GIS AND SITE ASSESSMENT PROJECT

ASTSWMO

SITE ASSESSMENT

FOCUS GROUP

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List of Acronyms

ASTSWMO – Association of State and Territorial Solid Waste Management Officials

CA – Cooperative Agreement

CERCLA – Comprehensive Environmental Response, Compensation, and Liability Act

EPA – Environmental Protection Agency

ESRI – Environmental Systems Research Institute

GIS – Geographic Information System

GPS – Global Positioning System

HRS – Hazard Ranking System

IT – Information Technology

LIDAR – Light Detection and Ranging

LUST – Leaking Underground Storage Tank

NPL – National Priorities List

PFAS – Per and Polyfluoroalkyl Substances

PII – Personal Identifiable Information

RCRA – Resource Conservation and Recovery Act

USGS – United States Geological Survey

Acknowledgements

Executive Summary

The Superfund Site Assessment Program, under the Comprehensive Environmental, Response, Compensation and Liability Act (CERCLA), is a partnership between the U.S. Environmental Protection Agency (EPA) and States and Territories (States). The primary purpose of the Superfund Site Assessment Program (referenced hereafter as "Site Assessment Program") is to identify releases or threats of releases of hazardous substances, pollutants, or contaminants that may endanger human health or the environment and determine whether these sites qualify for inclusion on the National Priorities List (NPL). To accomplish this, EPA and some States have entered into cooperative agreements to conduct Pre-CERCLA and CERCLA investigations at sites within their States.

Some of these States use Geographic Information System (GIS) to enhance their ability to determine if those sites qualify for the NPL. GIS is designed to capture, store, manage, manipulate, and analyze spatial or geographic data and allow users to edit data in maps, create interactive queries, analyze spatial information, and present the results of all these operations. The ASTSWMO Site Assessment Focus Group created and distributed a GIS Research Toolbox questionnaire (GIS Toolbox) to all States with the goal to determine their use of GIS in their Site Assessment Program processes, and, for ASTSWMO to share the questionnaire's key findings and provide improvement recommendations.

The following key findings were identified from the States' responses:
- GIS is an important tool for State Site Assessment programs. Most States use GIS for Site Assessment tasks, and over half use GIS frequently or all the time. States primarily use ESRI's ArcMap as their GIS software and some use Google Earth. However, access to commercial software such as ESRI's ArcGIS varied widely some States have enterprise licenses while others lack the funding to have access.

- GIS use in the Site Assessment programs is limited due to a lack of resources and staff knowledge. At least seventeen States indicate their program lacks training and/or funding to improve their GIS capabilities, and twelve States mention that inadequate equipment or lack of access to software and licenses restricts the use of GIS. States also responded that their Site Assessment Programs would benefit from EPA support through GIS training opportunities and funding to increase their GIS capabilities.

- For Site Assessment tasks, GIS is used most for the following activities: creating standardized maps, screening and prioritization of sites, field work activities, interacting with the public, environmental data management, discovery of new sites, and preparing HRS scoring packages.

- States use a wide array of spatial datasets to support Site Assessment work, including the following: (i) City/County GIS databases of property ownership information, (ii) contaminant disposal locations and environmental site locations, (iii) sensitive receptors such as schools and daycare facilities, public/private drinking water, environmental justice areas, sensitives wetlands, etc., (iv) potentially contaminating sources such as dry-cleaners, RCRA generators, and LUST sites, etc., and (v) others such as geologic data, aerial photography, historical Sanborn fire insurance maps, etc.

- Twenty-three States indicated that they collaborate with other agencies (State, federal, or local agencies) to share GIS mapping resources; ten States mentioned sharing GIS data with EPA. Data shared included aerial imagery, gridded maps, topographic maps, and parcel maps, and interactive GIS mapping programs. States share information via shapefiles via FTP servers; EQuIS, Scribe; ESRI ArcGIS Survey123; ESRI ArcGIS Collector; and, ESRI ArcGIS Online in connection with EPA Geoplatform. Twelve States also have public-facing GIS/Web mapping applications.

Based on the key findings for the responses to the GIS Toolbox, the Focus Group offers the following recommendations for consideration:

- EPA representatives working on Site Assessments may benefit from reviewing the findings of this report and having an open dialogue with States in their Region on the benefits of using GIS for the Site Assessment process and resources available to support GIS use.
- States performing Site Assessments would also benefit from reviewing the findings of this report to identify how they can benefit from GIS and what resources are available. States desiring to use GIS that do not have the proper equipment or training, are encouraged to explore options within their program, agency, and collaborations to acquire these resources.
- A lack of State-funded GIS resources may be addressed through federal, pre-remedial funding sources.
- The findings of this report indicate that more GIS information is generated by States than is shared with EPA. States and EPA Representatives may benefit from increased sharing of GIS data and maps.

Section 1.0: Introduction

The Site Assessment Program is a partnership between the U.S. Environmental Protection Agency (EPA) and States. Since its inception in the early 1980s, the Site Assessment Program has been the foundation of the national Superfund Program and has assessed more than 53,000 potentially contaminated hazardous substance sites. The task of the Focus Group is to evaluate various aspects of the Site Assessment process in collaboration with EPA in an effort to help identify areas where the process can benefit from information sharing, knowledge transfer, and training as well as the use of innovative technologies both in the office and the field.

For this research tool, the Focus Group was interested in determining the extent to which States utilize GIS in the Site Assessment process and identifying particular areas where GIS is the most useful. To achieve this, the Focus Group created and provided a GIS Toolbox to all States to determine their use of GIS in their Site Assessment program processes. The goal of this report is as follows:

- Obtain, summarize and report information about States' use of GIS;
- Identify where ASTSWMO can help States share examples of using GIS in their Site Assessment programs; and,
- Provide key findings and recommendations regarding the use of GIS in Site Assessment Programs.

Section 1.1: Research Methods

In late 2018, the Focus Group identified GIS as a robust technology that is utilized by States to varying extents. The Focus Group was interested in determining how GIS is used and if there are limitations that could be overcome by shared knowledge and collaboration between States or designated support (hardware or training) from EPA. The Focus Group began by developing a problem statement which read, "*States evaluate a variety of different sites, from those which present very little risk to those which may pose a higher risk to human health and the environment that might be proposed for the NPL or referred to State Superfund programs. Many States rely on GIS capabilities to assist them with a variety of site assessment tasks including the discovery of new sites, the screening and prioritization of sites, field work activities, environmental data management, creating standardized maps, interacting with the public, and preparing Hazard Ranking System (HRS) scoring packages. However, due to the relative complexity of available GIS tools and software applications, States might not have sufficient resources (staff, funding, equipment or training) to benefit from, or take advantage of, the full potential of GIS capabilities.*"

The Focus Group developed a GIS Toolbox and provided the research tool to the ASTSWMO State Site Assessment contacts in April and May 2019. Thirty-six States responded to the research tool. The Focus Group set a high response rate goal and employed strategies to boost the response rate through:

- Personalizing the contact with States by having each Focus Group member send an e-mail invitation with a direct hyperlink to the GIS Toolbox to States in their Region;
- Limiting the length of the GIS Toolbox;
- Designing a user-friendly electronic GIS Toolbox with clear instructions;
- Allowing adequate time to complete the GIS Toolbox;
- Explaining why the research is important and how the results will be used; and,
- Sending e-mail reminders encouraging States to participate.

