Uniform Federal Policy for Quality Assurance Project Plans

Munitions Response QAPP Toolkit

Module 1: Remedial Investigation (RI)/Feasibility Study (FS)

Military Munitions Support Services Webinar

February 2019

Introduction

Purpose: To provide an overview of the process used to prepare a Quality Assurance Project Plan (QAPP) using the MR-QAPP Toolkit Module 1. This does not describe how to conduct the RI/FS per se.

Scope: Covers the completion of the following key worksheets:

- WS #10: Conceptual Site Model (CSM)
- WS #11: Data Quality Objectives (DQO)
- WS #12: Measurement Performance Criteria (MPC)
- WS #17: Sampling Design and Project Work Flow
- WS #22: Measurement Quality Objectives (MQO)
- WS #37: Data Usability Assessment (DUA)

Highlights

- The MR-QAPP Toolkit introduces new terms, approaches, and QA/QC procedures applicable to Munitions Response projects. Existing DoD guidance will be updated to be consistent.
- For the purpose of illustration, Module 1 makes use of a complex example where the RI is conducted in phases. *For less complex sites, both the planning process and the technical approach illustrated in Module 1 can be simplified.*

Agenda

- Project Planning Process Overview
- Project Planning Step-by-Step
  - Session #1: Assemble preliminary CSM and define objectives
  - Session #2: Determine data needs and intended uses
  - Session #3: Develop technical approach and MPCs
  - Session #4: Develop sampling design
  - Sessions #5 and #6: Update sampling design (for phased RI/FS) if needed.
- The Data Usability Assessment

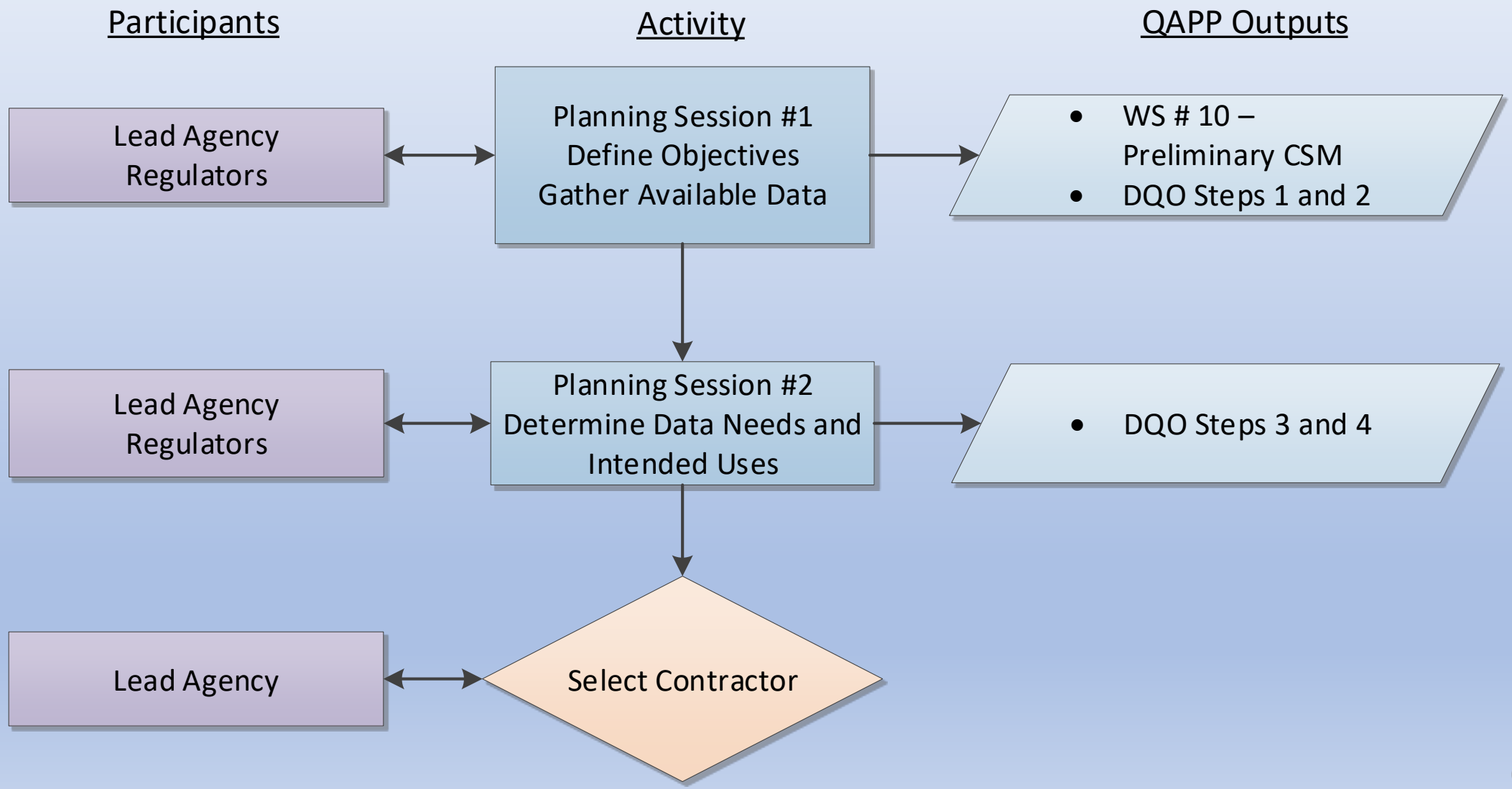
Project Planning Process Overview

- Worksheet #9, Figure 9-1 provides an example roadmap for conducting project planning, documenting DQOs, and completing key MR-QAPP Worksheets

