U.S. DEPARTMENT OF ENERGY

HSS
Office of Health, Safety and Security

Department of Energy Consolidated Audit Program

MAPEP

SPADAT

Analytical Services Program

Fiscal Year 2013 Report

U.S. Department of Energy
Office of Health, Safety and Security

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Table of Contents

Figures

Tables

Acronyms

3-D	three dimensional
ASP	Analytical Services Program
CRM	certified reference material
DCGL	derived concentration guideline level
DoD	Department of Defense
DOE	Department of Energy
DOECAP	Department of Energy Consolidated Audit Program
DQO	data quality objective
FY	fiscal year
GOCO	government owned/contractor operated
HSS	Office of Health, Safety and Security
IEC	International Electrotechnical Commission
ISO	International Organization for Standardization
LLNL	Lawrence Livermore National Laboratory
LM	Office of Legacy Management
M	Manual
MAPEP	Mixed Analyte Performance Evaluation Program
MARSSIM	*Multi-Agency Radiation Survey and Site Investigation Manual*
NIST	National Institute of Standards and Technology
NNSA	National Nuclear Security Administration
O	Order
ORNL	Oak Ridge National Laboratory
POC	point of contact
PT	proficiency testing
QSAS	*Quality Systems for Analytical Services*
QSM	*Quality Systems Manual (QSM) for Environmental Laboratories*
RMCC	Radiation Measurements Cross-Calibration [Program]
RESL	Radiological and Environmental Sciences Laboratory
SPADAT	System Planning and Data Assessment Tools
TNI	The NELAC Institute
UCL	upper confidence limit
TSDF	treatment, storage, and disposal facility
U.S.	United States
VSP	Visual Sample Plan

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Executive Summary

This report provides an overview of the Analytical Services Program (ASP) activities for fiscal year (FY) 2013 for the United States (U.S.) Department of Energy (DOE), including the National Nuclear Security Administration. The Office of Health, Safety and Security (HSS), Office of Sustainability Support, manages the ASP, which is composed of the elements listed below. The term *DOE managers* as used in this document refers to managers at all levels in the Department from the Program Offices to the field elements that depend on the services provided by the ASP's component programs.

- **Department of Energy Consolidated Audit Program (DOECAP)** – Ensures DOE managers receive high-quality analytical laboratory data for environmental decision-making and compliant waste treatment, storage, and disposal services.
- **Mixed Analyte Performance Evaluation Program (MAPEP)** – Provides cost-effective proficiency-testing (PT) sample development and grades the analytical laboratories' results so that DOE managers can have confidence in the environmental analytical services provided by commercial and government-owned/government-operated (GOCO) laboratories.
- **Systematic Planning and Data Assessment Tools (SPADAT) Program – Visual Sample Plan (VSP)** – Promotes development of sampling plans that identify the optimum locations to collect samples, determines the number of samples that are needed, and increases the cost-effectiveness of sampling programs and their implementation.

These auditing, PT, and planning activities are key vehicles for ensuring high-quality, reliable environmental data is available for decision-making to support ongoing, mission-critical DOE operations, such as environmental monitoring, environmental remediation, and long-term legacy management surveillances. In addition, the ASP contributes to the assurance that DOE's radiological and hazardous waste streams are properly accounted for, treated, and disposed of in a compliant manner.

Department of Energy Consolidated Audit Program

DOECAP is an auditing program for commercial and GOCO environmental analytical laboratories and waste treatment, storage, and disposal facilities (TSDFs). DOECAP provides a cost-effective means for DOE managers to meet applicable requirements of DOE Order (O) 414.1D, *Quality Assurance*, and DOE O 435.1, *Radioactive Waste Management*. DOE O 414.1D requires (a) DOE's products and services to meet or exceed customers' requirements and expectations and (b) DOE to achieve quality for all work based upon the following principles: performance and quality improvement require thorough, rigorous assessments and effective corrective actions. In addition, DOE O 435.1 and DOE Manual 435.1-1 require the field element manager to approve an exemption to allow use of non-DOE TSDF facilities based, in part, on the results of an annual DOE review of the facility. Appendix A provides the relevant paragraphs from these DOE Orders and Manual.

DOECAP has eliminated the need for more than 170 annual, independent field audits by conducting consolidated audits. Even after the cost of DOECAP's centralized support function (DOECAP Operations Team) and the cost for the auditors' time and travel are deducted, DOECAP resulted in an estimated annual cost savings to the Department in excess of $7.2 million in FY 2013, along with additional savings to the audited laboratories and TSDFs from hosting fewer audit teams that resulted in reduced overhead costs to the facilities and reduced costs to DOE.

During FY 2013, DOECAP conducted 31 audits of analytical laboratories and TSDFs. In conjunction with these audits, DOECAP management promoted increased Program participation and awareness across the DOE complex, as well as fostering improved understanding by DOE managers of the risks and liabilities associated with commercial laboratory and TSDF contracts. By tracking audit findings, reviewing and accepting (or rejecting) the audited facilities' proposed corrective action plans, and verifying closure of audit findings, DOECAP also encourages laboratory and TSDF performance improvement, including efforts to identify deficiencies and implement proactive corrective actions, strengthen quality assurance programs, and increase the facilities' focus toward meeting applicable requirements.

Support from the DOECAP participants is vital to the success of the Program. To staff all of the consolidated audits that are needed each year, it is crucial for the DOECAP volunteer auditor cadre to be as large as possible. During FY 2013, DOECAP added 8 new laboratory auditors and 11 TSDF auditors, helping to partially offset the loss of 14 auditors (mostly to retirement or job changes), but more auditors are needed.

DOECAP has continued its active involvement with national standards development programs and collaborative efforts with other agencies to promote DOE's missions and interests, and these activities provide beneficial contributions. For example, FY 2013 saw the culmination of two years of collaborative efforts by DOE and the Department of Defense (DoD) to integrate the agencies' laboratory auditing requirements into a single quality requirements manual. Both agencies began auditing laboratories to the requirements of the joint *Quality Systems Manual (QSM) for Environmental Laboratories* in January 2014. The laboratories will benefit by having a single set of quality requirements to implement rather than implementing two different sets of quality requirements. The major differences between the DoD and DOECAP laboratory auditing programs are shown in the following table.

DoD Laboratory Audits	DOECAP Laboratory Audits
Matrix/method/analyte-specific accreditations which serve only DoD's interests/needs	Programmatic in nature and addressing data quality for radiological, organic, and inorganic constituents of interest to DOE field sites Audits include the risks associated with worker safety and the management of radiological/hazardous waste generated from chemical analysis

DoD Laboratory Audits	DOECAP Laboratory Audits
Auditors are from third-party accrediting organizations	Auditors come from the DOE program offices/field sites and contractors performing onsite laboratory-related work
Laboratories pay for the audits Laboratories select the auditors	Audits conducted at no cost to the laboratories Audit teams are selected by the DOECAP Operations Team and DOECAP management Auditors undergo extensive DOECAP training

HSS sponsors an annual ASP Workshop to foster continuous improvement, communication, and sharing of information and lessons learned. The 2013 ASP Workshop was held in Asheville, North Carolina, and attended by DOECAP participants from all over the U.S., with additional attendees participating via a webinar link. The workshop included presentations on a variety of topics, training, and feedback sessions for the auditors and audited facilities, as well as a roundtable discussion on proposed changes to DOE O 435.1, *Radioactive Waste Management*, which is the "driver" document for DOECAP audits of radiological TSDFs.

Mixed Analyte Performance Evaluation Program

MAPEP is a PT program that evaluates the quality of analytical measurements made by laboratories supporting DOE for environmental decision-making. DOE spends approximately $31 million a year on contracts with GOCO and commercial laboratories for analysis of environmental samples.

DOE's Radiological and Environmental Sciences Laboratory (RESL), which is located at the Idaho National Laboratory, manages MAPEP and provides cost-effective sample development and grades the laboratories' PT results. In this way, MAPEP supports quality assurance oversight of the commercial and GOCO laboratories that provide environmental analytical services to the Department. MAPEP participants currently include more than 100 U.S. analytical laboratories supporting DOE's missions and/or interests. More than 30 international analytical laboratories participate in MAPEP that directly or indirectly support U.S. Government programs and initiatives (e.g., cooperative air monitoring and the Radiation Measurements Cross-Calibration Project in the Middle East and North Africa).

MAPEP's primary objective is to foster the reliability and credibility of the analytical results used in DOE management's decision-making processes, particularly with regard to decisions about DOE's radiological protection programs, environmental remediation/monitoring programs, and long-term stewardship activities. DOE's environmental samples typically contain multiple hazardous analytes; therefore, for the most realistic results, the PT samples sent to laboratories are comprised of a comparable mixture of target analytes. MAPEP is the only PT program in the U.S. that provides mixed analytes in real-world sample matrices, and only MAPEP requires the participating laboratories to quantify both radioactive and nonradioactive analytes in the same sample.