To ensure confidentiality of the thirty-six responding States and the protection of Personal Identifiable Information (PII), the Site Assessment Focus Group has removed the State names throughout this document. The States will be referred to as State 1 through State 36. States were also encouraged to offer their own unique responses to many questions and add comments or suggestions to provide a broader framework for their responses. The GIS Toolbox and the associated response comments are located in the following appendices:

Appendix A: ASTSWMO Research Tool
Appendix B: State GIS Research Tool Responses

State responses are included exactly as received except for their State name or agency. The responses provided in the appendices are in Excel format.

Section 2.0: Data Interpretation

The Focus Group provided the States the GIS Toolbox to determine State use of GIS in their Site Assessment program processes. The following Sections discuss, and show graphically, the State responses to the GIS Toolbox and how this relates to the following GIS processes:

- GIS use frequency and programs;
- Staff knowledge and training of GIS;
- Site Assessment GIS Tasks;
- Identification of State GIS Needs;
- GIS Collaboration with local, State, and federal agencies;
- GIS Usage within Post-Site Assessment Remedial programs; and,
- Innovative GIS projects.

Section 2.1: GIS Use Frequency and Programs

The States were provided the questions below to determine how often they use GIS software to identify sites or perform Site Assessments, and what software and data sets States use the most.

Question: *"How often does your State use GIS software to identify sites or perform Site Assessments at sites."*

Graph 1: Frequency of GIS Usage

Frequency of GIS Usage

14 %

86 %

■ Some Usage   ■ Not at All
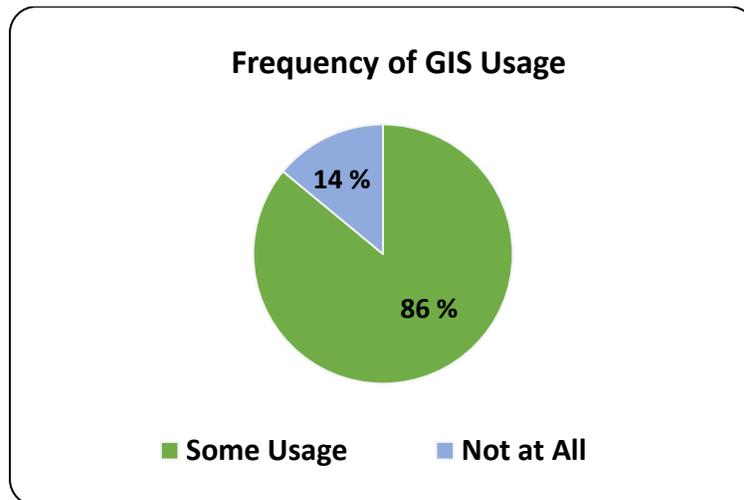
State responses indicate that GIS is an important tool in the Site Assessment process. A total of 86% of responding States indicate GIS is used for some type of Site Assessment activities and over 55% of responding States indicate GIS is used frequently or all the time.

Five States (14%) responded that GIS is not used for their Site Assessments and three of these five States (8%) indicated in other responses to the survey that GIS resources were limited. Two States responded that GIS would be beneficial to all Site Assessment tasks and one State responded that they are currently developing their GIS capabilities to be applied to Site Assessment.

Follow-up Question: "What software programs and data sets does your State utilize the most for the purpose of identifying sites and performing Site Assessments? If "Not at all", please explain? The five States that answered "Not at all" to the previous question did not provide a response to this follow-up question. The other thirty-one State responses varied, with about half providing information on hardware and software and half providing information on data sets. Hardware and software identified were generally consistent, while data set usage responses were more varied. Several interesting and detailed responses were provided describing application of data sets to Site Assessment.

Approximately two-thirds of the States which responded to this question, identified ESRI Arc Map and/or one of its components as the software used for Site Assessment. Several other related ESRI products were identified by States including: ESRI Collector; ESRI Survey 123; ESRI Explorer; and, Desktop Editor. ESRI ArcMap is clearly the standard commercial GIS software used by State agencies across the country. Several other hardware and software programs were identified including (response numbers in parenthesis): Google Earth (7), General GPS/Trimble (3), Pathfinder Office (2), Earthsoft EQuIS (1), Rockworks (1), Enviro Insite (1), Python (1), Virtual Sampling Plan (1), Surfer (1).

Five States specifically identified internal GIS programs. It was unclear based on responses whether these software packages were based on commercial software. Several other States likely have similar systems based on their responses referring to the organization of internal data sets. Synthesizing State responses creates a helpful resource of GIS datasets frequently used and applicable to Site Assessment. Commonly identified datasets and data types included the following:

- Sensitive environmental areas;
- Environmental justice areas;
- Schools and daycare facilities;
- Remediation and/or property site boundaries;
- Private and public supply well locations;
- Digitalized USGS quadrangle maps;
- Aerial photography;
- USGS historical aerial photography;
- USGS groundwater inventory;
- Historical Sanborn fire insurance maps;
- Digital elevation models; and,
- Census, LIDAR, geologic, RCRA, and LUST data.

States using GIS indicated that GIS can be vital to link contaminant data sets to receptor datasets to determine if contaminated sites pose a risk to receptors. A State provided a great example of how they use a Python script and GIS to *"triage"* new environmental sites. Their script *"looks at nearby features to give the site a preliminary triage score that can help identify risks to human health or the environment. This is an internal use only score that does not claim to address all the risk at a site."*

This State also indicates that all their environmental agency computers have ArcMap installed and that they have an enterprise license agreement with ESRI. Other States indicate in their responses that funding and licensing of ESRI software is a limiting factor in their ability to use GIS for Site Assessment tasks.

Section 2.2: Staff Knowledge and Training

The States were provided the questions below to determine the knowledge and expertise of GIS software in their program, as well as access to training.

