MapExpert: ▸ Telephone Directory: ▸ Chicagoland Atlas:			
Geologic Maps and Publications ▸ Soil Survey/Soil Maps: ▸ NRCS Hydric Soils List: ▸ NRCS Non-Prime Farmland Soils: ▸ Related Geologic Publications: ▸ Piskin Drift Thickness Map: ▸ Herzog Buried Bedrock Surface Map: ▸ Berg and Kempton/NIPC Stack Unit Map: ▸ Willman Geologic Map:			
Hydrogeologic Information ▸ Questor Database/ISGS Well Logs: ▸ ISWS Public Surface Water Supply Database: ▸ IEPA Public Groundwater Supply Report(s): ▸ IEPA GWM Location Report for Public Water Supply Wells: ▸ IEPA Restricted Status List: ▸ IEPA Well Site Survey Report(s): ▸ Keefer Groundwater Recharge Map: ▸ Berg Potential for Aquifer Contamination Map:			
Regulated Groundwater Recharge Areas:			
Aerial Photographs:			
Sanborn Fire Insurance Maps ▸ Chadwyck-Healey Inc.: ▸ University Publications of America:			
Rockford Map Publishers Plat Maps:			

Task	Status*	Date	By
UST List:			
LUST List:			
CERCLIS (Site/Alias/Description/Event) List: CERCLIS Archive (formerly NFRAP) List:			
IEPA Semi-Annual Hazardous Waste Update Report:			
Inventory of Waste Handling Facilities (IWHF) Notebook ▸ Winnebago County Inventory of Waste Disposal Sites: ▸ Badger Pipeline Company Leak History: ▸ STRIP List: ▸ Unpermitted Landfills: ▸ Issued Generic Landfill Applications: ▸ Special Waste Site List: ▸ Solid Waste Landfills Subject to State Surcharge: ▸ Hazardous Waste Disposal Sites: ▸ Solid Waste Disposal Site List: ▸ Nonhazardous Special Waste Annual Report: ▸ Criminal Prosecutions Resulting from Environmental Investigations: ▸ Generation and Management of Hazardous Waste during 1986: ▸ Summary of Annual Reports on Hazardous Waste: ▸ Companies that Generate, Treat, Dispose, or Recover Hazardous Waste:			
IEMA Hazardous Material Spill Information:			
IEPA Incident Database:			
HWRIC Information:			
Toxic Release Inventory:			
State Underground Injection Control Inventory:			
Illinois Manufactured Gas Sites:			
Illinois Manufacturers Directories: Illinois Services Directories: Industry Hazardous Materials:			
ICC Contacted re: Railroad Spills: Annual Reports of Railroad Spills: IDOT Contacted re: Abandoned Railroads:			
County Collection:			
City Directories:			
Mining Maps and Publications ▸ Treworgy Subsidence Publication: ▸ Abandoned Mined Lands Reclamation: ▸ Illinois Coal Mine Map(s) and Directory: ▸ Non-Coal Mine Inventory: ▸ ISGS Mine and Field Notes: ▸ Quade Subsidence Report(s): ▸ Works Progress Administration Map(s):			

Task	Status*	Date	By
Seismic Risk Map:			
Illinois Landslide Inventory Map:			
Flood Insurance Rate/Flood Hazard Boundary Map:			
National Wetlands Inventory:			
IDOT District Environmental Coordinator Contacted:			

*** MF = Material found, NF = Nothing found, NA = Not applicable, N/A = Not available**

Historical Survey Completed By: ____________________ Date: ______________

APPENDIX B INITIAL FIELD SURVEY CHECKLIST

IDOT NO. ___
ISGS NO. ___

Date: ______
By: ______

ITEM	YES	NO	UNK	COMMENT
FLORA/FAUNA				
Vegetation present Vegetation stressed Animal activity or presence				
NATURAL FEATURES AND CONDITIONS				
Depressions Mounding or soil piles Wetlands, ponds, lakes Rivers, streams, creeks Lagoons, surface impoundments Soil discoloration Water discoloration				
CULTURAL FEATURES AND CONDITIONS				
Buildings/structures Landfills Industry Asbestos source/presence Storage tanks (above or underground) Pumps/protruding pipes Drums Railroad spurs/tracks/ROW Dead end roads/trails Sewer lines Water wells Monitoring wells Septic tanks Pits/quarries Solid waste (garbage) Transformers/substations				
AMBIENT ENVIRONMENTAL CONDITIONS				
Unusual or noxious odors Noise pollution Dust/smoke				

COMMENTS:

LIST OF ATTACHMENTS

1. Project location map

2. Locations of tested parcels