RESL distributes MAPEP PT samples to participating laboratories twice a year, and the laboratories have 60 days to provide their results. During FY 2013, RESL shipped 1300 MAPEP

PT samples to more than 125 domestic and international laboratories, resulting in evaluation of 12,500 analytical results for acceptable performance. In addition, RESL began providing new certified reference materials, which are accompanied by a RESL Certificate of Traceability.

RESL maintains high quality standards for all its PT programs, as confirmed by its renewed accreditations in FY 2013 for the International Organization for Standardization (ISO)/ International Electrotechnical Commission (IEC) 17025, *General Requirements for the Competence of Testing and Calibration Laboratories*; ISO/IEC 17043, *Conformity Assessment - General Requirements for Proficiency Testing*; and ISO Guide 34, *General Requirements for the Competence of Reference Material Producers*. No other analytical laboratory in the U.S. maintains all three accreditations for radiological, inorganic, and organic analytes in multiple matrices.

Systematic Planning and Data Assessment Tools Program – Visual Sample Plan

Before DOE sites gather environmental data to support decision-making, they employ systematic planning to ensure they will collect the right type, quantity, and quality of data to meet their data quality objectives. The SPADAT Program developed VSP to meet the need for a tool to improve sample collection planning. VSP is a free, easy-to-use software tool that supports development of optimal sampling plans based on statistical sampling theory. VSP is widely accepted by regulatory agencies and is often recommended by them because it minimizes cost and sampling requirements while maximizing the available information and the user's confidence in the sampling results. VSP saves DOE money by providing real-time, cost-benefit tradeoff information, such as the following:

- Evaluations based on the projected number of samples, total sampling costs, and sampling locations, which allows users to select the option that provides just enough sampling to support defensible decisions
- Immediate feedback on how the statistical sampling plans affect the confidence levels and the probabilities of making incorrect decisions
- Sampling plans that fill in gaps for sites where samples have been taken in the past
- Graphic decision tools that integrate with AutoCad, ArcGIS, and similar georeference systems for spatial visualization and assessment

Virtually all DOE sites have facilities and operations that utilize VSP to improve the quality, defensibility, and cost-effectiveness of decisions based on sampling results for key environmental and cleanup projects, site closures, regulatory issues, and management of legacy sites. During FY 2013, the SPADAT Program continued to enhance and expand VSP's capabilities by adding new modules and features that improve the user's ability to select and implement the appropriate sample designs and statistical analysis algorithms. In addition, the SPADAT Program and the VSP sponsors coordinated to provide six VSP training courses to a variety of domestic and foreign users.

1.0 ANALYTICAL SERVICES PROGRAM (ASP)

This report provides an overview of the ASP activities for fiscal year (FY) 2013 for the United States (U.S.) Department of Energy (DOE), including the National Nuclear Security Administration (NNSA). The ASP is managed by the Office of Health, Safety and Security (HSS), Office of Sustainable Support. The ASP's component elements are as follows:

- Department of Energy Consolidated Audit Program (DOECAP)
- Mixed Analyte Performance Evaluation Program (MAPEP)
- Systematic Planning and Data Assessment Tools (SPADAT) Program – Visual Sample Plan (VSP)

The term *DOE managers* as used in this document refers to managers at all levels in the Department from the Program Offices to the field elements that depend on the services provided by the ASP's component programs. The ASP's auditing, proficiency testing (PT), and planning activities are key vehicles for ensuring high-quality, reliable environmental data is available for decision-making to support ongoing, mission-critical DOE operations, such as ongoing environmental monitoring, environmental remediation, and long-term legacy management surveillances. In addition, the ASP contributes to the assurance that DOE's radiological and hazardous waste streams are properly accounted for, treated, and disposed of in compliance with the applicable requirements.

2.0 DEPARTMENT OF ENERGY CONSOLIDATED AUDIT PROGRAM (DOECAP)

DOECAP has a clearly defined mission to improve data quality, risk management, safety, efficiency, and audit quality, *all of which help ensure reduced costs*. DOECAP audits provide DOE managers making environmental management/ cleanup decisions with the assurance that they are receiving high-quality laboratory data and compliant waste management services. Figure 1 illustrates the benefits that Program participants receive from DOECAP.

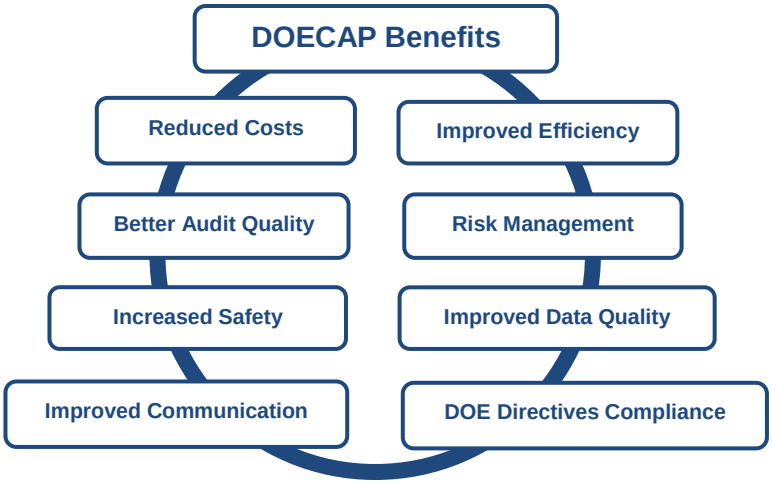

Figure 1. Benefits from DOECAP

Estimated FY 2014 Usage:
TSDFs – $36 Million
Laboratories – $31 Million

DOE intends to spend more than $67 million during FY 2014 for services at commercial and government-owned/contractor-operated (GOCO) environmental analytical laboratories and commercial waste treatment, storage, and disposal facilities (TSDFs). DOECAP is a key factor in ensuring that DOE receives the value that it expects for this money. DOECAP is an integrated, voluntary

participation effort, and the Program's success depends on each of the participants providing a fair share of auditor resources. In return, DOECAP provides all the participants with multiple benefits. Twenty-one Program Offices, site/field offices, and contractors provided auditors for DOECAP audits during FY 2013, and Appendix C provides a complete list of Program participants. Figure 2 illustrates the components that comprise DOECAP, each of which is vital to the success of the Program.

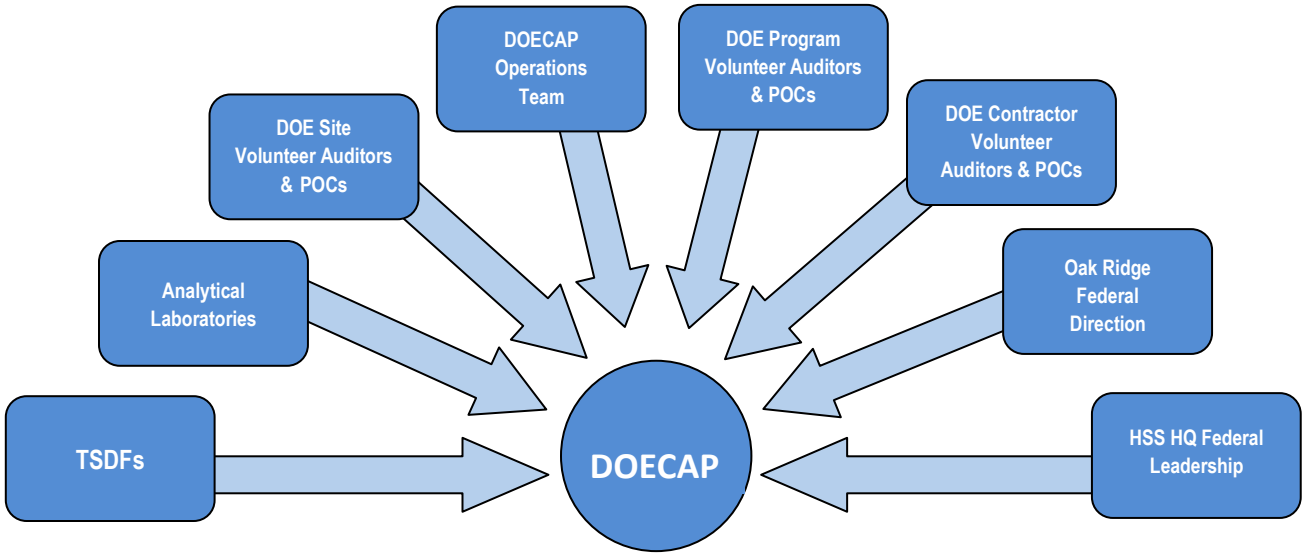

Figure 2. DOECAP Components

DOECAP provides a website, *https://doecap.oro.doe.gov/EDS_Public/default.aspx*, that enables public access to many of the Program documents, such as the *Quality Systems Manual (QSM) for Environmental Laboratories*, which is the laboratory requirements document; the laboratory and TSDF audit checklists; the current FY audit schedule; and presentations from the most recent ASP Workshop. DOECAP participants receive an identification code and password for access to the secure section of the website.

