



DEMONSTRATION PLAN GUIDANCE

Resource Conservation and Resiliency Projects

November 2017

OVERVIEW

A Demonstration Plan is a requirement of all Environmental Security Technology Certification Program (ESTCP) projects. This plan is reviewed and must be approved by ESTCP. The Demonstration Plan should state what the demonstration will attempt to prove, what the metrics are for success, how the demonstration will be conducted, and what measurements and analyses will be made to determine success. It should ensure that pertinent and reliable data are collected during the demonstration.

This document provides guidance for writing Demonstration Plans for natural or cultural resource and resiliency projects that receive funding under the ESTCP Resource Conservation and Resiliency program area. *Demonstrators should submit a draft plan at least two months prior to the initiation of significant demonstration activities to allow for review, comment, and revisions to be completed before work begins. ESTCP recognizes that minor changes to the Demonstration Plan may occur in the field. In the event of substantial changes to the Demonstration Plan that occur after approval, Principal Investigators must notify the ESTCP Program Manager immediately and secure concurrence with proposed changes.*

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

For projects involving multiple demonstration sites, separate Demonstration Plans or portions thereof may be required. If two or more sites are used for the demonstration without significant differences in the test design, the second and subsequent sites may require only an appendix to the main plan describing the site-specific conditions. If the additional sites require different test designs, then a full Demonstration Plan will be required for each site.

The guidance provided in this document is designed to ensure that project management and technical execution of the demonstration are consistent with ESTCP standards. Adherence to this guidance document will help provide a consistent demonstration methodology and data set, which will facilitate end-user review and evaluation.

Format

Although Demonstration Plans are working documents and not intended for publication, they are required deliverables. 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 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 Cover page: none Front matter: i, ii, iii, iv... 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 Demonstration Plan

Demonstration Plans 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 DEMONSTRATION PLAN GUIDANCE

Cover Page

Using the cover page provided in the Word version of this guidance document and also available at <https://serdp-estcp.org/Investigator-Resources/ESTCP-Resources/Demonstration-Plans>, 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.

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

1.0 INTRODUCTION

This section is intended to provide a general overview of the project for those reviewers not familiar with the original project proposal. Specific subsections as described below should be included in this section.

1.1 BACKGROUND

Describe the environmental problem to be addressed and its impact on Department of Defense (DoD) operations. Briefly describe the technology or methodology to be demonstrated and its potential benefit compared to current practices and other alternatives.

1.2 OBJECTIVE OF THE DEMONSTRATION

Provide a succinct statement of (1) the project's objectives and (2) the overarching objective(s) of the field demonstration. Briefly describe the technology or methodology to be demonstrated and the issues to be validated.

1.3 REGULATORY DRIVERS

State existing or anticipated federal, state, or local regulations or DoD directives that have resulted in a need for a new technology or methodology.

2.0 TECHNOLOGY/METHODOLOGY DESCRIPTION

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

2.1 TECHNOLOGY/METHODOLOGY OVERVIEW

- Describe the proposed technology or methodology in sufficient detail to provide an accurate and factual understanding of its theory, functionality, and operation.
- Provide an overall flow diagram for the technology or methodology.
- Provide a chronological summary of the development of the technology or methodology to date.
- Describe expected applications of the technology or methodology.

2.2 ADVANTAGES AND LIMITATIONS OF THE TECHNOLOGY/METHODOLOGY

Identify and briefly describe any prominent alternative technologies or methodologies that are currently in place (if any) to meet the applicable regulatory or stewardship need. State the advantages and limitations of the proposed technology or methodology, and compare these with the advantages and limitations of the identified alternative technologies or methodologies. Identify the major cost considerations involved with current practices and technologies.

3.0 PERFORMANCE OBJECTIVES

The performance objectives are a critical component of the Demonstration Plan. They provide the basis for evaluating the performance and costs of the technology or methodology. Performance objectives are the primary criteria established by the investigator for evaluating the innovative technology or methodology. Meeting these performance objectives is essential for successful demonstration and validation of the technology or methodology.

