# FINAL REPORT GUIDANCE

## Munitions Response Projects

**May 2018**

# OVERVIEW

A Final Report is a requirement of all Environmental Security Technology Certification Program (ESTCP) projects. This report must be reviewed and approved by ESTCP. The Final Report is a comprehensive technical report documenting the project's activities, results, and conclusions.

This document provides general guidance for writing final reports for projects that receive funding under the ESTCP Munitions Response program area. The guidance provided in this document will help to ensure that all project reporting of demonstration results is consistent with the ESTCP standards.

The guidance provided here is general and all elements may not apply to all ESTCP Munitions Response projects. It will be the responsibility of each investigator, with concurrence of ESTCP, to decide what is most appropriate, and to what degree, for his or her site and technology.

## Security Review

Because all Final Reports will be made available to the public via the ESTCP web site (http://www.serdp-estcp.org), a security review is required. A Standard Form 298 Report Documentation Page (SF 298) must be included in each document submission.

- For government agencies, the author will be responsible for Security and Distribution Classification review through their own agency's authority. The SF 298 should reflect the allowable distribution (i.e., unlimited public release) as determined by the clearing organization.
- For private and academic institutions, the SF 298 should be filled out to the extent possible, and ESTCP will conduct a Security and Policy Review through the Department of Defense's (DoD) Directorate for Freedom of Information and Security Review (FOISR).

All Final Reports should have the statement, "**Approved for public release; distribution is unlimited**" on the SF 298 Form. If any portion of the ESTCP-sponsored work requires limited distribution (i.e., proprietary, classified, or other distribution limitations), the principal investigator (PI) should contact the Munitions Response program manager for guidance.

The reports will also be posted on Defense Technical Information Center (DTIC) (http://www.dtic.mil). Federal organizations are responsible for ensuring that their publications are forwarded to DTIC. The ESTCP office will submit all non-DoD organization reports to DTIC.

## Format

Final reports are intended for publication. As such, ESTCP expects them to be professionally written and properly edited. The following general formatting parameters are recommended:

| | |
|---|---|
| Cover | Use the cover of this document as a template; include ESTCP project name and number, your organization's project number (if applicable), date (month/year), document version number, and the researcher(s) name(s) and organization. |
| Font | Times New Roman proportional font |
| Cover Main Title | 26 pt, bold, flush right |
| Cover Title | 18 pt, bold, flush right |
| Section headings | 14 pt, bold, flush left |
| Subsection headings | 12 pt, bold, flush left |
| Text | 12 pt |
| Margins | 1" top, left, right, bottom |
| Page numbering | Bottom center<br>Cover page: none<br>Front matter: i, ii, iii, iv…<br>Body of document: 1, 2, 3, 4… |
| Word processing software | Use either Microsoft Word or provide a PDF document |
| Figures, tables, and photographs | Insert in the document on the same or first page following the first reference. Liberal use is highly recommended. |

## How to Submit a Draft Final Report

Final Reports must be submitted to the ESTCP Support Office using ***one of the methods*** indicated below:

- For files that are 100MB or less: Submit the report in SEMS 2.0 (https://sems2.serdp-estcp.org). Follow the instructions below for uploading your document:
  - From the project dashboard, click "Overview & Plan" in the left-hand panel, then click "Project Plan".
  - Scroll down to the document milestone and click "Upload" in the milestone box.
  - Select the file you would like to upload and click the "Upload" button.
  - Click "Submit" in the bottom right corner of the milestone box.
- For files larger than 100MB: Contact serdp-estcp.documents@noblis.org to receive an email with the web link that will allow access to the system to upload your file(s). Please make sure you include the project number and the title(s) of the document(s) to allow identification of your files.

**Please do not submit reports directly to the ESTCP Program Manager.**

## SECTION-BY-SECTION FINAL REPORT GUIDANCE

**Cover Page:** Using the cover page provided in the Word version of this guidance document and also available at http://www.serdp-estcp.org/Investigator-Resources/ESTCP-Resources/Technical-Reports, include the Demonstration title, ESTCP project number, your organization's project number (if applicable), date (month/year), document version number, and the researcher(s) name(s) and organization.