2.1 Benefits From Participating in DOECAP

2.1.1 Reduced Costs and Improved Efficiency

Before DOECAP, each DOE site had to staff and send its own team to conduct every required audit. Across the DOE complex, this meant that in 1 year the sites might send as many as *22 audit teams to a single laboratory* and *19 audit teams to a single TSDF* to perform the necessary oversight to ensure the quality of services provided by each facility.

As Program participants, the sites provide auditors to staff a single DOECAP team to audit each facility, and all of them receive the final report. Thus, each site pays time and travel for far fewer auditor trips, which is a substantial cost savings for the site and the Department. It is estimated that DOECAP audits

save the individual DOE field sites approximately $7.2 million every year by eliminating more than 170 redundant field audits. Conducting fewer audits also saves the time and money for the audited facilities because they do not have to host as many DOE audit teams, which translates into lower costs to DOE for environmental analytical data and waste disposal services due to decreased overhead costs.

2.1.2 Improved Data Quality and Risk Management

DOECAP's laboratory and TSDF audits provide DOE managers with mission-critical information regarding the risks and liabilities associated with the contracted facilities' services. Trustworthy data quality means DOE managers can make confident decisions with regard to environmental monitoring, regulatory compliance, remediation and cleanup projects, and long-term stewardship surveillances.

Some of the shared risks and liabilities associated with poor laboratory data quality and inadequate, noncompliant waste services are (a) loss of public trust and credibility, (b) noncompliance with regulatory requirements, including environmental permits (c) failure to meet federal agreement milestones/goals for site cleanup, and (d) potential for litigation that could drive up DOE's costs and delay project activities. A risk specific to poor laboratory data quality is DOE issuing inaccurate or biased environmental reports because the reports were based on flawed data. A risk specific to DOE's use of noncompliant waste vendors is the potential for increased risk to the facility's personnel and the nearby public of higher radiological or hazardous exposures.

DOECAP uses nine standardized checklists to audit laboratories, and five of these checklists focus on various aspects of data quality (i.e., data quality of the organic analyses, inorganic/wet chemistry analyses, radiochemistry analyses, aquatic toxicity, and nondestructive assay). The other four checklists cover (a) quality assurance systems, (b) laboratory information management systems, which includes lines of inquiry related to Environmental Protection Agency 2185, *Good Automated Laboratory Practices*, (c) hazardous and radiological materials management, and (d) laboratory closure, which ensures appropriate disposition of DOE waste and material.

DOECAP TSDF audits include reviewing federal, state, and local agency files and interviewing regulators to identify any issues or concerns regarding compliance with requirements. In addition, the audit team reviews the facility's financial assurance for closure and liability insurance to ensure these are current and adequate.

The TSDF audits provide DOE managers with confidence that the waste services they use meet the applicable federal, state, and local requirements for storing, handling, transporting, processing, and final disposition of DOE's

waste and material. Over time, DOECAP audit results have demonstrated improvement in the TSDFs' radiological control programs and shown notable reductions in the legacy aged waste inventories.

2.1.3 Better Audit Quality

DOECAP provides a consistent level of audit quality by using:

- DOECAP-trained/qualified audit teams – DOECAP has established standard qualification requirements for lead auditors and auditors. Every DOECAP auditor and lead auditor completes required training and performs at least one audit as an auditor-in-training under the direction of an experienced auditor in his/her audit discipline. Due to the public's sensitivity regarding radiological material disposition, DOECAP-qualified, DOE federal employees lead all of the radiological TSDF audits.
- Standardized audit checklists – DOECAP's standardized checklists ensure the coverage and focus of the audits are consistent. The lines of inquiry in the checklists are based on the applicable requirements. The DOE sites can also use these checklists to conduct oversight of onsite activities.
- A well-established audit process – DOECAP has established a formalized, structured audit process, which includes opening and exit meetings, daily audit team debriefings, a facility factual accuracy review, and an audit team review of the facility's proposed corrective action plans.
- Centralized, dedicated computer system for records – The DOECAP Electronic Data System provides document control and archive capability, and it is accessible to Program participants from the Internet via the DOECAP website.
- Centralized support functions provided by the Operations Team:
  - ✓ Scheduling and coordinating the audits.
  - ✓ Obtaining documents and records from the facilities to be audited so that the audit teams can review them in advance of the audit.
  - ✓ Providing a standardized report format and technical/editorial support for the audit report.
  - ✓ Tracking findings and associated corrective actions to closure.
  - ✓ Qualifying lead auditor and auditor candidates.
  - ✓ Providing Internet-accessible training for auditors and lead auditors via the DOECAP website, and tracking completion of assigned training.

2.1.4 Increased Worker Safety at DOECAP-Audited Laboratories and TSDFs

Auditing the worker safety program at DOE's contracted laboratories and TSDFs helps reduce DOE's potential liability and risk of litigation, especially those activities associated with environmental analysis and disposition of material with hazardous and radiological constituents. The TSDF audits include a checklist covering the industrial and chemical safety programs, and the laboratory audits include a checklist covering hazardous and radioactive materials management.

2.1.5 Improved Communication Among DOE Sites Using Contracted Laboratories and TSDFs

DOECAP has established a group of approximately 80 laboratory and TSDF points of contact (POCs) from across the DOE complex, and they participate in conference calls every other week to update them on DOECAP audits and related activities. The conference calls promote the Program and assist in obtaining auditor resources for upcoming DOECAP audits.

When significant findings are identified during an audit that might severely impact DOE's operations (i.e., a Priority I finding), the DOECAP Manager notifies the federal POCs so that DOE can take appropriate action. The Program participants can also share information via the bulletin board feature of the DOECAP Electronic Data System. Another benefit from sharing audit findings and lessons learned among Program participants is the application of this information to similar activities at DOE's sites, such as onsite laboratories and waste management programs.

HSS sponsors an annual ASP Workshop to foster communication and sharing of information and lessons learned. The workshop includes presentations from leaders among the commercial analytical laboratories and waste management facilities, auditor/lead auditor training, and feedback sessions for the auditors and audited facilities. See Section 2.2.4 for details on the 2013 ASP Workshop.

2.1.6 Provides a Means to Meet DOE Directive Requirements

- Radiological TSDF Audits – DOE Order (O) 435.1, *Radioactive Waste Management*, states that "DOE radioactive waste management activities shall be systematically planned, documented, executed, and evaluated." DOE Manual (M) 435.1-1, *Radioactive Waste Management Manual*, requires DOE field managers to approve use of non-DOE facilities used to manage DOE's radiological waste, and an annual DOE review of the TSDF is required. To meet this requirement, DOECAP's TSDF audits assess each facility's management systems and operational activities to verify the TSDF's ability to meet the applicable requirements for

managing DOE waste and material. See Appendix A for excerpts of the applicable requirements from DOE O 435.1 and DOE M 435.1-1.

- Laboratory and Nonradiological TSDF Audits – DOE O 414.1D, *Quality Assurance*, requires (a) DOE's products and services to meet or exceed customers' requirements and expectations and (b) DOE to achieve quality for all work based upon the following principles: performance and quality improvement require thorough, rigorous assessments and effective corrective actions. DOECAP audits are a cost-effective vehicle that DOE field managers can use to meet these requirements. DOECAP's audits of analytical laboratories provide DOE's environmental program managers with confidence that they are receiving high-quality, documented, defensible data. DOECAP's biennial audits of nonradiological TSDFs ensure that DOE's waste is managed in accordance with the applicable requirements. See Appendix A for an excerpt of the applicable requirements from DOE O 414.1D.

2.1.7 Participation in Development of Industry Standards

DOECAP participation supports development of practical, cost-effective consensus standards that are consistent with federal policy and meet DOE's and national users' needs. Members of the DOECAP Operations Team serve on committees for The NELAC Institute (TNI), including the PT Expert Committee, the PT Executive Committee, and the Radiochemistry Expert Committee. In addition, the ASP Manager is a member of the TNI Board of Directors (ex-officio) and a member of the TNI Laboratory Accreditation System Executive Committee. The DOECAP Operations Team members' and the ASP Manager's interactions have successfully promoted DOE's auditing and PT policies and procedures for inclusion in the TNI standards (e.g., TNI Volume 1, *Management and Technical Requirements for Laboratories Performing Environmental Analysis*, Module 1, "Proficiency Testing"), as well as promoting implementation of biannual PT for laboratories and requiring causal analysis as part of the corrective action responses to findings.