Question: *"Please rate your Site Assessment Program staff's knowledge, skill, and expertise with GIS software."*

Graph 2: GIS Software – Knowledge, Skill and Expertise

GIS Software - Knowledge, Skill and Expertise

3 %

6 %

19 %

72 %

■ **None** ■ **Beginner** ■ **Intermediate** ■ **Expert**
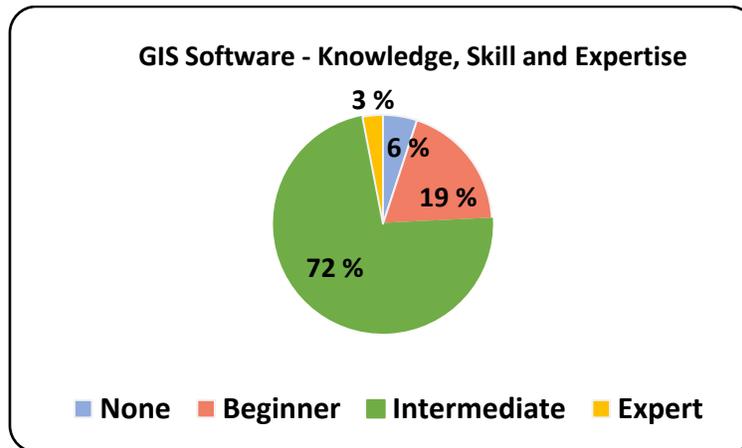
Most States (26 States, 72%) indicate their Site Assessment staff have an intermediate proficiency in GIS. Only nine States (25%) indicate their Site Assessment staff either have no experience (2 States, 6%) or beginner-level experience (7 States, 19%). One State (3%) indicates their Site Assessment program has expert proficiency in GIS. However, the expertise level in State agency programs appears to have broad ranges and, may be indicative of subjectivity of the respondents. Four State responses to the follow-up question specifically described a range of GIS capabilities within their programs from beginner to advanced. Additionally, three of the State responses identified GIS expertise in other agencies of their State which were available for GIS support. One State which answered "none" to this question mentioned in their response that their State no longer has a GIS program. Other States cited similar limitations including:

- Inadequate or basic GIS software training;
- Turnover of staff knowledgeable in GIS; and,
- Skill and expertise in GIS software.

Question: *"What types of GIS training courses have been available to your Site Assessment Program staff over the last five years (for example, basic GIS, Python training, online courses)."* State responses indicate the primary types of GIS training courses are basic internal classes and vendor (primarily ESRI) online courses. These types of training were referenced in over half of the responses to this survey. Responses implied that Site Assessment staff are encouraged to take these types of classes to obtain an intermediate proficiency in GIS. Several other training courses were identified, including:

- Conference attendance (2);
- Advanced external courses (2); and,
- GPS training (1).

Two States responded that their Site Assessment staff joined their agency with at least intermediate knowledge of GIS through college courses or previous employment experience.

Section 2.3 Site Assessment Tasks

The States were provided the question below to determine if their Site Assessment Program uses GIS to complete particular Site Assessment tasks and to rate the importance of GIS in completing the task on a scale of 0 – 10. For the purposes of this evaluation, a response of 0-3 is interpreted as not important, 4-6 is interpreted as moderately important, and 7-10 is considered highly important. The following are the tasks identified in the GIS Toolbox:

Question: *"Has your State's Site Assessment Program benefited from the use of GIS for Discovery of New Sites, Screening and Prioritization of Sites, Field Work Activities, Environmental Data Management, Creating Standardized Maps, Interacting with the Public, or Preparing HRS Scoring Packages?*

Follow-up Question: If so, please tell us about one (or more) Site Assessment task(s) where the use of GIS has improved efficiency in your State program. If not, please explain why."

Graph 3: Discovery of New Sites
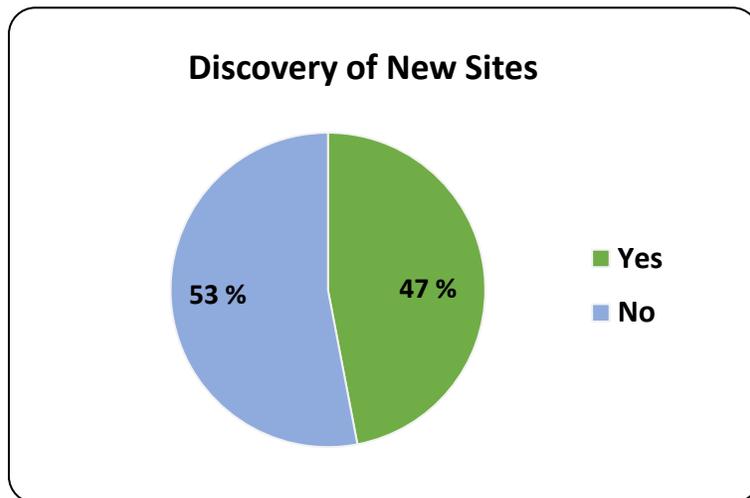
State responses for the Discovery of New Sites question indicate that this use of GIS is moderately important (average result 5.1), with three States rating New Site Discovery with a 10. Interestingly, eighteen States rate *Discovery of New Sites* with a score of 5 or lower and eighteen States rate this use with a score above 5.

Graph 4: Screening and Prioritization of Sites

Screening and Prioritization of Sites

25 %

75 %

- Yes
- No
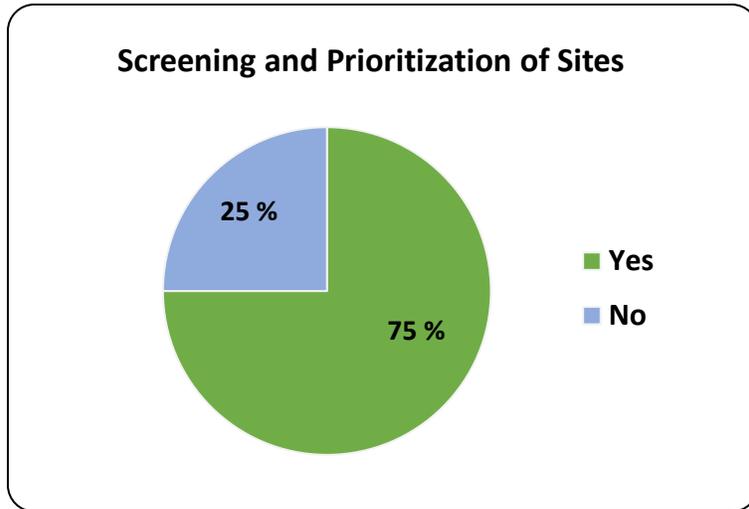
State responses for the Screening and Prioritization of Sites question indicate 75% of States utilize GIS to make screening and site prioritization decisions; this is the second most frequent use of GIS by States. States indicated that this use of GIS is moderately important (average result 6.7), with six States rating Screening and Prioritization of Sites with a 10. The average rating increases to almost 8 when looking at States that responded "Yes" to the first part of the survey question.

Graph 5: Field Work Activities

Field Work Activities

28 %

72 %

- Yes
- No
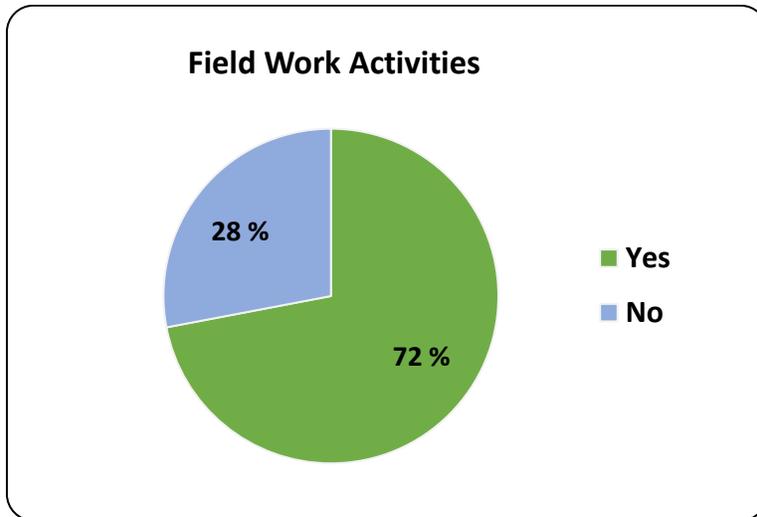
State responses for the Field Work Activities question indicate that 72% of respondents utilize GIS in some capacity while conducting field work activities for their State's Site Assessment Program. States indicated that this use of GIS is moderately important (average result 6.5); however, almost 28% (10) of responding States rate *Field Work Activities* with a 10. The average rating increases to 9 when looking at States that responded "Yes" to the previous question.