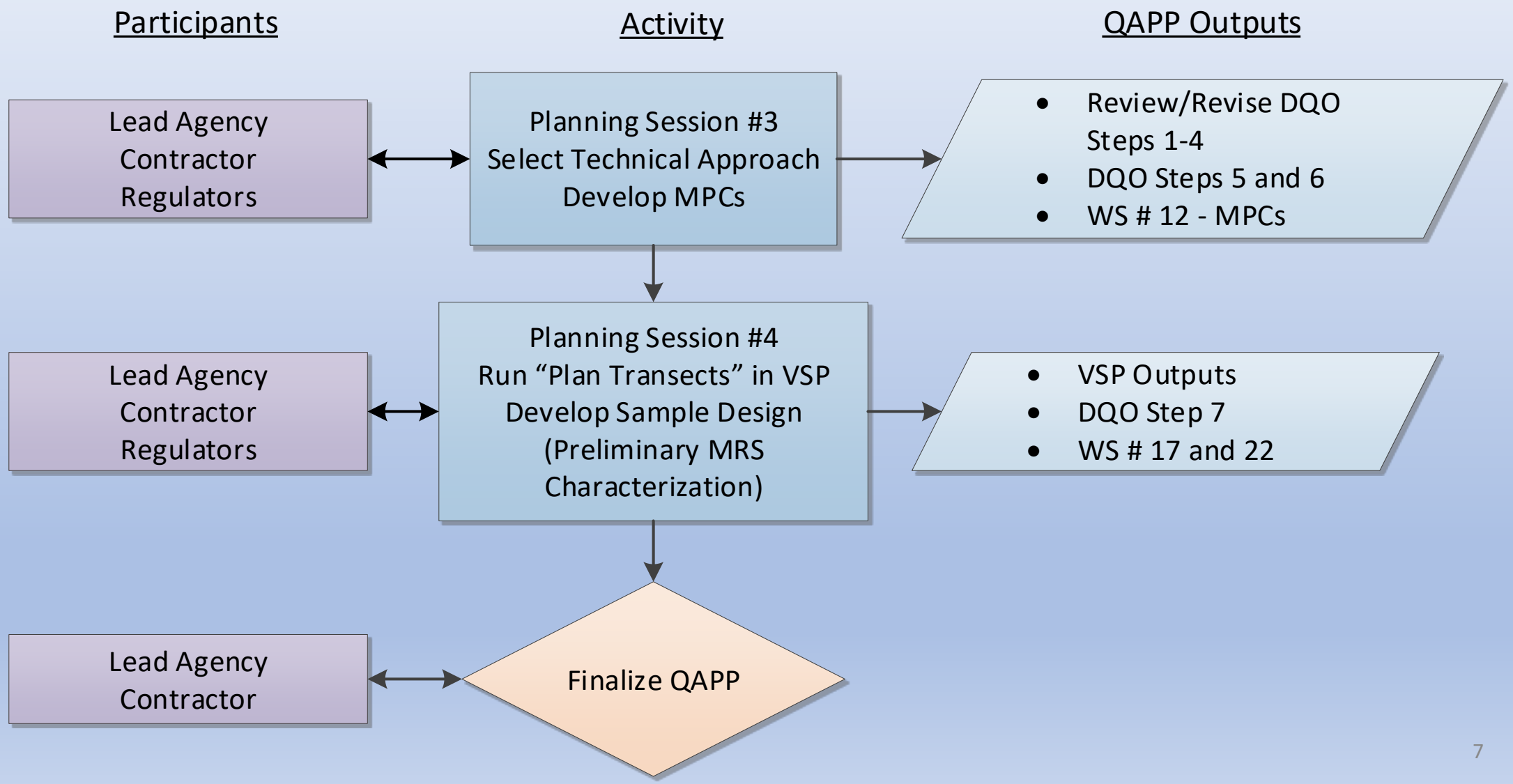
  (WS # 10, 11, 12, 17, 22, and 37)

- Example is based on the DQO process
- Example illustrates planning for a complex site where RI/FS is completed in phases
- Process can be simplified for less complex sites; for example, planning sessions can be consolidated

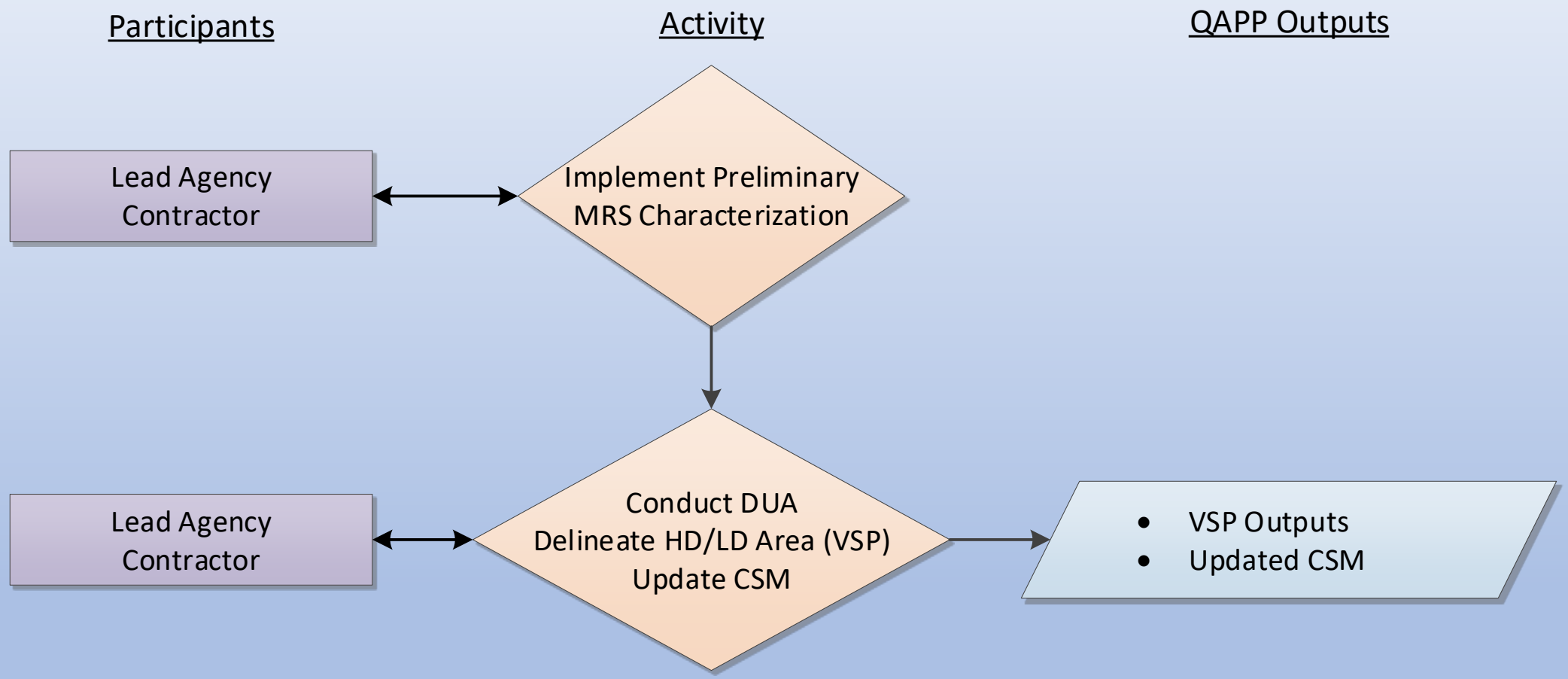
Worksheet #9: Project-Planning Process – Overview