2.2 DOECAP Fiscal Year 2013 Accomplishments

2.2.1 Completed 31 DOECAP Audits

DOECAP's primary purpose is to conduct audits, and during FY 2013, the Program conducted 31 audits—21 laboratory audits, 1 laboratory closure audit, 7 radiological TSDF audits, and 2 nonradiological TSDF audits. Figure 3 on the following page is a U.S. map showing the locations of the audited facilities. Appendix B provides a table with the names of the facilities and their locations.

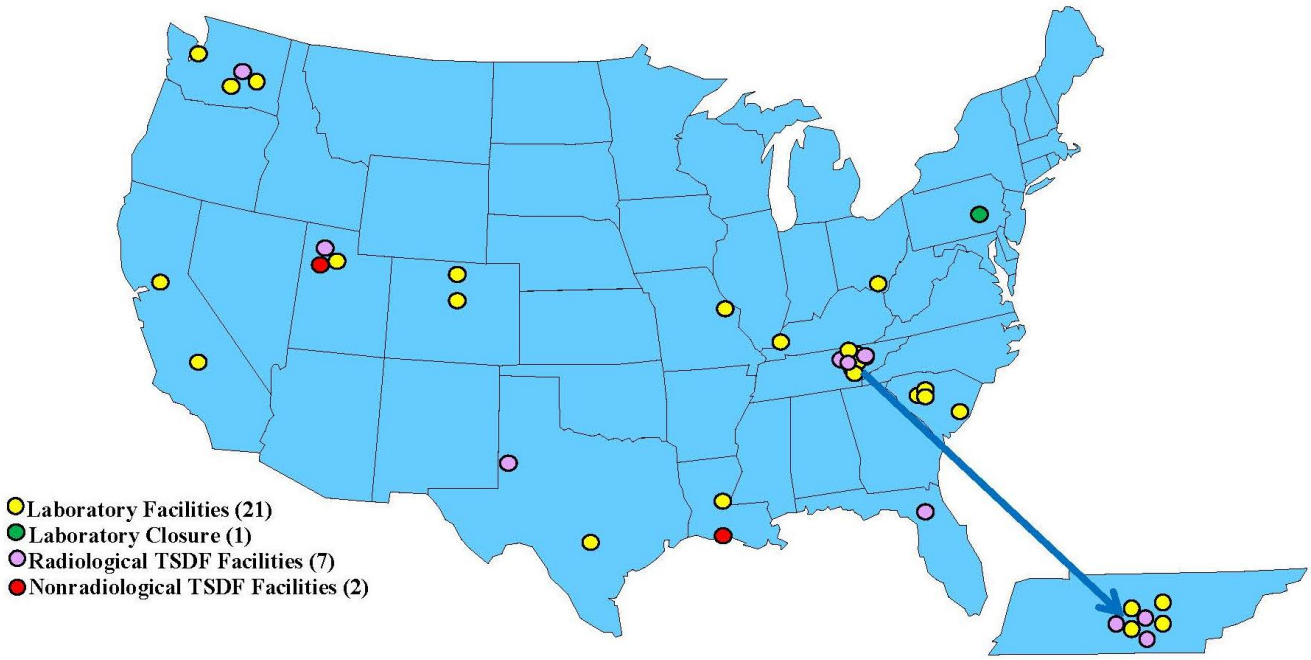

Figure 3. U.S. map showing the location of DOECAP audits conducted during FY 2013

2.2.2 Increased the DOECAP Auditor Cadre

To staff all the consolidated audits that are needed each year, it is crucial for the DOECAP volunteer auditor cadre to be as large as possible. DOECAP currently has 61 laboratory auditors and 74 TSDF auditors. During FY 2013, DOECAP added 8 laboratory auditors and 11 TSDF auditors to the cadre. This increase helped offset the loss of 14 auditors, primarily due to retirement and job changes. However, more auditors are always needed to maintain the cadre and balance the numbers lost to attrition, which varies from year to year. Serving as a member of the DOECAP audit cadre benefits the auditors by enhancing their audit skills and providing them with valuable experience that can be put to use at their sites.

2.2.3 Joint Department of Defense (DoD)–DOE *Quality Systems Manual for Environmental Laboratories*

During FY 2013, DOE and DoD completed two years of work to consolidate the agencies' environmental laboratory quality requirements. DoD issued the QSM, Revision 5.0, in July 2013, and DOE issued the QSM in October 2013. The QSM replaces the DOE *Quality Systems for Analytical Services* (QSAS), and in January 2014, both agencies began auditing contracted laboratories to the QSM requirements. The DOECAP Operations Team has revised the QSAS checklists to the QSM, with input from the DOECAP auditor cadre.

The laboratories will benefit by having a single set of quality requirements to implement rather than implementing two different sets of quality require-

ments. The major differences between the DoD and DOECAP laboratory auditing programs are shown in the following table.

Table 1. Comparison of DoD and DOECAP Audits

DoD Laboratory Audits	DOECAP Laboratory Audits
Matrix/method/analyte-specific and serve only DoD's interests/ needs	Programmatic in nature and addressing data quality for radiological, organic, and inorganic constituents of interest to DOE field sites Audits include the risks associated with worker safety and radiological/hazardous waste generated from chemical analyses
Auditors are from third-party accrediting organizations	Auditors come from the DOE program offices/field sites and contractors performing onsite laboratory-related work
Laboratories pay for the audits Laboratories select the auditors	Audits are conducted at no cost to the laboratories Audit teams are selected by the DOECAP Operations Team and DOECAP management Auditors undergo extensive DOECAP training

2.2.4 2013 ASP Workshop

HSS sponsors an annual ASP Workshop to foster continuous improvement, communication, and sharing of information and lessons learned. The 2013 ASP Workshop was held in Asheville, North Carolina, and 93 DOECAP participants attended from all over the U.S., with 35 additional attendees participating via a webinar link, which is a popular, cost-saving feature of the workshop.

The workshop included presentations on a variety of topics, such as mercury speciation, aquatic toxicity, high-resolution analysis for dioxins, Waste Control Specialists LLC's newly opened federal waste cell, and cleanup of the bankrupt IMPACT Site, as well as a presentation on collaboration between agencies from a representative of the U.S. Environmental Protection Agency, Office of the Science Advisor. The Chief Health, Safety and Security Officer delivered a presentation on the need for broader awareness across the DOE complex of DOECAP's benefits and value to the field elements. DOE and contractor representatives co-chaired a roundtable discussion on the proposed changes to DOE O 435.1, and how those changes might impact DOECAP

audits of the radiological TSDFs. Appendix A provides the applicable paragraphs from DOE O 435.1 and DOE M 435.1-1.

DOECAP provided three training sessions for lead auditors and auditors, which included training on how to write findings, how to conduct a laboratory closure audit, and the differences between the QSAS and the new QSM. In addition, feedback sessions for the auditors and audited facilities provided both sides of the audit process with an opportunity to share lessons learned and make suggestions for improving the Program.

3.0 MIXED ANALYTE PERFORMANCE EVALUATION PROGRAM (MAPEP)

3.1 MAPEP Benefits

3.1.1 PT Program for Laboratories Supporting DOE's Missions

MAPEP is a PT program that measures the analytical performance of commercial, GOCO, other federal, state, and international laboratories supporting various DOE missions. DOE's Radiological and Environmental Sciences Laboratory (RESL), located at Idaho National Laboratory, manages MAPEP. DOE spends approximately $31 million each year on laboratory contracts to analyze environmental samples, and DOE managers use the analytical results to make decisions that impact the protection of workers, the public, and the environment. Through MAPEP, RESL provides DOE field managers with confidence in analytical laboratory results by providing:

- Assurance of analytical measurement quality.
- Traceability of the PT samples to international standards.
- Independence from the laboratories being tested.

The Office of Nuclear Energy provides programmatic funding for RESL to implement MAPEP, and HSS provides guidance, direction, and oversight of program implementation. To delineate their responsibilities, the Office of Nuclear Energy and HSS executed the *Memorandum of Understanding Between the Idaho Operations Office – Nuclear Energy and the Office of Health, Safety and Security for Programmatic Activities at the Radiological and Environmental Sciences Laboratory* on June 20, 2012.

3.1.2 MAPEP Provides Mixed Analytes in Real-World Sample Matrices

DOE's environmental samples typically contain constituents from radiological, inorganic, and organic analytes all mixed together. Thus, for the most realistic PT results, the samples that RESL sends to laboratories are comprised of comparable mixtures of analytes. MAPEP is the only PT program that provides mixed analytes in real-world sample matrices, and only

MAPEP requires the laboratories to quantify both radioactive and nonradioactive analytes in the same sample.