Graph 6: Environmental Data Management

Environmental Data Management

36 %

64 %

■ Yes
■ No
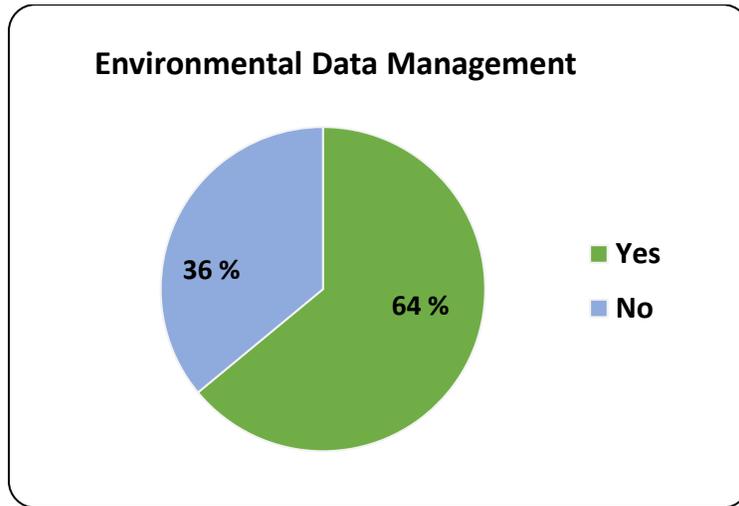
State responses for the Environmental Data Management question indicate that 64% of States utilize GIS in some capacity for managing environmental data. States indicate that this use of GIS is highly important (average result 7.1), with five States rating Environmental Data Management with a 10. Of the responding States that replied "No", more than 50% of States rated the importance of using GIS for environmental data management as a 7 or higher.

Graph 7: Creating Standardized Maps

Creating Standardized Maps

22 %

78 %

■ Yes
■ No
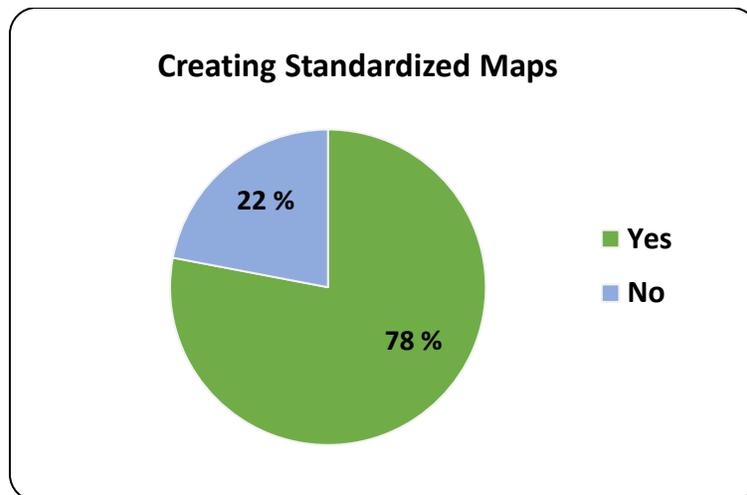
State Reponses for the Creating Standardized Maps question indicate that 78% of States utilize GIS to create standardized maps; this is the most popular use of GIS by States. States indicated that this use of GIS is highly important (average result 8.4), with almost 50% (17) of responding States rating *Creating Standardized Maps* with a 10.

Graph 8: Interacting with the Public

Interacting with the Public
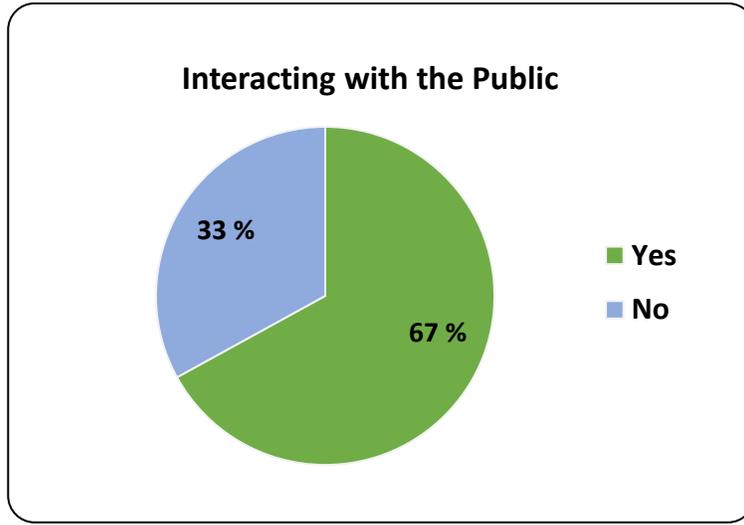
State responses for the Interacting with Public question indicate that 67% of States utilize GIS for the purposes of interacting with the public in some ca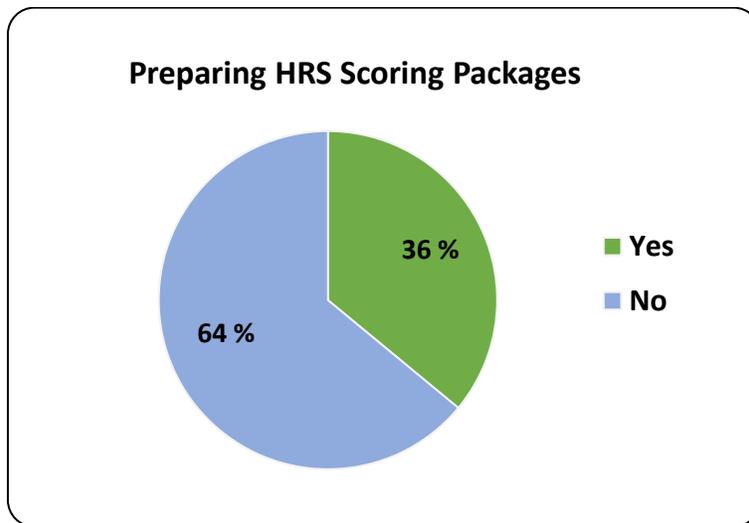pacity. States indicated that this use of GIS is moderately important (average result 6.6), with five States providing a rating of 10.