**Standard Form 298 Report Documentation Page**: Include report date, type, title, author(s), Contract number, project number, performing organization name and address, abstract, subject terms, number of pages, and name and phone number of responsible person.

**Front Matter:** Provide a Table of Contents and list of Acronyms, Figures, and Tables.

**Acknowledgments:** State the individuals and/or organizations that contributed to the demonstration project and the generation of the Final Report.

**Abstract:** Provide a one page abstract with the following sections:

- Introduction and Objectives
- Technology Description
- Performance and Cost Assessment
- Implementation Issues
- Publications

The abstract will be used to update the project web page:

**Executive Summary:** Provide a 5 to 10 page extended Executive Summary. The Executive Summary will be posted as a stand-alone document on the SERDP & ESTCP web site. It should include key graphics and tables from the Final Report. Include the following sections:

- Introduction
- Objectives
- Technology Description
- Performance Assessment
- Cost Assessment
- Implementation Issues

# 1.0 INTRODUCTION

This section is intended to provide a general overview of the project. Specific subsections as described below should be included in this section.

## 1.1 BACKGROUND

Describe the environmental problem being addressed and its impact on DoD operations. Briefly describe the technology that was demonstrated and its potential benefit compared to conventional practices and alternatives.

## 1.2 OBJECTIVE OF THE DEMONSTRATION

Describe the overarching objective(s) of the demonstration, such as to validate the technology in a controlled test site or in the field at a live site, or to transfer the technology to an end user.

## 1.3 REGULATORY DRIVERS

State the existing or anticipated federal, state, or local regulations, or DoD directives that have resulted in a need for this innovative technology or that will be relevant to its acceptance and use.

# 2.0 TECHNOLOGY

This section is intended to provide an overview of the technology that was demonstrated. Reference to existing papers and reports is highly encouraged.

## 2.1 TECHNOLOGY DESCRIPTION

- Describe the technology in sufficient detail to provide an accurate and factual understanding of its theory, functionality, and operation.
- Provide an overall schematic diagram of the technology.
- Provide a chronological summary of the development of the technology to date.

## 2.2 TECHNOLOGY DEVELOPMENT

For projects that conducted significant development work under ESTCP that was not documented in another published source, provide a detailed description of all technology development conducted prior to the field demonstration. This section should be sufficiently detailed to fully describe the work. As appropriate, detailed data sets and design information should be provided in appendices, but a summary of the results should be provided in this section. Liberal use of graphics is encouraged to aid the reader in understanding the results.

If the development work has been published in a separate technical report, provide a brief summary and reference that report. If no development work was done under the ESTCP project, provide the summary indicated in Section 2.1 and delete this section.

## 2.3 ADVANTAGES AND LIMITATIONS OF THE TECHNOLOGY

State the advantages and limitations of the technology and compare these with the advantages and limitations of alternative technologies. Name any prominent alternative technologies.

This section should be updated from that provided in the Demonstration Plan to include any advantages or disadvantages as noted during the demonstration.

# 3.0 PERFORMANCE OBJECTIVES

The performance objectives provide the basis for evaluating the performance and costs of the technology. Performance objectives are the primary criteria established by the investigator for evaluating the innovative technology. This section should provide an accurate summary of the performance objectives and whether they were met and, if not met, the principal reason for failure.

Performance objectives may be qualitative or quantitative and should be summarized in Table 1. A sample is provided and it should be modified to include all relevant objectives for each demonstration. The objectives should include, but are not limited to, such things as probability of detection, false alarm rate, and production rate.