Project-Planning Process – Overview (cont'd.)



Project-Planning Process – Overview (cont'd.)



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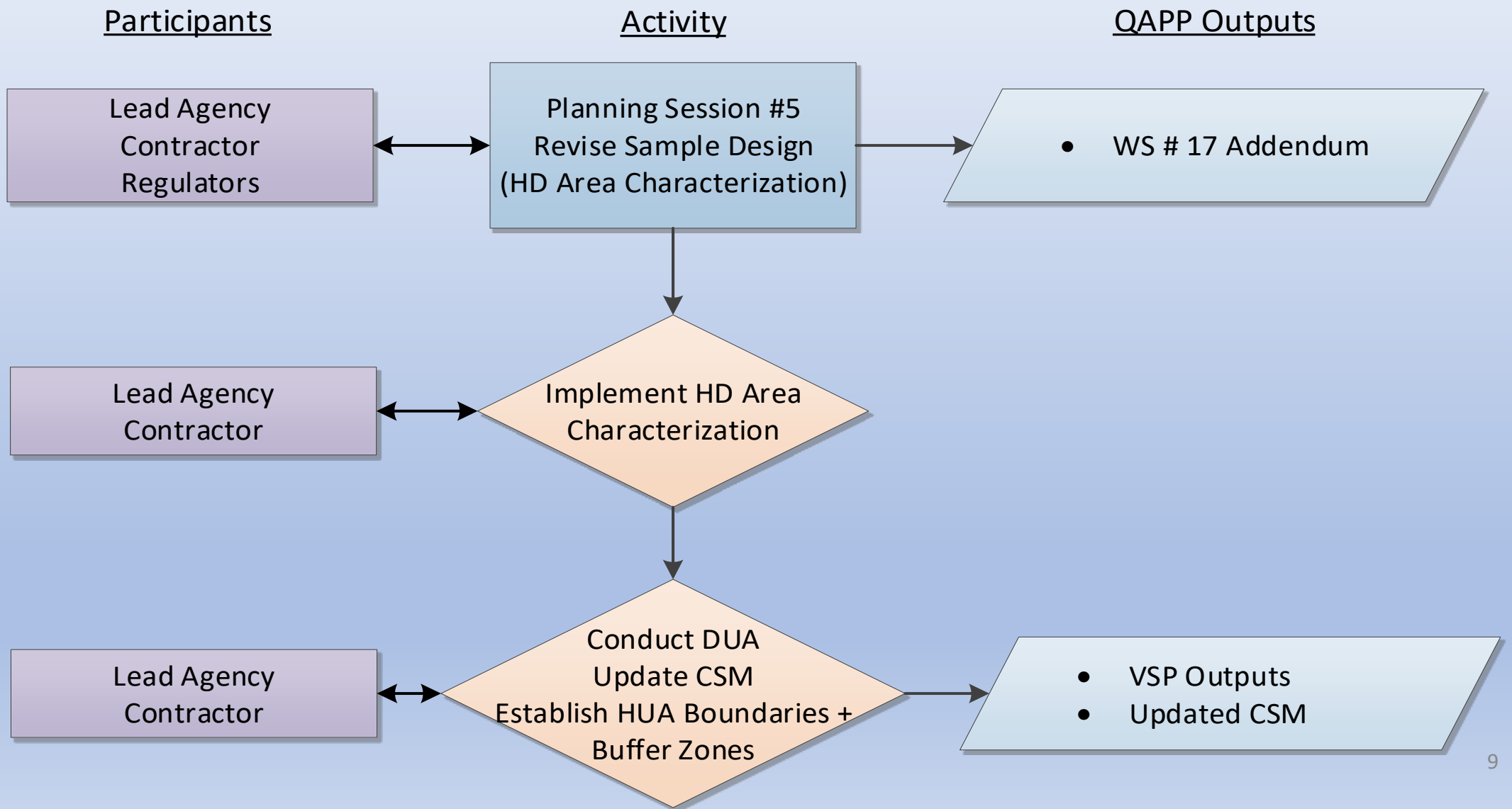
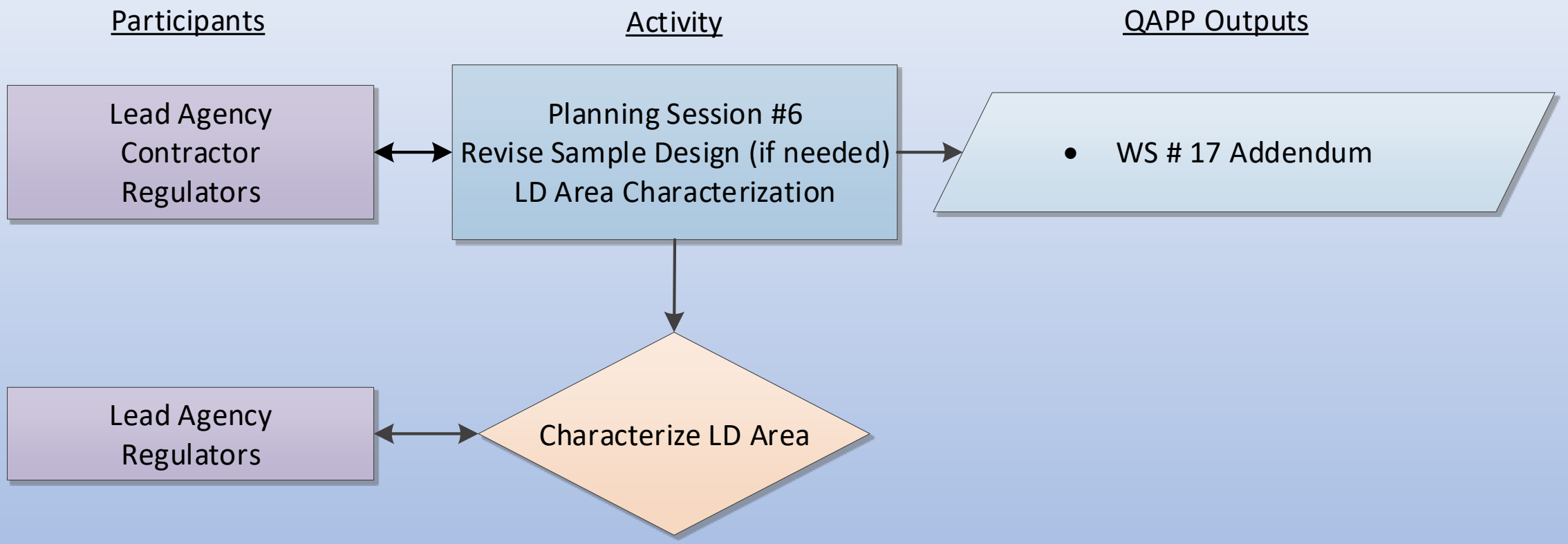