Graph 9: Preparing HRS Scoring Packages

Preparing HRS Scoring Packages

State responses for the Preparing HRS Scoring Packages question indicate that 36% of respondents utilize GIS for the purposes of preparing HRS packages. States indicated that this use of GIS is on the lower end of moderately important (average rating 4.4), with six States providing a rating of 10. Of the respondents that replied "yes" to the previous question, nine States rated the importance of using GIS to prepare HRS Scoring packages with a 7 or higher. Thus, it appears that for those States that do use GIS for this purpose, it is important. It is interesting to note that in the 2017 Site Assessment Program Analysis paper

(), the Focus Group learned that many States do not actually complete the HRS scoring packages.

Graph 10: GIS Usage Benefits Site Assessment Program

GIS Usage Benefits Site Assessment Program

22 %

78 %

■ Yes
■ No
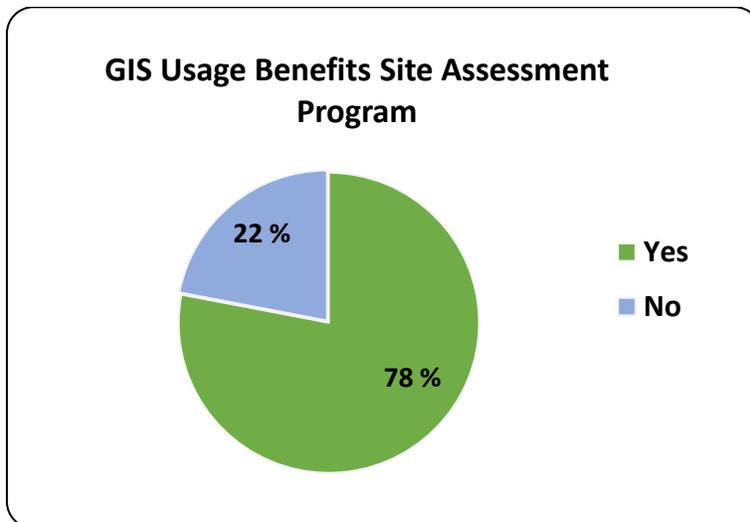
State responses for the GIS benefitting their State Site Assessment Program question indicate that 78% (28) of the States benefit from the use of GIS and 22% (8) of the States have not benefitted from the use of GIS. Of these eight States, five States indicated their programs have little or no GIS capability. However, one of these States indicated that much of their Site Assessment work is conducted by State contractors and generally the contractor uses GIS extensively. Two States indicated that GIS is used in other agency programs, but that the Site Assessment Program does not have access to it. One State indicated they do not have a Site Assessment Program.

The twenty-eight States that benefitted from the use of GIS, used it for the following tasks, in order of greatest number of States:

- Creating Standardized Maps (28 States);
- Screening and Prioritization of Sites (27 States);
- Field Work Activities (26 States);
- Interacting with the Public (24 States);
- Environmental Data Management (23 States);
- Discovery of New Sites (19 States); and,
- Preparing HRS Scoring Packages (13 States).

Many States responded that they have a publicly available web GIS application that can be used to locate sites and access information regarding those sites. Some of these systems allow the user to access specific reports and data, while others do not. Several States mentioned that they use GIS to identify private wells which might have been impacted from contaminated

groundwater at a site. The creation of standardized maps was identified as a use that increases efficiency at several States. Another State's usage of GIS includes projects to re-assess closed sites that were closed before subsurface vapor intrusion was fully understood as an exposure pathway, particularly with the chlorinated ethene sites. Several other States are using GIS in their assessments for identifying per- and polyfluoroalkyl substance (PFAS), chlorinated solvents, and other contaminant sites to identify or manage potential exposure pathways.

Section 2.4 Identification of State Needs

Identification of State Needs

Category	%
EPA GIS support	~47%
Training/funding	~47%
Software/licenses	~33%
Increased GIS capabilities	~31%
Funding for GIS	~19%

% of respondents identifying the listed need
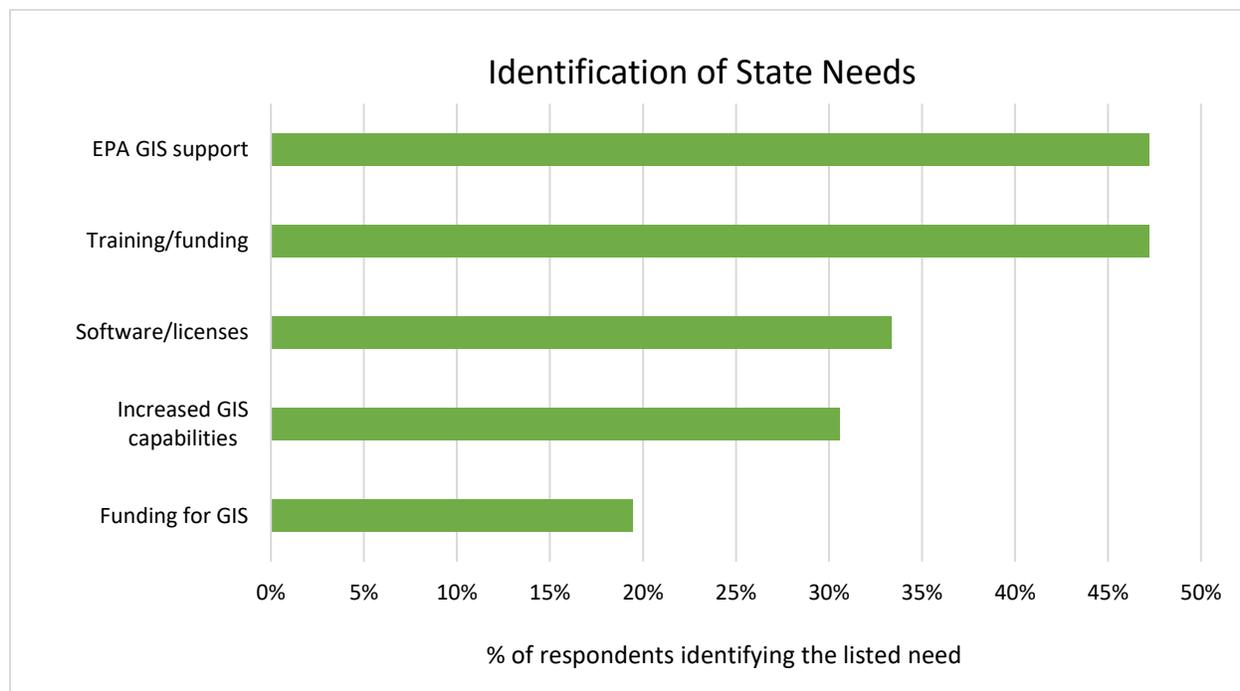
States were provided the questions below to determine the limiting factors for State environmental programs use of GIS and if State Site Assessment Programs would benefit from EPA support/funding to increase GIS capabilities.

Question: "The use of GIS in environmental programs is often controlled by limited resources and/or training. What are the main reasons which limit your State's use of GIS?"