**Table 1. Performance Objectives**
**[SAMPLE ONLY-Performance objectives must be specific to the technology being demonstrated.]**

| Performance Objective | Metric | Data Required | Success Criteria | Results |
|---|---|---|---|---|
| **Quantitative Performance Objectives** | | | | |
| Detection of all munitions of interest | Percent detected of seeded items | • Location of seeded Items<br>• Prioritized dig list | Pd=0.98 | |
| Reduction of false alarms | Number of false targets eliminated at a specified confidence level | • Prioritized dig list with probabilities<br>• Validation data for 500 selected targets | Reduction of False Alarms by >40% | |
| Location accuracy | Average error and standard deviation in northing and easting for seed items | • Location of seed items surveyed to accuracy of 1 cm<br>• Estimated location from analysis of geophysics data | $\Delta N$ and $\Delta E$ <0.02 m<br>$\sigma N$ and $\sigma E$ <0.10 m | |
| Production rate | Number of acres of data collection per day<br>Time required to analyze each target | • Log of field work and data analysis time accurate to 15 minutes | Survey: 15 acres per day<br>Analysis time: <5 minutes per target | |
| **Qualitative Performance Objectives** | | | | |
| Ease of use | | • Feedback from technician on usability of technology and time required | | |

The following information should be included in the detailed description of each performance objective:

- A full explanation of the objective
- The metric that was used to assess whether the objectives were met
- A statement as to what data were collected to evaluate the performance objectives
- A statement as to how the data were interpreted and to what extent the success criteria were met.

***Please note that equivalent subsections should be provided for each performance objective. It is recognized that related performance objectives may have similar data acquisition needs. As a result, reference can be made to earlier sections rather than repeating all information.***

# 4.0 SITE DESCRIPTION

This section should provide a concise summary of the demonstration site(s) and should include all site information that is relevant to the technology. Specific subsections below are intended to capture relevant information; however, please include other site information that has immediate bearing on the performance of the technology.

## 4.1 SITE SELECTION

Identify the site that was used for the technology demonstration. Describe the criteria and requirements used in selecting the test site(s). Discuss how they relate to the technology. For example, does the test site provide representative challenges and a maximum likelihood of success, and does it have a good existing infrastructure or regulatory interest? Provide a map showing the location of the site where the technology demonstration took place.

## 4.2 SITE HISTORY

Describe the history of operations at the test site(s), focused on known munitions use. Describe any existing conditions that could have impacted the demonstration. Provide references to existing documentation such Archives Search Reports if appropriate.

## 4.3 SITE GEOLOGY

Provide information on site geology that is relevant for the technology demonstration.

## 4.4 MUNITIONS CONTAMINATION

Provide a summary of what was known about the munitions contamination on the site. Include site maps and/or tables illustrating the extent and distribution. Indicate the munitions types that were known or suspected to be present. Identify the source of the data that were used.

# 5.0 TEST DESIGN

This section provides the detailed description of the system design and testing conducted during the demonstration. Descriptions here should be sufficiently detailed that a reader can fully understand the demonstration and all data collected.

For demonstrations that used existing data sets, this section should provide an overview of how the data were acquired and may reference existing documents, if appropriate. The example outline below is appropriate for projects that demonstrated detection and discrimination technologies. Appropriate sections should be developed for other types of technologies.

## 5.1 CONCEPTUAL EXPERIMENTAL DESIGN

Provide a broad overview of the experimental design of the field test used to evaluate the technology. Discuss the major elements of the demonstration and how they relate to one another. Identify key aspects of the overall approach that must be specified for successful evaluation of the technology. Provide a Gantt chart that shows the schedule of each phase of testing and how the various phases were related. Identify any decisions made on this chart. Specific details should be provided in the following sections.

## 5.2 SITE PREPARATION

Describe any activities that were undertaken for site preparation. These might include installation of survey markers, vegetation removal, surface clearance, and the like. If blind seeded targets were used, describe the procedures that were used to emplace the targets and protect the truth data from the performers. Reference appropriate documents.

## 5.3 SYSTEM SPECIFICATION

Describe the overall system, including a section for each component such as the sensor, platform, positioning, and data acquisition systems. The values for all adjustable parameters used should be specified. For a geophysics survey, this should include timing and duration of time gates, update rates of positioning technology, data rate for the recorder, and other values that could affect data quality.