Project-Planning Process – Overview (cont'd.)



Planning Session #1

Participants: Lead Agency and Regulators

Activities:

- Gather available data
- Review/compile preliminary CSM
- Define objectives

Outputs:

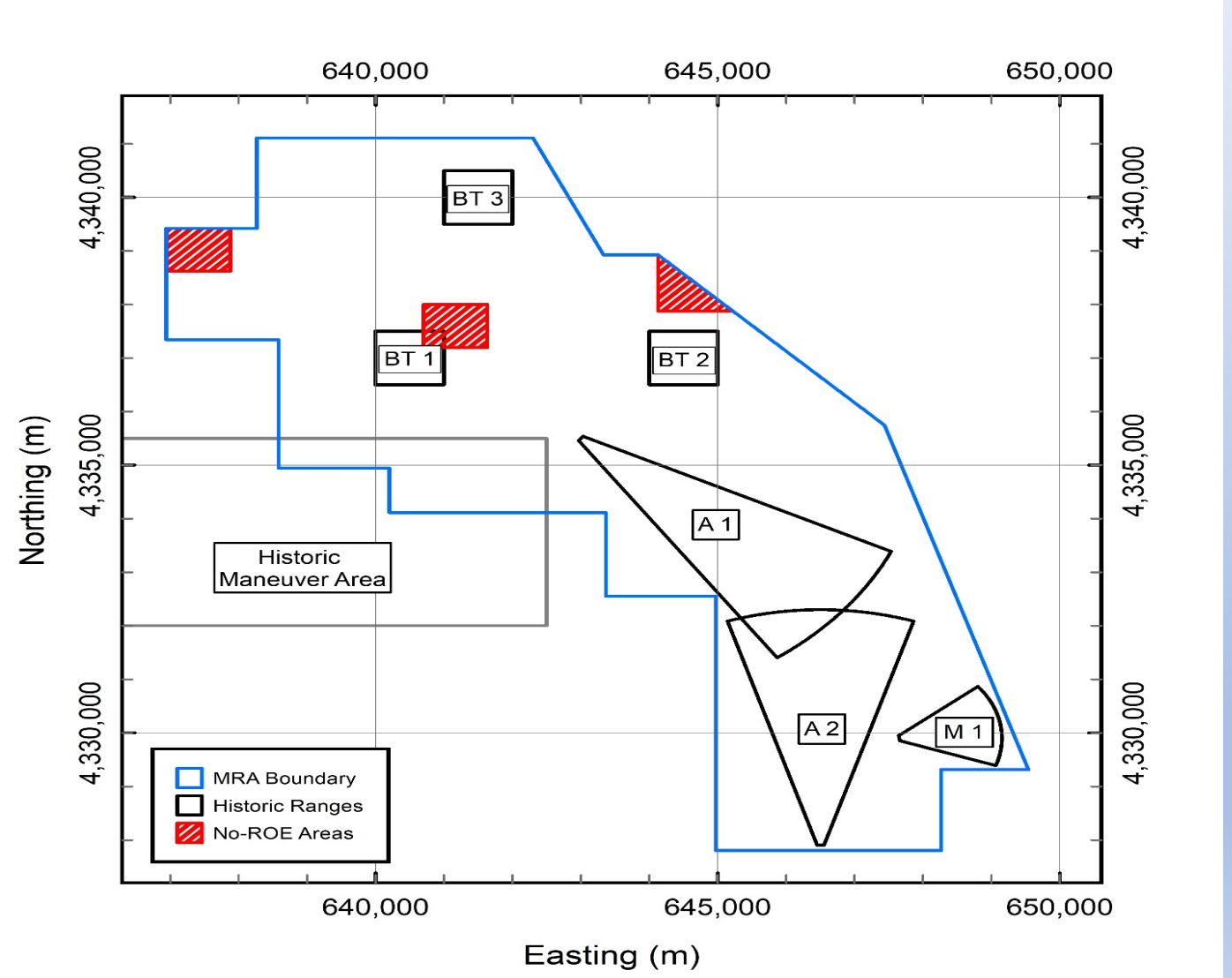
- Worksheet #10 – Preliminary CSM
- Worksheet #11 – DQO Steps 1 and 2