Performance objectives may be related to and presented in two ways, via *qualitative and quantitative parameters*, and along with related metric information should be summarized in Table 1 (sample provided). Performance objectives should include, but are not limited to, such things as end-point criteria, performance time, and analytical sensitivity. In Sections 5.0 and 6.0, details will be required on the methods for collecting and analyzing the data required to assess the performance objectives listed in Table 1.

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

Performance Objective	Metric	Data Requirements	Success Criteria
Quantitative Performance Objectives			
Improve species habitat/ecosystem restoration (<i>Natural Resources</i>)	<ul style="list-style-type: none"> Correspondence with listed species habitat structure requirements Reduction in non-native invasive species abundance Increase in the number of breeding pairs 	<ul style="list-style-type: none"> Tree size class and basal area measurements Vegetation presence/absence data and cover estimates Population demographic data 	<ul style="list-style-type: none"> < 10 ft²/acre basal area of trees < 10 inches in diameter Non-native invasive species cover < 10% > 250 effective breeding pairs
Improve erosion control (<i>Natural Resources</i>)	Soil loss per unit area	Soil loss measurements via calibrated pin markers	Reduce soil loss in kg/m ³ by > 25% compared with current approaches
Improve artifact discrimination (<i>Cultural Resources</i>)	Reduction in frequency of false identifications	Test plot with known number and position of artifacts	> 95% discrimination accuracy
Qualitative Performance Objectives			
Ease of use	Ability of a technician-level individual to use the technology	Feedback from the technician on usability of the technology and time required to use	A single field technician able to effectively take measurements with minimal training

The following information, presented in brief in Table 1, should be included in the detailed text description of each performance objective:

- Sufficient narrative to fully explain the objective and its relevance to the demonstration

- A full description of the metric that will be used to assess whether the objective was met
- A full description of the data required to calculate or evaluate the metric
- Criteria that will be used to determine success (i.e., for quantitative objectives, the metric threshold value).

Please note that equivalent information 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 these earlier descriptions rather than repeating information. Qualitative performance objectives, though perhaps lacking a relationship to specific units of measure, may still require some level of data collection and analysis. As a result, this format also should be used for qualitative performance objectives as appropriate.

4.0 SITE DESCRIPTION

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

4.1 SITE SELECTION

Describe the criteria and requirements used in selecting the test site(s). Discuss how the selection of the demonstration site relates to the technology or methodology to be demonstrated. For example, describe how the demonstration site provides the conditions needed to successfully demonstrate the technology or methodology, provides the necessary infrastructure to support the demonstration, and meets the regulatory or end-user community's requirements for the demonstration.

4.2 SITE LOCATION AND HISTORY

Describe the location, mission, and relevant physical characteristics of the host installation(s) for the demonstration and any relevant portion (range, training area, or cantonment area) or facility (particular building, as in the case of a cultural resource) on the installation that will serve as the demonstration site. Describe the relevant history of operations at the test site(s). Describe any existing operations that may impact the demonstration.

Provide a map showing the location of the site(s) where the demonstration will take place.

4.3 SITE CHARACTERISTICS

Provide information that is relevant for the demonstration. Describe the site conditions; for example, describe any relevant topographic, climatic, or other feature that may impact the demonstration.

4.4 SITE-RELATED PERMITS AND REGULATIONS

Identify any permits or potential regulations that may apply to the demonstration. Provide information on the status of and appropriate references for pertinent environmental permits required for the demonstration to proceed.

5.0 TEST DESIGN

This section provides the detailed description of the system or process design and testing to be conducted to address the performance objectives described in Section 3.0. Descriptions here should be sufficiently detailed that a technician can use this section to conduct the demonstration in the field.

5.1 CONCEPTUAL TEST DESIGN

Provide a broad overview of the test design to be used to evaluate the performance objectives, including a discussion of controls, treatments, various operational phases, and/or other means to evaluate the technology or methodology performance. Specific details should be provided in the following sections.