## 5.4 CALIBRATION ACTIVITIES

Describe the methods used to confirm that equipment was operating properly and that meaningful data were collected. This could include measuring responses of canonical targets with analytical solutions, making test pit measurements of targets of interest, or surveying a surface or buried test strip. Describe the measurements taken; summarize the results, the analysis performed, and the criteria for acceptance. Provide detailed information and data sets as appropriate in an appendix.

## 5.5 DATA COLLECTION

Provide detailed information on how the data were collected, recorded, and stored. Provide a summary of the extent and quality of the recorded data. Specify all aspects of the data collection that affected data quality. Sections should address the following:

- *Scale*. Discuss the number of acres surveyed and the procedures used. Provide appropriate maps to show details of the data collection.
- *Sample density*. Discuss cross track spacing and down track speed, and indicate the spatial density of the data that were collected. Explain why these parameters were appropriate.
- *Quality checks*. Discuss what checks were performed to ensure that the data collected met the specifications set forth. Indicate how frequently these checks were made and any out-of-spec data issues.
- *Data summary*. Provide a summary of the data collected and reference where the data reside. Provide sufficient meta-data information to allow others to potentially access, read, and understand the data.

## 5.5 VALIDATION

If targets were dug for validation, provide the criteria used for selecting the targets for validation, the detailed procedures for digging, and how and what data were recorded. If validation was performed as part of the project, provide a summary of the results and, in an appendix, all pertinent information that can be archived.

# 6.0 DATA ANALYSIS AND PRODUCTS

This section is intended to outline the specific analysis steps that were used to produce the data products and to fully document the resulting final products. Each step should be outlined at a level of detail sufficient to illustrate the effect it has on the final product and to allow a reader to understand the criteria for making all decisions and their impact on the demonstration results. The example outline below is appropriate for many projects demonstrating detection and discrimination technologies. Appropriate sections should be developed for the specific project.

## 6.1 PREPROCESSING

Indicate the steps that were involved in transforming the raw data streams to the data product that will ultimately be used for analysis. This should include the merging of geolocation and sensor data, corrections for common data problems, such as time lags, as well as any filtering that was used. Provide sufficient examples to fully illustrate the process and product.

## 6.2 TARGET SELECTION FOR DETECTION

Discuss how targets were selected from the preprocessed data. Indicate the criteria used to define a target of interest and how thresholds were set. Describe in detail the detection dig list that was produced. Provide sufficient examples to fully illustrate the process and product. Provide in an appendix the actual product.

## 6.3 PARAMETER ESTIMATES

Discuss the algorithms that were used to estimate target parameters. Provide sufficient examples to fully illustrate the process and products. Illustrate as appropriate their distributions and other factors.

## 6.4 CLASSIFIER AND TRAINING

Fully describe and discuss the classifier and training data used. Describe how and why they were selected. Provide sufficient information for both a technical and an educated lay audience to fully understand the process.

## 6.6 DATA PRODUCTS

Provide sufficient examples of data products to fully illustrate the work conducted. Review qualitatively the data product quality and discuss any pertinent issues. Provide sufficient information for a reader to fully understand the products produced. Provide in appendices or by reference copies of all data products.

# 7.0 PERFORMANCE ASSESSMENT

Details on all data analysis in support of the assessment of performance objectives should be provided in this section. At a minimum, provide a subsection for each performance objective. Substantive analyses of data obtained during the demonstration that supports the conclusions summarized in Section 3.0 should be provided. Include methods used to calculate any quantitative metrics, as well as an assessment of uncertainties, as appropriate. Reference information provided in the preceding section rather than repeating information, as appropriate.

Subsections should be provided for each performance objective. It is recognized that related performance objectives may have similar data analysis, and as such, reference can be made to earlier sections rather than repeating all information.

# 8.0 COST ASSESSMENT

This section should provide sufficient cost information such that a professional involved in the field could reasonably estimate costs for implementation at a given site. In addition, this section should provide a discussion of the cost benefit of the technology. The following subsections with detailed discussions and examples should be provided.