Planning Session # 1 Outputs:
WS #10 – Conceptual Site Model

- A working, iterative model depicting current understanding of sources, pathways, and receptors
  - Facility profile (site location/size, facility uses, previous investigation findings)
  - Physical profile (topography, geology, climate, sensitive habitats, access restrictions)
  - Release profile (MEC use/storage/disposal, expected distribution of MEC)
  - Land use and exposure profile (Current/future uses, accessibility, receptors)
- Preliminary CSM depicted in QAPP usually is CSM generated at the end of the SI
- Working version of the CSM should be updated throughout project

(this does not require updating the QAPP)

Example Figure 10-1. Camp Example Showing Historic Ranges



Example Table 10-1. CSM Overview, Camp Example – MRS A

Table 10-1. Overview of Preliminary Conceptual Site Model, Camp Example – MRS A

Site Details	Potential/Suspected Location and Distribution of MEC	Known/ Suspected Munitions	Exposure Medium	Current and Future Receptors	Exposure Pathways
Camp Example, MRS A **Boundaries and acreage: See Figure 10-2** **Background anomaly density (estimated): 75/acre** **Known/suspected past DoD activities (release mechanisms):** **Bombing Target #1: Proposed, but no evidence of use** **Bombing Target #2: 100-lb practice bombs** **Bombing Target #3: Proposed but no evidence of use** **Current land use: Low-density residential, agricultural, and wildlife preserve** **Future land use: Future increased residential density expected in northwest area of MRS**	HUAs: -Evidence of munitions handling or use (e.g., target areas) -High likelihood of finding residual MEC, MD, or range-related debris (RRD) -Anomaly density ≥ critical density	-Bomb, HE, M30A1 -Bomb, practice, 100-lb, M38A2 -nose fuze, AN-M103 Series -tail fuze, AN-M100 Series M1A1 spotting charges for 100-lb practice bombs	Surface soil and subsurface soil	Ranchers Farmers Hunters Hikers Campers Residents U.S. Forestry Service	HUAs: Potentially complete exposure to surface and/or subsurface MEC
	Low use areas (LUAs): -Low likelihood of finding residual MEC, MD, or RRD -Anomaly density < critical density				LUAs: Potentially complete exposure to surface and/or subsurface MEC
	Non-impacted Areas (NIAs): -No evidence of munition use				NIAs: Incomplete

Planning Session #1 Outputs:
DQO Step 1: State the problem

Define the problem in terms specific to the MRS, considering information in the preliminary CSM.

[Example] Evidence from previous investigations indicates that MEC in the form of Unexploded ordnance (UXO) and discarded military munitions (DMM) may be present at MRS A and MRS B resulting from their use between 19XX and 19XX as bombing targets, artillery ranges, and mortar ranges involving the use of both practice munitions and high explosives (HE). Further investigation is needed to:

- Confirm the locations of targets,
- Establish boundaries for high-use areas (HUA) and low-use areas (LUA),
- Characterize the type, nature and distribution of munitions within each HUA and LUA,
- Evaluate risk,
- Support determinations of non-impacted areas (NIA), and
- Collect data to support a feasibility study (FS) if necessary.

Planning Session #1 Outputs:
DQO Step 2: Identify the goals of data collection

Identify principal study questions. State how data will be used. Define alternative outcomes.

Principal study questions: [Example]

- What are the nature and extent (i.e. horizontal and vertical distribution) of explosive hazards at MRS A and MRS B?
- What current and potential future threats may be posed to human health and the environment by MEC remaining at the site?
- What are alternative actions for mitigating current and potential threats (if identified) posed by MEC remaining at the site?

Planning Session #2

Participants: Lead Agency and Regulators

Activities: Determine data needs and intended uses

Outputs: Worksheet #11 – DQO Steps 3 and 4

Together, planning sessions #1&2 generate information usually needed to prepare the solicitation

Planning Session #2 Outputs:
DQO Step 3: Identify information inputs

Identify information needed to fill data gaps in CSM and answer study questions.

Information needed to establish presence/absence of MEC and characterize potential hazard

e.g., Background density, target area density, type/distribution of MEC

Information needed to establish exposure potential

e.g., current/future land use, receptors, and exposure scenarios

Information needed to support the FS, if necessary

e.g., cost effectiveness & practicality of alternatives

Planning Session #2 Outputs:
DQO Step 4: Define the boundaries of the project

Specify the target population and characteristics of interest. Define spatial and temporal boundaries.

Target population: [Example] The target population includes any ordnance used, stored, or discarded at Camp Example, including UXO and DMM. The target population also includes MD, which serves as an indicator of potential MEC hazards and potential munitions constituent (MC) contamination. Table 11-1 lists munitions that are known or suspected to be present at Camp Example:

Table 11-1: Known/suspected munitions

- Known/Suspected Munitions (include nomenclature)
- UXO vs. DMM
- Potential Hazards/Severity
- Expected Fragmentation Distance
- Detection Depth
- Approximate Diameter
- Approximate Length

Planning Session #3

Participants: Lead Agency, Contractor and Regulators

Activities: Develop data collection options (technical approach) and measurement performance criteria (MPCs)

Outputs:

- Review/revise DQO steps 1-4 (with contractor participation)
- Worksheet #11 – DQO Steps 5 and 6
- Worksheet #12 - MPCs

Planning Session #3 Outputs:
DQO Step 5: Develop Data Collection/Analysis Approach

Define parameters of interest, specify inference and develop decision rules

Example approach involves three phases:

- Preliminary MRS Characterization: delineate high density (HD) and low density (LD) areas)
- HD Area Characterization: determine whether HD area is munitions-related, and if so, characterize anomalies and establish high-use-area (HUA) boundaries
- LD Area Characterization: differentiate low-use areas (LUA) from non-impacted areas (NIA)

DQO Step 5: Develop Data Collection/Analysis Approach (cont'd.)