5.2 BASELINE CHARACTERIZATION AND PREPARATION

Describe baseline characterization and/or site preparation required to support the demonstration. As appropriate, provide biological, chemical, and physical information that will be used as reference conditions to assess performance of the technology or methodology. Include a subsection on each relevant site characterization activity. If data have been previously collected, briefly summarize results, provide references, and describe the relevance of this information to the demonstration.

5.3 DESIGN AND LAYOUT OF TECHNOLOGY AND METHODOLOGY COMPONENTS

This section should provide a thorough description of all technology components, as applicable. Provide a subsection for each significant technology component describing its design and planned location. For example, if demonstrating a restoration technology, include subsections on equipment and materials to be used. If a monitoring technology is to be demonstrated, include subsections on construction and installation of the sensors and sampling devices. Provide detailed site maps showing the location(s) of all technology components. Schematic diagrams of equipment showing details should be provided when such equipment is an integral part of what is to be demonstrated. This section also should provide a thorough description of any treatments and controls involved, including the associated test design layout and locations. Provide a map showing treatment and control layouts and site location(s) as appropriate.

5.4 FIELD TESTING

Provide a description of each significant operational phase of the technology or methodology to be assessed. Activities may include system start-up, system operation under different operating parameters (provide a subsection on each operating parameter condition), and system shutdown and demobilization. Alternatively, activities may include test treatment initiation, monitoring of progress, and, when appropriate, treatment removal.

Descriptions here should be sufficiently detailed such that a technician can use this section to conduct the demonstration in the field. If needed, provide references or appendices to describe details of field operations.

Provide anticipated dates and duration of the field demonstration. This may be presented in the form of a Gantt chart or a table. Describe plans for removal of equipment or material, if any, at the conclusion of the demonstration. If equipment or material is to be left in place, please plan to obtain written permission from the facility to do so and provide this written permission as an appendix to the Demonstration Plan.

5.5 SAMPLING PROTOCOL

The sampling protocol should result in the collection of relevant and sufficient data to validate the technology or methodology performance under real-world conditions and enable regulatory agencies and managers to evaluate the innovative technology or methodology. Significant spatial and temporal variations should be considered in designing the sampling protocol to ensure a thorough evaluation.

Provide a description of the samples to be collected during each phase of the project and summarize the number and type of samples to be collected in a table. In addition, provide a brief description of each method required. However, methods that are not standard must be described in detail in the text. Provide a detailed sampling schedule as applicable. When appropriate, provide a map or schematic showing the sampling points.

5.6 EQUIPMENT CALIBRATION AND DATA QUALITY ISSUES

The following subsections should be provided as appropriate.

5.6.1 Calibration of Equipment

Provide a description of the calibration procedures for any equipment that will be utilized as part of the project, except for equipment operated by a contract laboratory. Calibration procedures may be provided here or at the first reference of the equipment use in the Demonstration Plan. If calibration procedures are described elsewhere, please just reference that section. If calibration procedures follow manufacturer guidelines, it is not necessary to repeat the procedure in the Demonstration Plan; instead, a reference can be provided.

5.6.2 Quality Assurance Sampling

Provide a description of the quality assurance (QA) samples that will be collected, such as field duplicates, equipment blanks, trip blanks, and field blanks.

5.6.3 Sample Documentation

Describe the components of the sample documentation program, including sample labels, custody seals, field logbooks, photographs, chain-of-custody forms, and laboratory logbooks.

6.0 PERFORMANCE ASSESSMENT

A summary of all data analysis planned in support of the assessment of performance objectives should be provided in this section. Describe the intended statistical procedures/tests to be applied for analyzing the data and determining statistical significance, especially when comparisons with data from current or alternative technologies/methodologies are needed or comparisons to success criteria are sensitive to variances in the data and sample size. Discuss the bases for selecting these procedures. Also describe any power analyses that may be conducted prior to the demonstration to ensure that sample sizes are appropriate and will provide data sufficient to enable valid statistical analyses.

At a minimum, provide a subsection for each performance objective. Plans for analyses of data obtained during the field demonstration that address each performance objective in Section 3.0 should be provided.