MAPEP provides cost-effective sample development and grades the laboratories' PT results. In this way, MAPEP supports quality assurance oversight of the commercial and GOCO laboratories that provide environmental analytical services to the Department. Currently, there are more than 100 U.S. analytical laboratories participating in MAPEP that directly or indirectly support the Department's missions and/or interests. On December 30, 2013, the Chief Health, Safety and Security Officer issued a memorandum with the subject "Program Line and Field Participation in the Mixed Analyte Evaluation Program" to stress the importance of participation in MAPEP by all DOE onsite and subcontracted environmental analytical laboratories.

3.1.3 MAPEP Fosters the Reliability and Credibility of Analytical Results Used for Environmental Management Decisions

MAPEP's primary objective is to foster the reliability and credibility of the analytical results used in DOE management's decision-making processes, particularly with regard to decisions for DOE's radiological protection programs, environmental remediation and monitoring programs, and long-term stewardship surveillances. In the future, the number of domestic and international laboratories participating in MAPEP is expected to increase. At the request of the Office of Nuclear Energy, RESL will facilitate this increase based on national and international needs for the capability to analyze, on an expedited basis, environmental samples related to potential biological, chemical, or radiological events to determine the nature and extent of contamination.

RESL provides MAPEP at no cost to the participating laboratories, as opposed to the cost the laboratories pay to obtain PT services from private vendors. Twice a year (February and August), RESL distributes nine standard MAPEP PT sample types in four matrices (water, soil, vegetation, and air filters), and RESL prepares them with National Institute of Standards and Technology (NIST)-traceable analytes.

Figure 4. Chemist preparing a MAPEP sample

Figure 4 shows a MAPEP chemist preparing a PT sample. DOE requires laboratories that possess a radioactive materials license and perform inorganic, semivolatile organic, or radiochemical analyses for the Department to participate in MAPEP and to maintain acceptable performance results for the duration of the

contract. Laboratories without a radioactive materials license can voluntarily participate in MAPEP for nonradiological samples (e.g., metals, semivolatile organic samples) and are then subject to the same performance criteria. RESL evaluates the laboratories' results according to the criteria in the *Handbook for the Department of Energy's Mixed Analyte Performance Evaluation Program (MAPEP)*, which is available on the RESL homepage (MAPEP tab) at http://www.id.energy.gov/resl.

RESL maintains the MAPEP secure website for laboratories to report analytical results, view their individual performance reports, and trend historical performance by analyte. DOE program and field element personnel, including DOECAP POCs and auditors; the DOECAP Operations Team; regulators; and other approved users also have access to the MAPEP website to view laboratories' PT performance and MAPEP PT series reports and to run queries for historical trending by analyte and/or matrix.

3.2 MAPEP Fiscal Year 2013 Accomplishments

3.2.1 MAPEP Series 28 and 29

MAPEP FY 2013:
1300 PT Samples Shipped
12,500 Analytical Results Evaluated for Performance

RESL shipped 1300 PT samples for the two 2013 MAPEP testing sessions (Series 28 and 29) to more than 125 domestic and international laboratories, resulting in RESL's evaluation of 12,500 analytical results for acceptable performance. The laboratories have 60 days to analyze the samples and provide their results to RESL. Approximately one month later, RESL posts the results in the secure section of the MAPEP website.

The RESL staff provides a full report for each PT sample series directly to personnel from DOE Headquarters, DOE field elements, and the DOECAP Operations Team. The report details the participating laboratories' MAPEP performance, points out marginal or poor performance, and delineates those laboratories that did not participate or report results for the MAPEP series.

The DOECAP Operations Team reviews the MAPEP PT results for all DOECAP-audited laboratories. If RESL's analysis identifies a laboratory's PT results as "Not Acceptable" for two or more consecutive PT rounds (single or multiple analytes), DOECAP issues a finding to that laboratory. The priority level of the finding (Priority I or II) depends on the severity of the problem.

During FY 2013, DOECAP issued 17 findings related to MAPEP PT performance (6 Priority I findings and 11 Priority II findings). In response to a DOECAP finding, laboratories are required to develop corrective actions, which are reviewed and accepted (or rejected) by the Department. The DOECAP Operations Team tracks the findings and corrective actions to

closure and is authorized to request RESL to issue remedial MAPEP PT samples to DOECAP-audited laboratories as part of the corrective action implementation process.

3.2.2 MAPEP Iodine-129 Samples

RESL monitors the types of analyses performed at participating laboratories and adjusts the MAPEP PT series accordingly. Several years ago, RESL personnel noted that laboratories with DOE contracts were performing iodine-129 analyses, but no PT provider was including that analyte in test samples. As a result, RESL began including iodine-129 with MAPEP Series 25. Many of the laboratories started off with poor performance for analysis of iodine-129 in water, but most of them had improved by MAPEP Series 28 during FY 2013. Figure 5 illustrates the MAPEP participating laboratories' progress over time in analyzing iodine-129.

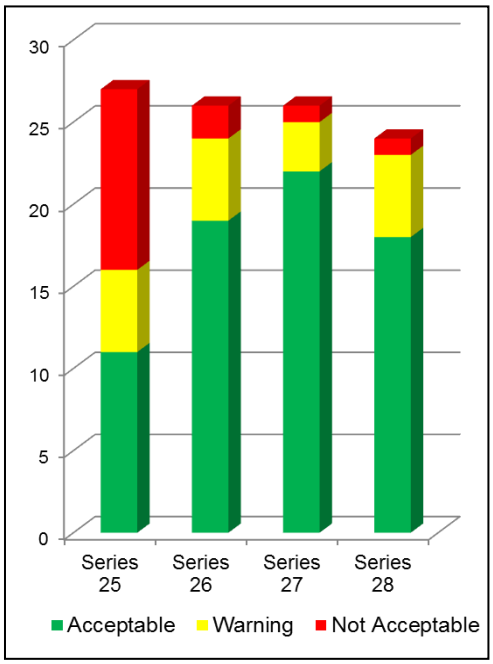

Figure 5. Laboratories' performance for analysis of iodine-129 in water for MAPEP Series 25–28

3.2.3 Specialized MAPEP Samples

RESL ensures that MAPEP continually challenges analytical laboratories by including unique, specialized tests. An example is the historic performance of the U.S. laboratories in reporting MAPEP results for plutonium false positive testing, which is shown in Figure 6. MAPEP was one of the first PT programs to include routine false positive/false negative testing for environmentally critical analytes. MAPEP includes other specialized

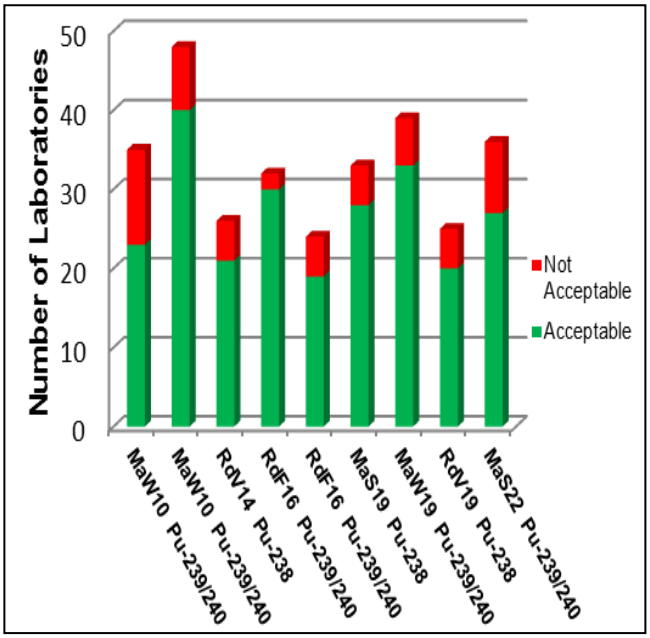

Figure 6. Example of U.S. laboratories' historical performance for plutonium-239/240 false positive testing

tests that challenge the laboratories, such as varying the isotopic ratios, adding specialized interferences to the natural matrices, and sensitivity testing. DOE's radiological environmental samples often contain unique interferences, and RESL strives to create samples that will provide the laboratories with realistic tests and aid them in improving their performance.

In MAPEP Series 29, RESL added the fission product europium-152 in soil as interference for analysis of cobalt-57 and zinc-65 with the following results:

- 60% of the laboratories falsely reported the presence of cobalt-57, when in fact there was none present in the sample
- 44% of the laboratories received "Not Acceptable" flags for zinc-65 analysis when europium-152 was present in the soil sample

RESL noted that the laboratories receiving "Not Acceptable" flags for cobalt-57 and zinc-65 might be relying on results from commercial software without adding an analyst's detailed review of the data. RESL offers technical assistance to laboratories in determining why their analyses provided unacceptable results. In addition, RESL brings up performance issues like these during the MAPEP portion of the DOECAP laboratory conference calls for discussion with the DOECAP POCs and auditors.