Caveats:

- Preliminary characterization phase may not be necessary if target locations are well-documented in CSM
- HD/LD Area characterizations may not require separate mobilizations.
- For smaller sites, it may be impractical/unnecessary to distinguish between LUA and NIA.

DQO Step 5: Develop Data Collection/Analysis Approach
[Example] HD Area Characterization

Parameters of interest: The sources of anomalies and horizontal/vertical distribution of munitions-related anomalies

Type of inference: Within an HD area, the presence of MEC, or MD associated with munitions that have functioned, will indicate an HUA.

Decision rules (partial list):

1) IF MEC/MD are identified, and CSM indicated munitions were used, HD area will be confirmed as HUA and team will establish boundary and buffer zone.
2) If no MEC, MD or RRD are found, the team will revisit the CSM to confirm use of the are and investigate area as presumed LUA or NIA, based on evidence.

Planning Session #3 Outputs:
DQO Step 6: Develop project-specific MPCs

Considering previous steps, derive project-specific MPCs to minimize possibility of making erroneous decisions

MPCs are documented on Worksheet #12

- Document requirements (accuracy, sensitivity, representativeness, completeness, comparability) necessary to meet DQOs
- Guide development of sample design
- Provide criteria for data usability assessment at the end of the study
- Project-specific QAPP must justify any changes to specifications presented in black text

Table 12-1: Measurement Performance Criteria

Measurement	Data Quality Indicator	Specification	Activity Used to Assess Performance
Site Preparation			
1. Accessibility	Completeness	All areas inaccessible to investigation or inaccessible to use of proposed geophysical systems are identified and mapped in a geographic information system (GIS).	Lead organization will visually inspect the site and/or review the GIS
Sampling Design			
2. Planned survey coverage (Preliminary MRS Characterization)	Representativeness/ Completeness	Planned, initial transect spacing will be sufficient to detect HUA with a radius of X at a confidence level of 100%. Infill transects will be designed to achieve the MPC for anomaly density estimates (see MPC 13).	QC geophysicist reviews Visual Sample Plan (VSP) output. [VSP *Post-Survey-Probability-Of-Traversal* tool.]
3. Detection threshold (transects & grids)	Sensitivity	5 x RMS noise [Note: This is expected to be sufficient to permit detection of both munitions and munitions debris.]	1) Review of sampling design 2) Initial verification at instrument verification strip (IVS) 3) Background analysis prior to VSP analysis

Planning Session #4

Participants: Lead Agency, Contractor and Regulators

Activities: Run “Plan Transects” in VSP and develop sampling design

Outputs:

- DQO Step 7
- VSP outputs
- Worksheets #17 and 22

Planning Session #4 Outputs:
DQO Step 7: Sampling Design and Project Work Flow

Develop a resource-effective sample design for collecting data that will meet project-specific DQOs (WS #11) and MPCs (WS #12)

- For simpler projects conducted in one mobilization, this is typically the last planning session
- VSP inputs and outputs needed to develop the sample design can be documented on Worksheet #11, Tables 11-2 and 11-3
- Step 7 usually refers to WS #17, which documents the sampling design and project work flow in detail

Table 11-2: Visual Sample Plan Input [Example]

VSP Input	**MRS A**	**MRS B**	
	DGM Area	DGM Area	Analog Area
Design Objective: Ensure high probability of traversal and detection			
Target Area Size and Pattern (VSP to calculate)	100-lb bomb, air-dropped	60mm mortar, surface-launched	60mm mortar, surface-launched
Target Diameter	218m	112m	112m
Background Density	75/acre	75/acre	225/acre
Average Target Area Density (above background)	20/acre	10/acre	30/acre
Average Target Area Density (above background) input determined at:	Outer edge of target	Outer edge of target	Outer edge of target
Target Distribution	Bivariate Normal Density	Bivariate Normal Density	Bivariate Normal Density
Probability of Traversing and Detecting Target Area	100	100	100
Transect Width	1m	3m	1.5m
Probability of Detection	100%	100%	90%
Transect Pattern	Parallel	Parallel	Parallel
Orientation	NS	NS	NS – parallel to slope

Table 11-3: Visual Sample Plan Output [Example]

VSP Output	**MRS A**	**MRS B**	
	DGM Area	DGM Area	Analog Area
Transect Spacing	250m	225m	129m
Detection System	TEMTADS	EM61 Array	Schonstedt

Planning Session #4 Outputs:
Worksheet #17: Sampling Design and Project Work Flow

Worksheet #17 should include:

- A map showing physical boundaries for each MRS
- A work flow diagram, including activities and decision points
- Concise descriptions for each DFW, including documents and deliverables
  (Detailed SOPs must be included in an appendix)
- Contingencies in the event field conditions affecting the sampling design are different than expected
- Points in the process at which lead organization, regulator, and stakeholder interface will occur, as agreed upon during project planning.

Planning Session #4 Outputs:
Worksheet #17: (cont'd.)

The project work flow and example presented in Module 1 illustrate a sampling design for an RI conducted in phases at "Camp Example"

- Example is based on a large MRS involving multiple types of targets
- Significant data gaps exist in preliminary CSM
- Incorporates the use of both analog and digital technology
- For less complex sites, sampling design can be simplified
- Project teams may modify the project work flow to meet project-specific DQOs

Planning Session #4 Outputs:
Worksheet #17: (cont'd.)