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

7.0 COST ASSESSMENT

ESTCP projects are required to develop and validate, to the extent possible, the expected operational costs of deploying the technology or methodology. The intent of this section is to identify the information that can be tracked or the data that can be obtained during the demonstration that will aid in establishing realistic costs for implementing the technology or methodology and comparing it with potential alternative technologies or methodologies. This section of the Demonstration Plan must include a discussion of all cost elements *relevant to the technology or methodology* and related data that can be tracked and documented during the demonstration so that the operational costs of the technology or methodology can be estimated at the scale of operation appropriate to its end use.

A simple cost model for the proposed technology or methodology must be developed. Please focus on cost elements that are relevant to the technology. For each cost element, data that can be obtained during the demonstration that are relevant for estimating the cost of that element should be identified. A sample of a cost model for a sensor-based monitoring technology is provided in Table 2. Please modify this table to specify the cost elements that are relevant for the proposed technology or methodology and identify the data that will be tracked in this project to validate the cost estimate.

S A M P L E	
Table 2. Cost Model for a Monitoring Technology	
Cost Element	Data Tracked During the Demonstration
Sensor procurement	Estimates made based on component costs for demonstration
Installation costs	Labor and material required to install
Sensor consumable	Rate of consumables used during field demonstration
Operation costs	No unique requirements encountered
Maintenance	<ul style="list-style-type: none"> • Frequency of required maintenance • Labor and material per maintenance action
Sensor lifetime	No unique data tracked

The following information should be included in the detailed text description of each cost element:

- A description to briefly explain the cost element
- A statement as to what data will be tracked and/or what will be the basis for a cost estimate

- A statement as to how the data will be interpreted and how issues of scaling, if applicable, will be addressed.

In addition, provide a description of how each applicable cost element can be used to estimate the life-cycle costs for implementing and operating the innovative technology or methodology. Clearly define the time frame for the life-cycle cost estimate.

8.0 SCHEDULE OF ACTIVITIES

Provide a Gantt chart to show the date and anticipated duration of each task of the demonstration, from project initiation to project completion. This chart differs from the Gantt chart requested in Section 5.4 in that it should encompass the entire project, whereas the Gantt chart in Section 5.4 should be specific to the activities conducted as part of the field testing.

9.0 MANAGEMENT AND STAFFING

Describe responsibilities of personnel during the demonstration. Provide a flow chart to show managerial hierarchy and the relationship between the principal investigator (PI), Service representatives, and their contractors.

10.0 REFERENCES

Provide complete citations to references cited in the Demonstration Plan narrative to capture the various data sources used or scientific literature consulted. When applicable, also include web-site addresses, if available.

APPENDICES

Appendix A: Health and Safety Plan (HASP)

Each Demonstration Plan should include or reference a Health and Safety Plan. **Demonstrators are responsible for ensuring that the HASP is reviewed and approved by appropriate offices. ESTCP will not formally review and approve these plans.** Demonstrators should anticipate the most likely scenarios and develop plans for handling emergencies that are as detailed as possible to ensure the safety of everyone involved.

Demonstrators who already have a HASP can adapt that plan to the demonstration.

Overall, demonstrators should consider the following issues:

- What are the applicable local, state, and federal health and safety laws and regulations?
- What is the potential for worker exposure to hazardous materials and/or other hazards?
- What physical requirements are expected of workers?
- How many people are required to operate the technology?
- What is the technology's history of breakdowns or accidents?
- Will there be any potential effects from the transporting of equipment, samples, wastes, or other materials associated with the technology?
- What impact will this technology have on the surrounding environment?
- Where is the closest medical facility? (Provide a map and written directions.)

Appendix B: Points of Contact

List all the important points of contact (POC) involved in the demonstration, such as co-investigators, sponsors, industry partners, regulators, etc. The list should include the following information: (1) full name; (2) complete mailing and 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 Name	ORGANIZATION Name Address	Phone Fax E-mail	Role in Project

Additional Appendices

As needed, provide additional appendices to fully define methodologies identified in Section 5.0 Test Design