GIS usage is limited in most State Site Assessment Programs due to a lack of resources and time according to the thirty-six responding States. The results weighed heavily on funding constraints to develop and improve GIS expertise for inexperienced staff members. At least seventeen States (47%) indicate their program lacks the training and/or funding to improve their GIS capabilities. One State indicates their State relies on Information Technology (IT) staff to complete their advanced GIS tasks. They recommended that advanced level GIS tasks should be delegated to individuals that use it daily, otherwise software fluency is difficult to maintain. Several States from EPA Regions 2, 4, and 7 suggested that expertise is difficult to maintain because of the rate of staff turnover within their program. Inadequate equipment or a lack of access to software and

licenses restricts GIS use in at least twelve States (33%). A lack of direction, value, or support from management was expressed by four States in EPA Regions 4, 5, and 10.

Question: *"Would your State's Site Assessment Program benefit from receiving more EPA support and/or funding for increasing your GIS capabilities? If so, please describe what that support might entail."*

State responses from seventeen States (47%) indicate their Site Assessment Programs would benefit from EPA support through GIS training opportunities. Of these, at least three States (8%) requested more direction and guidance from EPA regarding the types of datasets and/or GIS processes EPA would like the States to use. Four States (11%) responded "no" to this question. Two of these States indicated they already have funding and GIS support mechanisms in place, and a third clarified that GIS assistance could be helpful in the future, after EPA starts to integrate these tools. At least one State expressed that EPA has already been instrumental in advancing their usage of GIS in Site Assessment. Eleven States (31%) from six EPA Regions said their Site Assessment Programs would benefit from funding to increase their GIS capabilities. At least seven States (19%) from EPA Regions 1, 4, 5, 6, 7, and 8 specified that funding for GIS equipment including, infrastructure and/or software upgrades would be beneficial.

Section 2.5 GIS Mapping Collaboration with Other Agencies

States were provided the questions below to determine their Site Assessment programs collaborations with local, State and/or federal agencies in the utilization of resources for GIS mapping and if their Site Assessment programs are equipped to share GIS data with EPA.

Question: *"Has your State's Site Assessment Program collaborated with other agencies (local, State, or federal) to utilize available GIS mapping resources? If so, please describe one of these collaborations and tell us how it has helped to improve your State's Site Assessment Program. If not, please explain why."*

Graph 12: GIS Mapping Collaboration with Other Agencies
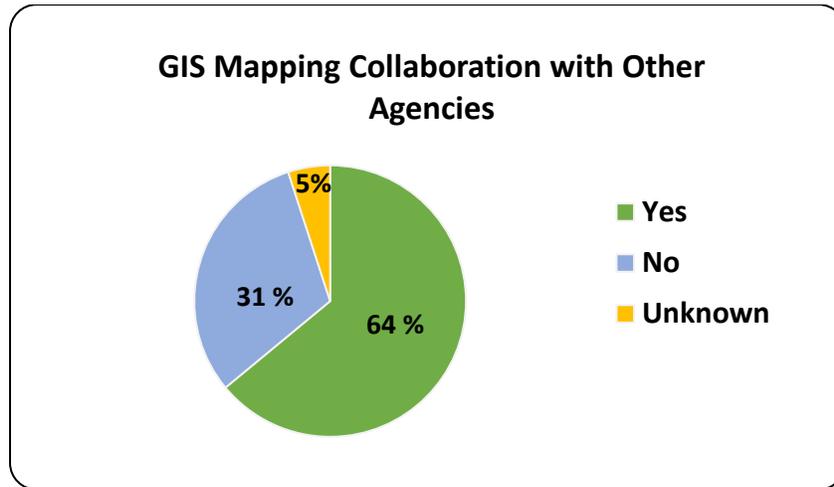
State responses indicate twenty-three States (64%) are collaborating with other agencies for their GIS mapping resources, eleven States (31%) indicate they do not collaborate, and two (5%) specified "*unknown*". At least one State explained that their GIS collaboration opportunities are hindered by a "*lack of tools, knowledge and resources*".

Approximately half of the responding States described GIS collaborations have enhanced the improvement of their Site Assessment and includes:

- ArcGIS;
- National Agricultural Imagery;
- ESRI ArcGIS Survey123; and,
- ESRI ArcGIS Collector.

State Site Assessment programs that are using ESRI's ArcGIS Survey123 and ArcGIS Collector indicate they overlay data from other agencies to map environmental terrain and establish property boundaries. Eight responding States (22%) indicate they share GIS mapping with other agencies and includes:

- Aerial imagery;
- Gridded maps;
- Topographic maps; and,
- Parcel maps.

The States GIS mapping content utilized and valued is diverse and includes:

- Property ownership tax and parcel information;
- Environmental site locations containing links to electronic information files;
- Contaminant disposal locations;

- Sensitive receptor (day care facilities, public/private drinking water wells/other water sources, wetland areas, endangered species areas);
- Identified dry-cleaners; and,
- City/County GIS databases (property/parcel information).

In general, responses indicate that collaborative efforts between States and agencies have been influential to the improvement of State Site Assessment activities. States that participate in collaborative GIS mapping are building contacts, learning new technologies, and accessing and sharing more up-to-date datasets that are relevant to site discovery or remediation, both internally and externally.

Question: *"Is your State's Site Assessment Program equipped to share GIS data with EPA? If so, please describe how GIS data may be shared."*

Graph 13: States Sharing GIS Data with EPA
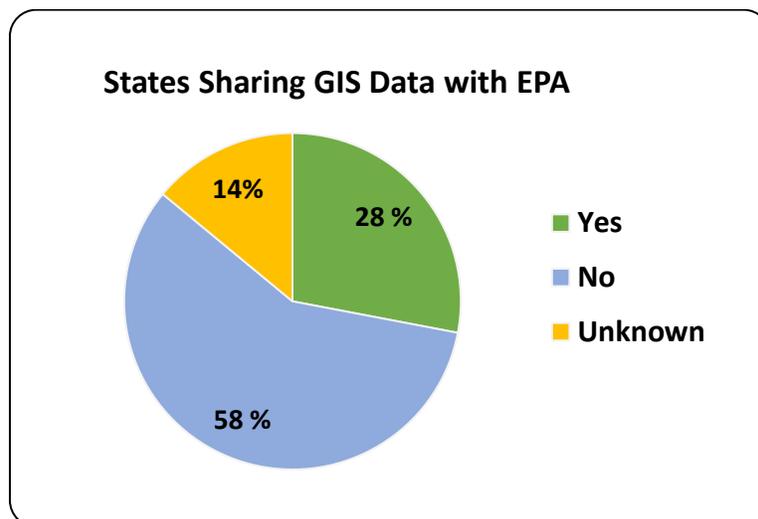
The majority of responding States (58%, 21 States) do not share GIS information with EPA. The States reasoning for this includes: EPA has not requested specific data (such as shapefiles or layers) and the State systems are not set up to provide this type of data transfer. State responses (28%, 10 responses) indicate their agencies provide ArcGIS information to the public on their websites which can be accessed by EPA. States that do share information with EPA indicated several methods of data transfer including:

- Shapefiles via FTP servers;
- EQuIS, Scribe;
- ESRI ArcGIS Survey123;
- ESRI ArcGIS Collector; and,
- ESRI ArcGIS Online in connection with EPA Geoplatform.