3.2.4 Certified Reference Materials (CRMs)

RESL serves as a reference laboratory for DOE, NIST, the Nuclear Regulatory Commission, and the International Atomic Energy Agency. RESL's core capabilities include expertise in analytical measurements for radiological, inorganic, and organic analyses; radiation measurements and calibrations for dosimeters; development of DOE and national consensus standards; and applied programmatic research and development for new analytical methods and new radiological and inorganic CRMs. RESL prepares and certifies new reference materials in accordance with International Organization for Standardization (ISO) Guide 34 and issues an accompanying RESL Certificate of Traceability. During FY 2013, RESL supplied radiological and inorganic CRMs in soil and water matrices. The radiological CRMs included the following matrices:

- Cement (surface contamination)
- Cement (homogeneous)
- Powdered eggs and milk
- Vegetation
- Dehydrated beef and chicken
- Filters
- Nasal swabs
- Dehydrated fruits

3.2.5 Maintained International Accreditations

RESL maintains high quality standards for its programs, as confirmed by its renewed accreditations in FY 2013 from the American Association of Laboratory Accreditation for the following ISO standards:

- ISO/International Electrotechnical Commission (IEC) 17025, *General Requirements for the Competence of Testing and Calibration Laboratories* (RESL Certificate 2377.01)
- ISO/IEC 17043, *Proficiency Testing Provider Accreditation Program* (RESL Certificate 2377.02)
- ISO Guide 34, *General Requirements for the Competence of Reference Material Producers* (RESL Certificate 2377.03)

3.3 MAPEP International Participation

In support of the U.S. global national security goals, MAPEP offers a vehicle to build positive ties between the U.S. Government and foreign nations by fostering international collaborative relationships and lasting partnerships. Over 30 international laboratories representing multiple foreign nations currently participate in MAPEP. Foreign governments are concerned about potential regional radiological and hazardous pollutants adversely affecting their populations, the environment, and economic growth. With a focus on scientific laboratory measurements of radiological, inorganic, and organic constituents in multiple environmental media (i.e., air, water, soil, and vegetation), MAPEP offers a credible means to test and measure environmental pollutants, thereby achieving confidence in environmental data quality and data trending.

An example of MAPEP support for U.S. and international governments' efforts to "build partnerships through peace" is RESL providing PT for the Radiation Measurements Cross-Calibration (RMCC) Project with analytical laboratories in the Middle East and North Africa. The ASP Manager typically provides a presentation and training session on MAPEP and DOECAP each year at the RMCC Project Workshop. The ASP Manager's 2013 presentation in Amman, Jordan, covered quality management and laboratory information management systems. During the presentation, the ASP Manager provided background information on both programs and shared the results of the Middle East and North African laboratory MAPEP PT performance. The top ten DOECAP analytical laboratory findings from past audits were also presented. In addition, the ASP Manager led a mock audit training exercise using the DOECAP laboratory quality assurance checklist. The training exercise featured audits of three Jordanian analytical laboratories, which helped develop auditor interview and discovery skills amongst the attendees while identifying areas for performance improvement for the Jordanian laboratories. Participant feedback on both the MAPEP and auditing training sessions was overwhelmingly positive, with the Department receiving special recognition and thanks from the Jordanian Atomic Energy Commission and the U.S. Department of State.

The RMCC Project is facilitated by the Sandia National Laboratories in New Mexico though the DOE Office of International Nuclear Safeguards and Engagement Program and in collaboration with the U.S. Department of State, Office of

International Security and Nonproliferation Bureau, and the International Atomic Energy Agency. The MAPEP foreign laboratory participants for this project include Saudi Arabia, Jordan, Kuwait, Qatar, Yemen, United Arab Emirates, Iraq, Bahrain, Oman, Lebanon, Morocco, and Tunisia. MAPEP provides semiannual PT samples to these countries analytical laboratories to help ensure accuracy in measuring radiological and hazardous pollutants potentially impacting the food chain and to improve overall laboratory performance levels.

Large-scale radiological releases, from Chernobyl and more recently Fukushima, coupled with commercial nuclear power development in Iran and other nations in the Middle East and North Africa have led to heightened concern about regional radiological releases and human health exposures. In addition, foreign nations from across the globe—Brazil, the Netherlands, Bolivia, New Zealand, Ecuador, and Spain—are participating in MAPEP PT activities through DOE cooperative air monitoring agreements related to the Nuclear Test Ban Treaty and nuclear nonproliferation goals. With MAPEP's ISO accreditations and international credibility, the number of foreign laboratory participating in MAPEP should continue to grow.

4.0 SYSTEMATIC PLANNING AND DATA ASSESSMENT TOOLS (SPADAT) PROGRAM – VISUAL SAMPLE PLAN (VSP)

HSS supports the SPADAT Program's development of environmental sampling and statistical assessment tools, such as VSP, to enable DOE field sites to obtain the optimal type, quality, and quantity of data necessary to make confident, defensible decisions. VSP helps DOE field elements and contractors identify the nature and extent of environmental contamination, resulting in overall cleanup cost savings. VSP's primary objective is to *decrease* costs and *increase* defensibility while managing uncertainty.

Figure 7 provides an example of a VSP contamination concentration map. DOE sites obtain samples for a variety of purposes, such as waste management, decontamination and decommissioning, cleanup verification, and discovery of potential new contamination. If the site does not obtain the right type, quality, and number of samples, then even perfect analytical results from sample analysis will not provide the data needed to support confident decisions. Systematic planning and assessment of data quality objectives (DQOs) are key ingredients for confident decision-making with regard to environmental field sampling and assessment.

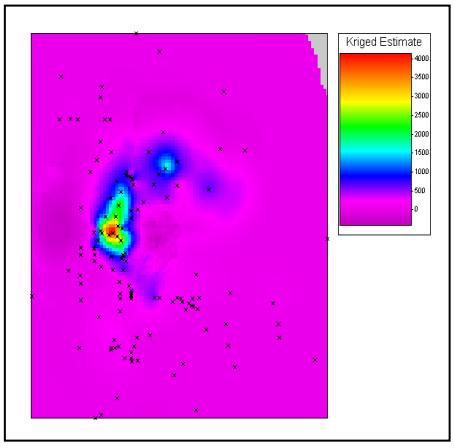

Figure 7. Example of a VSP contamination concentration map

Nearly every DOE site uses VSP, as it helps the site determine how many samples are needed, where to take the samples, and what decisions the data will support. Some of the sampling goals and objectives that VSP can support include the following:

- Comparing individual sample results against a limit
- Developing a plan for sampling items, such as drums and containers
- Evaluating redundancies or inadequacies in well placement
- Developing sampling and analysis plans for unexploded ordnance sites
- Evaluating trends over time
- Exploring the correlation between multiple analytes
- Developing a geospatial contaminant concentration map
- Assessing whether the boundary around an area is free of contaminants
- Developing a targeted, purely judgmental sampling scheme

4.1 VSP Benefits

4.1.1 VSP is Free and Easy to Use

VSP is available for free download at http://vsp.pnnl.gov/. The software is designed for easy use. Users can import and export maps, photographs, images, and building floor plans. VSP's easy-to-understand graphics also support improved communications with stakeholders. For example, Figure 8 shows sampling points in a three dimensional (3-D) representation of an office area.

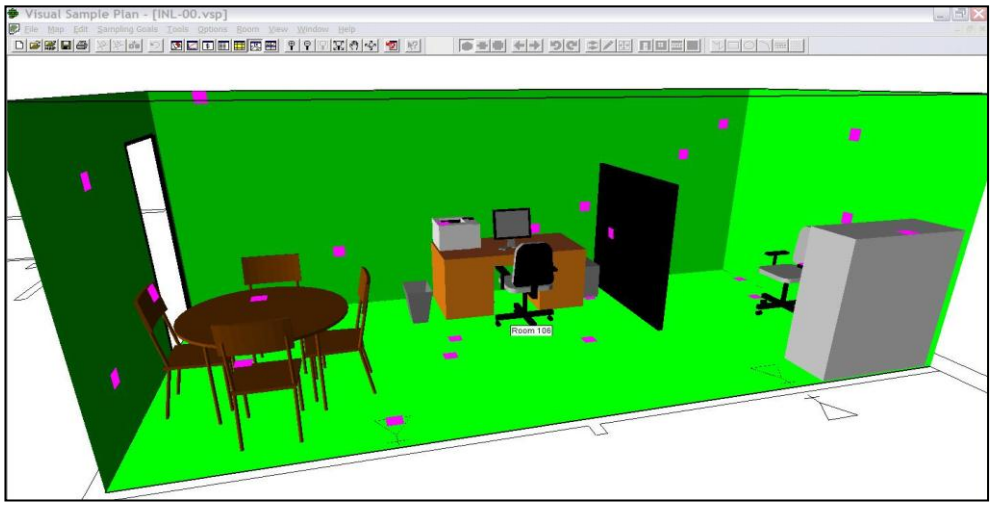

Figure 8. Example VSP 3-D representation of an office with sampling points marked

The VSP website provides information about the VSP modules and upcoming VSP training courses, as well as links to other sites that provide software for use in contaminated site cleanup. Users can easily download the *Visual Sample Plan Version 6.0 User's Guide* as a complete file or by individual

chapter. Online help and technical documentation on the statistical methods are also available.