## 8.1 COST MODEL

A simple cost model for the technology should be presented so that a professional may understand costing implications. The cost model should reflect all cost elements that would be required for implementing the technology at a real site. For each cost element, list the cost data that were tracked during the demonstration and the associated cost as incurred during the demonstration. Please note that some cost elements may not be able to be tracked during a demonstration or are standard practice and as such were not tracked. The cost element should be included in the table, but no cost data are required. A sample of cost elements for a project is provided in Table 2. Please modify this table to illustrate the cost elements that are relevant for the technology.

S A M P L E

**Table 2. Cost Model for a Detection/Discrimination Survey Technology**

| Cost Element | Data Tracked During Demonstration | Estimated Costs |
|---|---|---|
| **Instrument cost** | Component costs and integration costs<br>• Engineering estimates based on current development<br>• Lifetime estimate<br>Track consumables and repairs | • |
| **Mobilization and demobilization** | Cost to mobilize to site<br>Derived from demonstration costs | • |
| **Site preparation** | No unique requirements encountered | |
| **Instrument setup costs** | Unit: $ cost to set up and calibrate<br>Data Requirements:<br>• Hours required<br>• Personnel required<br>• Frequency required | • |
| **Survey costs** | Unit: $ cost per hectare<br>Data requirements:<br>• Hours per hectare<br>• Personnel required | • |
| **Detection data processing costs** | Unit: $ cost per hectare as function of anomaly density<br>Data requirements:<br>• Time required<br>• Personnel required | • |
| **Discrimination data processing** | Unit: $ per anomaly<br>• Time required<br>• Personnel required | • |

For each cost element unique to the technology, provide a subsection that includes the following information:

- A description to briefly explain the cost element and the need for it in the implementation of the technology
- A description and, if appropriate, supporting analysis as to what data supports the listed cost estimate or range
- A description as to how the costs should be interpreted and how issues of scale are addressed.

## 8.2 COST DRIVERS

Discuss anticipated cost drivers that should be considered in selecting the technology for future implementation. Highlight any site-specific characteristic that will significantly impact cost.

Provide examples of how these cost drivers will impact the implementation cost of the technology.

## 8.3 COST BENEFIT

This section should provide a realistic discussion of the cost benefits the technology provides. As appropriate, comparison should be made between the innovative technology and the traditional technology that it is intended to replace. In some cases, the technology does not replace an existing technology, but instead improves on existing technologies or methodologies. In such instances, cost savings or cost avoidances that the technology provides should be discussed.

# 9.0 IMPLEMENTATION ISSUES

This section should provide information that will aid in the future implementation of the technology. A brief description and references for other documents such as guidance or protocols should be provided. Lessons learned during the demonstration and other pertinent issues such as those listed below should be provided, as appropriate.

- Identify potential regulations that may apply to the use of the technology. Provide a list of pertinent environmental regulations and any necessary permits required to implement the technology.
- Highlight end-user concerns, reservations, and decision-making factors. Discuss how the demonstration addressed these concerns.
- Describe any relevant procurement issues (whether equipment required for implementation is standard commercial off-the-shelf (COTS), a custom-built prototype, or newly commercialized.)
- Discuss the current availability of the technology.
- Discuss any specialized skills or training needed to implement the technology.

# 10.0 REFERENCES

Use a standard format for literature citations such as:

**Author name(s). Year. *Title.* Publication. Publication number. Page number.**

# APPENDICES

## Appendix A: Points of Contact

List all the important points of contact (POC) involved in the demonstration, such as co-investigators, sponsors, industry partners, and regulators. The list should include the following information: (1) full name; (2) complete mailing and/or FedEx addresses (if different); (3) telephone number, fax number, and e-mail address; and (4) the role of the individual in the project.

Use the tabular format below:

| POINT OF CONTACT<br>Name | ORGANIZATION<br>Name<br>Address | Phone<br>Fax<br>E-mail | Role in Project |
|---|---|---|---|
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

## Additional Appendices

As needed, provide additional appendices to fully define methodologies identified in Section 5.0, Test Design, and to archive all results summarized in the body of the report.