Section 2.6 State Use of GIS Outside of Site Assessment

States were provided the questions below to determine their use of GIS in post-Site Assessment remedial programs and if so, how GIS has enhanced efficiency in their remedial programs.

Question: *"Does your State use GIS in the implementation of post-Site Assessment remedial programs? If so, please provide an example of how GIS has made your State's remedial program more efficient."*

Graph 14: GIS – Implementation of Post-Site Assessment Remedial Programs
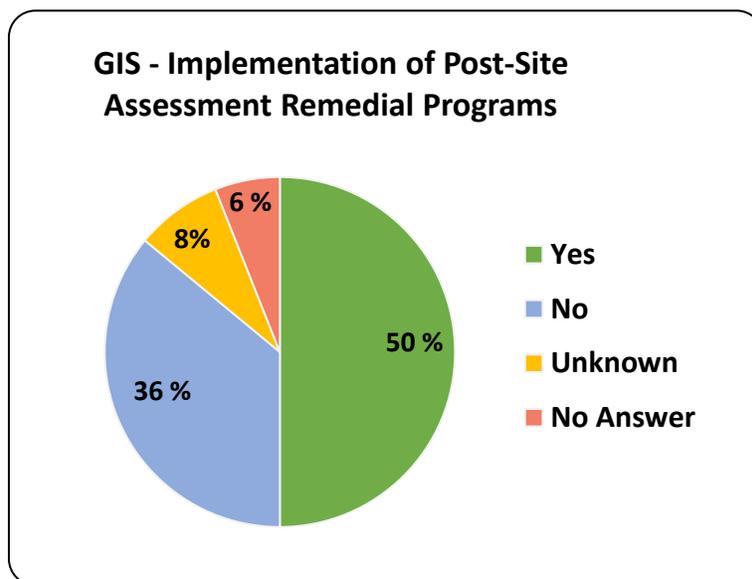
State responses indicate 50% (18) use GIS and 36% (13 States) do not use GIS in their post-Site Assessment Remedial programs, 8% (3 States) did not know about post-Site Assessment use, and 6% (2 States) did not provide an answer to the question. In the responses that contained examples, 33% (12 States) indicate there was generally widespread use of GIS throughout their Remedial programs. In addition, 33% (12 States) indicate public-facing GIS/Web mapping applications are a primary use of GIS.

Three States indicate they use GIS in other programs beyond the Site Assessment Program; however, the use is generally minimal because there are few agency drivers that support widespread usage of GIS. Additionally, a lack of staff training or familiarity with GIS have resulted in inconsistent GIS application at sites outside of their Site Assessment Program. One State has eliminated in-agency GIS capabilities altogether.

The responses indicate the use of GIS beyond the Site Assessment program is generally highest among States that have relatively high use of GIS in their Site Assessment Program. These States appear to have well developed, enterprise-wide GIS programs and agency drivers that promote

the wide application and usage of GIS. State environmental agencies that do not have strong internal drivers that promote GIS use have relatively low GIS usage in their Remediation programs.

Section 2.7 State Innovative GIS Projects

States were provided the questions below to determine their use of GIS for innovative projects in their Site Assessment program.

Question: *"Has an innovative project in GIS or some other software program enhanced your State's Site Assessment Program? Please explain. Would your State be willing to share the specifics of this project as a case study at a future time? If so, please provide a brief (3-4 sentence) description of this project."*

Graph 15: GIS Innovative Project Enhanced State Site Assessment Program
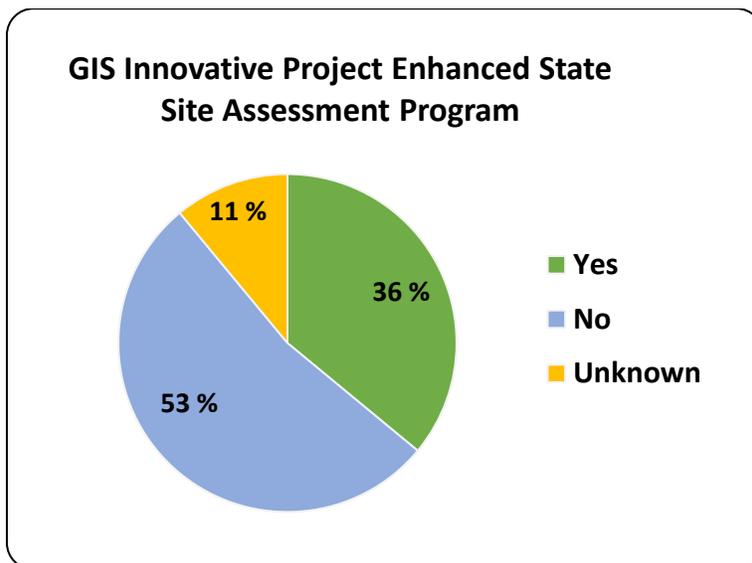
State responses indicate 36% (13) of the State's Site Assessment programs were enhanced by innovative GIS projects, 64% (23) States responded "No" or "N/A". The States currently or have been involved with innovative GIS projects provided comments that were overwhelmingly positive. These States indicate their projects have been enhanced by the following:

- Identification, evaluation, and prioritization of potential risks targets;
- Time savings;
- Development of pilot projects; and,
- Screening potential releases within specified radii.

States provided examples of innovative projects being implemented and/or developed within their State. Some examples included the EQuis software program, which has been implemented by States in EPA Regions 2 and 3, to store data and conceptualize contamination areas for locating

potential sources. At least two States indicated that their Site Assessment program uses EnviroInsite software to complete environmental modeling and plume contour mapping tasks.

Two States (6%) responded GIS usage was conducted in other State Programs and two States (6%) responded the usage of GIS was unknown. Other States added additional clarifications, such as: although their State utilizes GIS for figures, map building and aerial photography analysis, *"budgetary, resource, personnel, and time constraints"* have prevented them from being involved with more innovative projects and, "*unfortunately, we have not had an innovative project in GIS recently that enhanced our program, but we would be eager to implement one."*

States within EPA Region's 1, 2, 4, 6, 7, and 10 all described interactive GIS mapping programs they use in collaboration with other agencies. According to their responses, these tools improve their access to useful environmental data by linking it spatially and, in some cases, by making it public. Site Assessment programs are able to search for sensitive receptor areas and locate and evaluate contaminated sites. For example, one State implements an advanced Internal Web Mapper GIS program with HRS scoring capabilities to facilitate their Pre-screening Site Assessment activities and another State implements a GIS Spatial Prioritization Geographic Information Tool (SPGIT) that combines data from various sources to identify and rank contaminated groundwater areas. One State has an E-Start program that makes spatial information and data on active Site cleanups and ongoing investigations publicly available. States in EPA Region 4 are currently developing similar capable GIS tools for their own internal use.