4.1.2 VSP Saves Money by Providing Real-Time, Cost-Benefit Tradeoff Information

VSP provides users with:

- Real-time, cost-benefit tradeoff evaluations based on the projected number of samples, total sampling costs, and sampling locations, which allows users to select the option that provides just enough sampling to obtain a defensible answer and saves money.
- Immediate feedback on the projected results of statistical sampling plans by overlaying the sampling locations or grids directly onto the site map or building plan loaded by the user, which makes it easy to evaluate the confidence levels of the different sample numbers and coverage.
- Sampling plans that fill in gaps for sites where samples have been taken in the past.
- Graphic decision tools, plus integration with AutoCad, ArcGIS, and similar georeference systems.
- Ability to calculate the statistical confidence level based on the number of samples.
- Random or gridded sampling locations that automatically display on maps loaded by the user and are easily transferred to global positioning system units in the field.

4.1.3 VSP is Widely Accepted by Regulatory Agencies

VSP has wide acceptance from federal and state regulatory agencies, and its use is often recommended for minimizing cost and sampling requirements while maximizing the available information and the user's confidence in the sampling results. VSP utilizes statistical and mathematical algorithms to provide a quantified confidence level and statistically defensible sampling designs.

4.2 Examples of Recent VSP Applications

4.2.1 VSP-Based Process for DOE Class 1 Final Status Surveys Involving Hard-to-Detect Radionuclides

Oak Ridge Associated Universities has developed a process to balance the probability of detecting and quantifying small areas of residual contamination with the cost of sample analysis, while at the same time maintaining the *Multi-Agency Radiation Survey and Site Investigation Manual* (MARSSIM)-based statistical process. The process relies on using the VSP Ranked Set Sampling Module as the planning tool in the survey design to differentiate relative

concentrations of alpha and/or beta emitters in soil when demonstrating compliance with both the average derived concentration guideline level (DCGL) and the acceptable DCGL elevated measurement comparison.

4.2.2 Lawrence Livermore National Laboratory (LLNL) Uses VSP to Meet Multiple Construction-Related Needs

> **If it's radiological, they ask "Did you use MARSSIM?" If it's not radiological, they ask "Did you use VSP?"'**

LLNL uses the VSP Hotspot Sampling Module to determine whether onsite locations intended for construction are contaminated. VSP is also used to determine appropriate sampling for soil reuse acceptability and post-remediation confirmation. VSP enables LLNL to develop DQO-based sampling plans. Because LLNL's VSP use is increasing, the laboratory is developing site-specific internal guidance on appropriate VSP use and typical parameter inputs for the applicable VSP modules. The VSP team's planned MARSSIM-related updates will assist LLNL by providing more radiological survey applications.

4.2.3 VSP Improves Communication with Regulators at the Portsmouth and Paducah Sites

The DOE Portsmouth/Paducah Project Office uses VSP for project planning, developing DQOs, and developing sampling plans. VSP has been used on numerous projects at each site, including ditches, soil piles, facilities, and burial grounds. Using VSP has led to a more structured approach to developing sample plans, allowed the contractor to develop defensible plans prior to meeting with regulators, and improved communication between DOE and regulators. It is estimated that approximately 16 hours of meeting time for multiple personnel are saved for each project that uses VSP.

4.2.4 Office of Legacy Management (LM) Uses VSP to Place Wells to Analyze Contamination Plumes

LM uses VSP to create "probability of exceedance maps" and place wells to identify the plume edge and areas of greatest uncertainty. Figure 9 provides an example of a VSP probability map for a contamination plume. LM also performs exploratory data analysis to correlate the contamination concentration over distance. Because two

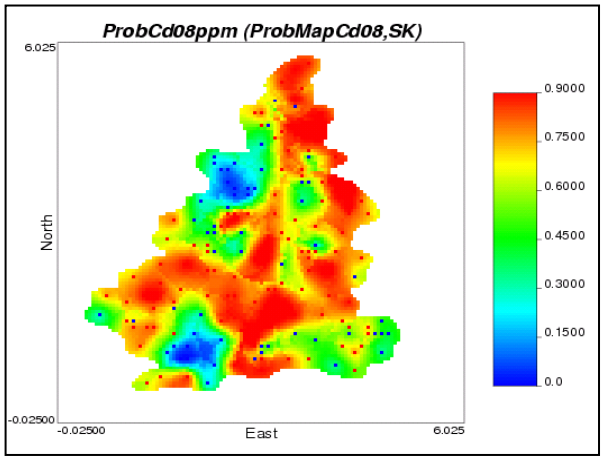

Figure 9. Example of a VSP probability map

or more distinct plumes of the same contaminant can be subject to different attenuation processes, LM uses VSP to develop statistical summaries of the well groups and quantify the general contaminant behavior between sampling events.

4.2.5 U.S. Navy Used VSP for Radiological Release Surveys of Naval Assets Impacted by the Fukushima Event in Japan

The Fukushima airborne releases impacted U.S. Naval assets sent to support Japan after the 2011 earthquake and tsunami (Operation TOMODACHI). Oak Ridge Associated Universities used VSP to design the radiological release surveys for the U.S. Navy. The project involved multiple ship decks and complex, inter-related air-handling systems and compartments that required development of final status survey plans.

4.3 VSP Fiscal Year 2013 Accomplishments

4.3.1 New VSP Modules and Features

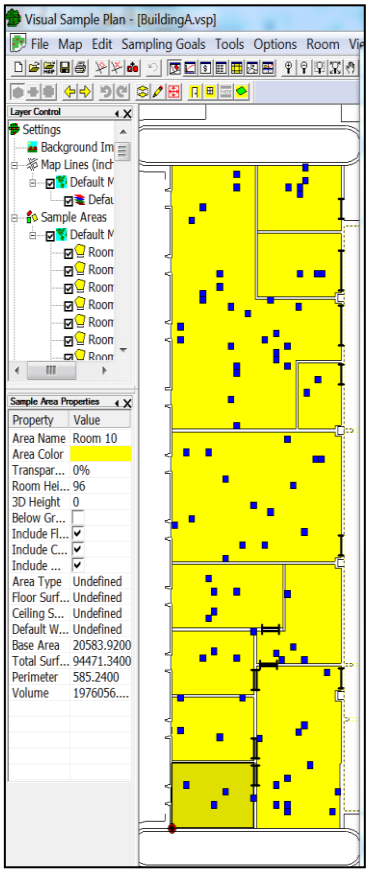

Figure 10. Example of building grid cells created with the Discovery Sampling Module

During FY 2013, the VSP team added online help features and new modules that support DOE's needs, such as the Discovery Sampling Module and the Proportion Upper Confidence Limit (UCL) Module, and they enhanced the Piles and 3-D Volume Sampling Module. In addition, the VSP team developed a process workflow guide, added more case studies to the training materials, and made numerous minor improvements, such as grid cell outputs, data entry mappings, multiple-layer rasters, and graphic enhancements for better visualization.

The Proportion UCL Module estimates the proportion of a contaminated area to within the desired ± limit and performs the UCL calculation. The Discovery Sampling Module is used to develop a sampling plan that ensures high confidence in getting at least one unacceptable sample if at least X% of the area (or items) is not acceptable. The VSP module determines the number of samples needed to achieve the desired confidence. Figure 10 is an example of building grid cells created using the Discovery Sampling Module.

As shown in Figure 11, the enhanced Piles and Subsurface Sampling Module allows creation of sampling plans for uneven 3-D piles, ponds, lakes, etc. This module can define the contour shapes and sampling for the surface or within the volume. Users can determine random or systematic sample placement by layer.