For complex sites (e.g., large sites, many targets, diverse uses, uncertainty in types/locations of targets)

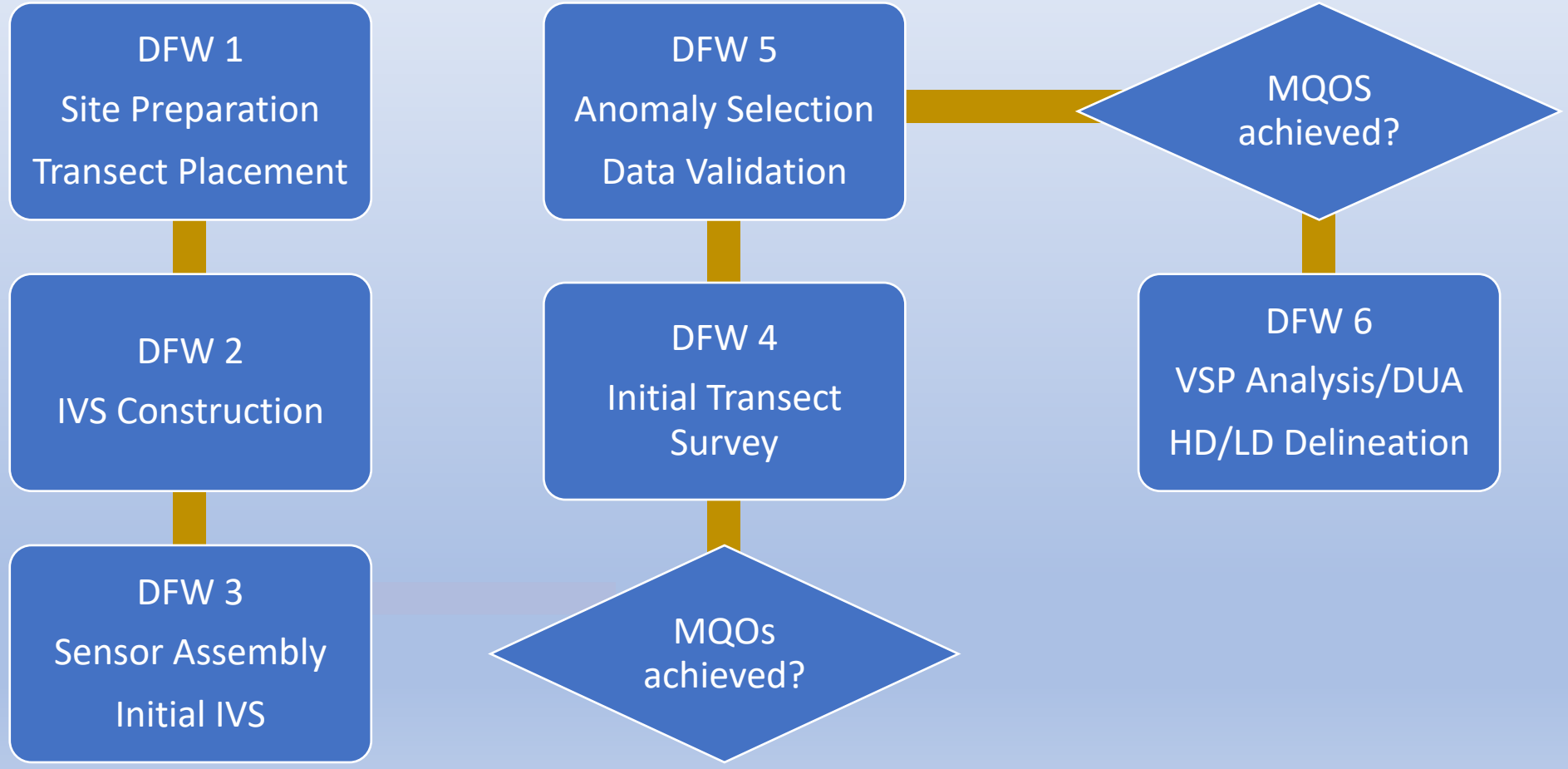
- Phased implementation may be most effective
- Project-specific MR-QAPP (WS #17) will describe Preliminary MRS Characterization in detail
- Approaches for HD area and LD area characterization will be described in general terms
- Updates to the sampling design can be documented and issued as WS #17 addenda

Planning Session #4 Outputs:
Worksheet #17: (cont'd.)

For less complex sites (e.g., smaller sites, fewer targets, target locations well-documented)

- Phased implementation may not be required
- Preliminary MRS Characterization step may not be necessary
- HD area and LD area characterizations may be combined into one mobilization.
- Based on future expected land-use considerations, it may not be necessary to distinguish LUAs from NIAs

Work Flow Diagram – Preliminary MRS Characterization [Example]



Planning Session #4 Outputs:
Worksheet #22: Equipment Testing, Inspection, and Quality Control

Measurement Quality Objective	MQO#	Frequency	Responsible Person/ Report Method/ Verified by:	Acceptance Criteria	Failure Response
Geodetic Equipment Function Test	HD26	Daily (RTK GPS) Each time equipment is moved (RTS)	Field Team Leader/ GIS data recorded/ Project QC or designee	Measured position of control point within 10cm of ground truth	RCA/CA; document questionable information in database
Geodetic Accuracy (Confirm Valid Position)	HD27	Evaluated for each measurement	Field Team Leader/ GIS data recorded/ Project QC or designee	GPS status flag indicates RTK fix (RTK GPS) RTS passes Geodetic Function Test (RTS)	RCA/CA; document questionable information in database
Initial measurement of production area background locations and background verification (five background measurements: one centered at the flag and one offset at least ½ sensor spacing in each cardinal direction) (AGC)	HD43	Once per background location	Field Team Leader/ IVS Memorandum Project Geophysicist	All five measurements have a library match within 0.9	RCA/CA: reject BG location and find alternative