Section 3.0 Conclusions and Recommendations

The following provides key conclusions based on the responses to the GIS Toolbox on the use of GIS for Site Assessment activities.

GIS Use: GIS is an important tool for State Site Assessment programs. Most States (31 of the 36 that responded to the GIS Toolbox) use GIS for Site Assessment tasks, and over half (20 States) use GIS frequently or all the time. Twenty-eight States indicated that their Site Assessment program benefits from the use of GIS, while eight States said they have not. Of those eight, five States indicated that their programs have little to no GIS capabilities. Eighteen States indicated that they use GIS in their post-site assessment remedial programs, and thirteen States indicated that their Site Assessment program has been enhanced by innovative GIS project applications. These States indicated their projects have been enhanced by the following: (i) identification, evaluation, and prioritization of potential risks/targets; (ii) time savings; (iii) development of pilot projects; and, (iv) screening potential releases within specified radii. Only five States responded that GIS is not used for Site Assessment. However, even the States that do not use GIS saw some benefits in its use.

GIS Data: States indicated that GIS can be vital to link contaminant data sets to receptor data sets to determine if contaminated sites pose a risk. For Site Assessment tasks, GIS is used most commonly for the following activities: creating standardized maps (28 States, 78%); screening

and prioritization of sites (26 States, 72%); field work activities (26 States, 72%); interacting with the public (<50%); environmental data management (23 States, 64%); discovery of new sites (<50%); and, preparing HRS scoring packages (<50%). States use spatial datasets including the following: (i) City/County GIS databases of property ownership, tax, and parcel information; (ii) contaminant disposal locations and environmental site locations; (iii) sensitive receptors such as sensitive environmental areas, environmental justice areas, schools and daycare facilities, public/private drinking water wells/other water sources, wetland areas, endangered species areas; (iv) potentially contaminating sources such as dry-cleaners, RCRA generators, and LUST sites, etc.; and, (v) others such as geologic data, digitalized USGS quadrangle maps, aerial photography, historical Sanborn fire insurance maps; Digital elevation models, LIDAR, and more.

GIS Software and Training: ESRI's ArcMap is the standard commercial GIS software used by State agencies across the country, used by two-third of respondents; Google Earth was the next most common, mentioned in 20% of responses. Half the States responded that the primary types of GIS training courses were basic internal classes and vendor (primarily ESRI) online courses. Most States (75%, 27 States) have a GIS user experience level of intermediate. However, there is a large discrepancy in access to GIS software such as ESRI's ArcGIS – some States have enterprise licenses, while others indicate that a lack of funding and licensing limits their ability to use GIS for Site Assessment tasks.

State Needs: GIS use in the Site Assessment programs is limited due to a lack of resources and staff knowledge. At least seventeen States (47%) indicate their program lacks the training and/or funding to improve their GIS capabilities, and twelve States (33%) mention that inadequate equipment or lack of access to software and licenses restricts use of GIS. States also responded that their Site Assessment Programs would benefit from EPA support through GIS training opportunities (47%, 17 States) and funding to increase their GIS capabilities (31%, 11 States).

Sharing GIS Data: Twenty-three States indicated that they collaborate with other agencies (State, federal, or local agencies) to share GIS mapping resources; ten States mentioned sharing GIS data with EPA. Data shared included aerial imagery, gridded maps, topographic maps, and parcel maps. States within EPA Region's 1, 2, 4, 6, 7, and 10 all described interactive GIS mapping programs they use in collaboration with other agencies. Twelve States (33%) have public-facing GIS/Web mapping applications that are a primary use of GIS. Ten States (28%) responded that their agencies provide ArcGIS information to the public on their websites that can be accessed by EPA. States that do share information with EPA indicated several methods of data transfer including: Shapefiles via FTP servers; EQuIS, Scribe; ESRI ArcGIS Survey123; ESRI ArcGIS Collector; and, ESRI ArcGIS Online in connection with EPA Geoplatform.

KEY RECOMMENDATIONS

Based on the key findings for the responses to the GIS Toolbox, the Focus Group offers the following recommendations for consideration:

- EPA representatives working on Site Assessments may benefit from reviewing the findings of this report and having an open dialogue with States in their Region on the benefits of using GIS for the Site Assessment process and resources available to support GIS use.
- States performing Site Assessments would also benefit from reviewing the findings of this report to identify how they can benefit from GIS and what resources are available. States desiring to use GIS that do not have the proper equipment or training, are encouraged to explore options within their program, agency, and collaborations to acquire these resources.
- A lack of State-funded GIS resources may be addressed through federal, pre-remedial funding sources.
- The findings of this report indicate that more GIS information is generated by States than is shared with EPA. States and EPA Representatives may benefit from increased sharing of GIS data and maps.

APPENDICES
The GIS Toolbox and the associated response comments are located in the following appendices:

Appendix A: ASTSWMO Research Tool
Appendix B: State GIS Research Tool Responses

State responses are included exactly as received except for their State name or agency remain confidential. The responses provided in Appendix B - State GIS Research Tool Responses, are provided in Excel format.

Appendix A: ASTSWMO Research Tool

(Research conducted in 2019)

ASTSWMO – CERCLA and Brownfields Research Center
Site Assessment Focus Group (SAFG)
GIS Use in Site Assessment Program – Research Tool

The Association of State and Territorial Solid Waste Management Officials (ASTSWMO) Site Assessment Focus Group is conducting research on the use of Geographic Information Systems (GIS) in State and Territory (State) Site Assessment Programs.

States evaluate a variety of different sites, from those which present very little risk to those which may pose a higher risk to human health and the environment that might be proposed for the NPL or referred to State Superfund programs. Many States rely on GIS capabilities to assist them with a variety of site assessment tasks including the discovery of new sites, the screening and prioritization of sites, field work activities, environmental data management, creating standardized maps, interacting with the public, and preparing Hazard Ranking System (HRS) scoring packages. However, due to the relative complexity of available GIS tools and software applications, States might not have sufficient resources (staff, funding, equipment, or training) to benefit from, or take advantage of, the full potential of GIS capabilities.

The intent of the research tool is to collect information to determine how States are using GIS in their Site Assessment Programs. The research tool asks States questions about States' current GIS resources and proficiency, use of GIS for common tasks, most urgent GIS needs, experiences with GIS collaboration, and case studies in support of their respective Site Assessment Programs. The research project is designed to allow for a phased approach with a research tool to collect information from the individual States to determine their current use of GIS in their respective Site Assessment Programs.   This information would then be shared with the EPA and recommendations made to improve the use of GIS in Site Assessment Programs nationwide. Thank you in advance for your participation; your feedback is greatly appreciated. We hope that the collective input from all States will help to improve the use of GIS in the Site Assessment process.

For more information on the ASTSWMO Site Assessment Focus Group, please go to www.astswmo.org.

Appendix B: State GIS Research Tool Responses

http://astswmo.org/files/Resources/CERCLA_and_Brownfields/2021-GIS-Research-Tool-Results.xlsx