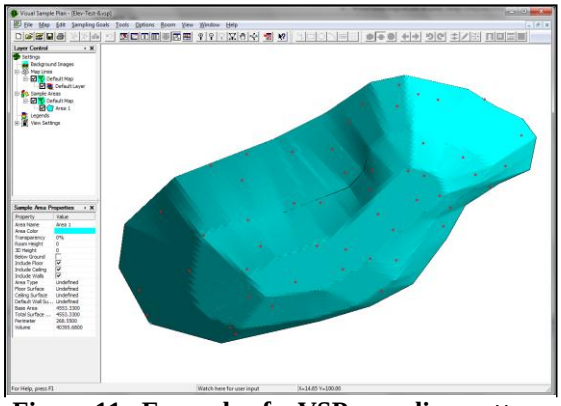

Figure 11. Example of a VSP sampling pattern for an uneven elevation area

4.3.2 VSP Training

VSP training enables DOE, regulatory, and contractor personnel to streamline development and regulatory acceptance of optimal, cost-effective, defensible sampling plans and statistical analysis approaches. During FY 2013, the SPADAT Program and VSP sponsors coordinated to provide six VSP training courses to a variety of domestic and foreign users:

- October 2012 – DoD Unexploded Ordinance
- November 2012 – DOE Hanford Site
- January 2013 – Nuclear Regulatory Commission
- May 2013 – United Kingdom and AMEC
- July 2013 – Environmental Protection Agency and Department of Homeland Security
- August 2013 – DOE Brookhaven National Laboratory and New York City Department of Environmental Protection

The VSP classes provided to DOE proved to be popular and fully attended. Arrangements are being made to provide these classes through the DOE National Training Center during FY 2014 so as to make more classes available to DOE federal and contractor personnel.

5.0 ASP CHALLENGES FOR THE FUTURE

5.1 DOECAP Challenges

The key challenges to achieving DOECAP's continued viability and sustainability during the coming year include:

- Promoting DOECAP participation throughout the DOE complex, including provision of adequate funding to send auditors on DOECAP audits, since without the auditors provided by the Program participants, the primary

objective of conducting consolidated audits via cooperative field and Headquarters endeavors cannot be achieved.

- Maintaining adequate funding for the centralized DOECAP support functions provided by the Operations Team during a period of declining budgets.
- Increasing the number of DOE participants by enlisting Program Office and field element individuals as DOE POCs that will actively promote DOECAP and educate their sites and offices regarding DOECAP's benefits, the need to adequately support DOECAP audits, and the necessity of providing accurate information regarding current laboratory and TSDF contracts and planned usage.

5.2 MAPEP Challenges

The key challenges to sustaining MAPEP during the coming year include:

- Maintaining adequate funding to continue providing MAPEP as a high-quality PT program and to ensure the availability of the sample development and analytical functions during a period of declining budgets.
- Maintaining RESL's international accreditations.
- Pursuing approval of a DOE technical standard for analytical laboratory participation in MAPEP.
- Challenging the analytical laboratories' performance with unique, specialized PT samples.
- Increasing awareness of the importance of participating in MAPEP at sites throughout the DOE complex so as to continue improving the quality and reliability of environmental analytical data provided to DOE and the cost savings of doing so for the field elements and laboratories, as opposed to the costs associated with obtaining PT services from private vendors.

5.3 VSP Challenges

The key challenges to sustaining the SPADAT Program's ability to provide VSP during the coming year include:

- Ensuring the demand for VSP training is met using the new registration fee-based approach through the DOE National Training Center.
- Maintaining regulator acceptance of VSP-generated sampling plans and statistical analyses now that cost-shared courses with the Environmental Protection Agency are no longer an option given current budget pressures.
- Maintaining adequate funding to meet users' demands for VSP maintenance, development of new modules, and enhancements during a period of declining budgets.

- Increasing awareness and use of VSP at sites throughout the DOE complex so as to continue improving the development of sampling plans and DQOs.

Appendix A: Excerpts from DOE Order 435.1, DOE Manual 435.1-1, and DOE Order 414.1D

DOE O 435.1, *Radioactive Waste Management*	
Paragraph 4a:	"DOE radioactive waste management activities shall be systematically planned, documented, executed, and evaluated."
Paragraph 4c:	"All radioactive waste shall be managed in accordance with the requirements in DOE M 435.1-1, *Radioactive Waste Management Manual*."
DOE M 435.1-1, *Radioactive Waste Management Manual*, Chapter I	
Paragraph 2F(4):	Approval of Exemptions for Use of Non-DOE Facilities. "DOE waste shall be treated, stored, and in the case of low-level waste, disposed of at the site where the waste is generated, if practical; or at another DOE facility. If DOE capabilities are not practical or cost effective, exemptions may be approved to allow use of non-DOE facilities for the storage, treatment, or disposal of DOE radioactive waste based on the following requirements: (a) Such non-DOE facilities shall: 1. Comply with applicable federal, state, and local requirements; 2. Have the necessary permit(s), license(s), and approval(s) for the specific waste(s); and 3. Be determined by the Field Element Manager to be acceptable based on a review conducted annually by DOE. (b) Exemptions for the use of non-DOE facilities shall be documented to be cost effective and in the best interest of DOE, including consideration of alternatives for on-site disposal, an alternative DOE site, and available non-DOE facilities; consideration of life-cycle cost and potential liability; and protection of public health and the environment."
DOE O 414.1D, *Quality Assurance*	
Paragraph 1a:	"To ensure that Department of Energy (DOE), including National Nuclear Security Administration (NNSA), products and services meet or exceed customers' requirements and expectations."
Paragraph 1b(3):	"To achieve quality for all work based upon the following principles: Performance and quality improvement require thorough, rigorous assessments and effective corrective actions;"

Appendix B: Fiscal Year 2013 DOECAP-Audited Laboratories and Treatment, Storage, and Disposal Facilities

Fiscal Year 2013 DOECAP-Audited Laboratories	
ALS Laboratory Group, Cincinnati, Ohio	ALS Environmental Fort Collins Laboratory, Fort Collins, Colorado
ALS Laboratory Group, Salt Lake City, Utah	B&W Y-12, LLC, Analytical Chemistry Organization, Oak Ridge, Tennessee
American Radiation Services, Inc., Port Allen, Louisiana	BC Laboratories, Inc., Bakersfield, California
Caltest Analytical Laboratory, Napa, California	CEBAM Analytical, Inc., Bothell, Washington
Center for Laboratory Sciences, Pasco, Washington	Davis and Floyd, Inc. Greenwood, South Carolina
Eberline Analytical Corporation, Oak Ridge, Tennessee	GEL Laboratories, LLC, Charleston, South Carolina
Materials and Chemistry Laboratory, Inc. Oak Ridge, Tennessee	Paducah Analytical Services Paducah, Kentucky
Shealy Consulting, LLC, Lexington, South Carolina	Shealy Environmental Services, Inc., West Columbia, South Carolina
Southwest Research Institute, San Antonio, Texas	TestAmerica, Inc., Arvada, Colorado
TestAmerica, Inc., Earth City, Missouri	TestAmerica, Inc., Knoxville, Tennessee
TestAmerica, Inc., Richland, Washington	Lionville Laboratory Inc. Exton, Pennsylvania (Closure Audit)
Fiscal Year 2013 DOECAP-Audited TSDFs	
Clean Harbors Colfax, LLC Colfax, Louisiana (Nonradiological)	Clean Harbors Environmental Services, Aragonite, Utah (Nonradiological)
Diversified Scientific Services, Inc., Kingston, Tennessee	Energy*Solutions*, LLC, Clive, Utah
Energy*Solutions*, LLC, Oak Ridge, Tennessee	Materials and Energy Corporation, Oak Ridge, Tennessee
Perma-Fix Environmental Services of Florida, Gainesville, Florida	Perma-Fix Northwest, Inc., Richland, Washington
Waste Control Specialists LLC, Andrews, Texas	

Appendix C: DOE Programs and Sites that Participated in DOECAP During Fiscal Year 2013

Office of Health, Safety and Security	Office of Legacy Management
Office of Environmental Management	Brookhaven National Laboratory Brookhaven Site Office
Environmental Management Consolidated Business Center	Hanford Site Office of River Protection and Richland Operations Office
Idaho National Laboratory Idaho Operations Office	Lawrence Berkeley National Laboratory Berkeley Site Office
Lawrence Livermore National Laboratory Livermore Field Office	Nevada National Security Site Nevada Field Office
Los Alamos National Laboratory Los Alamos Field Office	Oak Ridge Environmental Management Program
Oak Ridge National Laboratory (ORNL) ORNL Site Office	Oak Ridge Office Integrated Support Center
Pacific Northwest National Laboratory Pacific Northwest Site Office	Pantex Plant National Nuclear Security Administration Production Office
Portsmouth Site and Paducah Site Portsmouth/Paducah Project Office	Sandia National Laboratories Sandia Field Office
Savannah River Site Savannah River Operations Office	Thomas Jefferson National Accelerator Facility Thomas Jefferson Site Office
Y-12 National Security Complex National Nuclear Security Administration Production Office	

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