Planning Session #5 (for phased RI/FS, if needed)
HD Area Characterization

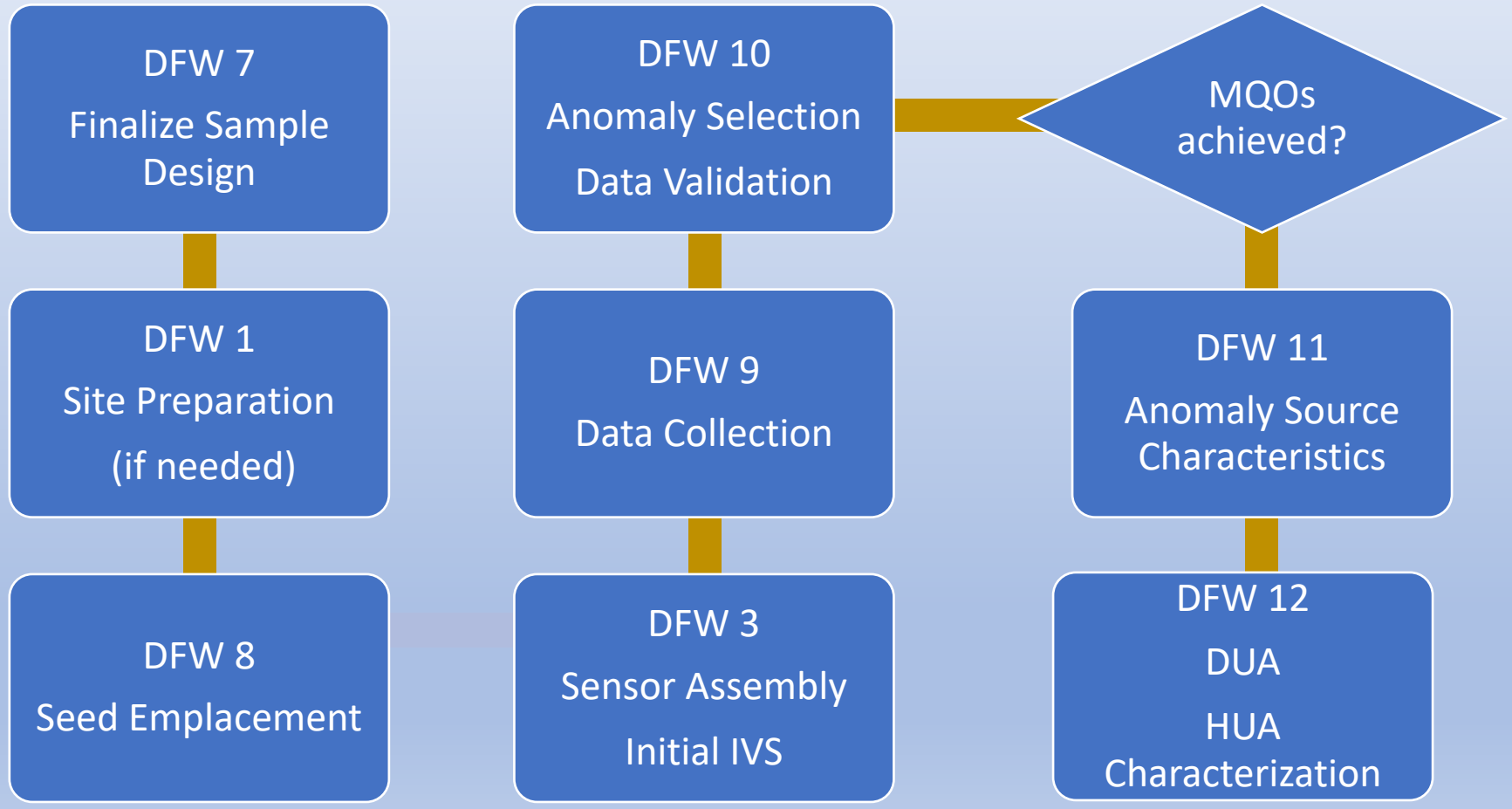
Participants: Lead Agency, Contractor and Regulators

Activities:

- Review Preliminary MRS Characterization Report (including DUA report)
- Update HD Area Characterization sample design, as needed

Outputs: Worksheet #17 Addendum

Work Flow Diagram – HD Area Characterization [Example]



Planning Session #6 (for phased RI/FS, if needed)
LD Area Characterization

Participants: Lead Agency, Contractor and Regulators

Activities:

- Review HD Area Characterization Report (including DUA report)
- Update LD Area Characterization sample design, as needed

Outputs: Worksheet #17 Addendum

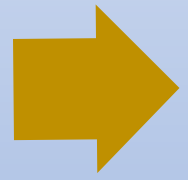
Work Flow Diagram – LD Area Characterization [Example]

DFW 13

Review CSM

Collect Data (if needed)

Establish LUA/NIA Boundaries



DFW 14

Conduct Final DUA

Finalize CSM

Worksheet #37: Data Usability Assessment

- Performed by key members of project team
- Regulators have opportunity to review and comment
- Integrated into decision-making
- Conducted at end of each phase (if applicable)
- Evaluates whether data support MPCs and DQOs, i.e.

Are underlying assumptions supported?

Have sources of uncertainty been managed appropriately?

Do data represent the population of interest?

Can the results be used as intended with an acceptable level of confidence?

Worksheet #37: Data Usability Assessment (cont'd.)

Identify personnel responsible for participating in the DUA, e.g.,

- DoD RPM
- Project Manager
- Project QA Manager
- Project Geophysicist
- QC Geophysicist
- Field Geophysicist (lead)

Identify documents and records required as DUA inputs

Describe how the DUA will be documented

Worksheet 37: DUA (cont'd.)
The DUA Process

Step 1: Review objectives and sampling design

- Review DQOs – are underlying assumptions valid?
- Review sampling design as implemented – Were VSP inputs representative?
- Summarize deviations and describe their impacts on DQOs

Step 2: Review data verification/validation outputs and evaluate conformance to MPCs

- Was RCA/CA effective?
- Do data gaps remain?

Next Steps

- Develop and deliver a two-day Module 1 training course in all EPA Regions – CY 2019
- Update AGC-QAPP and issue as MR-QAPP Module 2: Remedial Action – CY 2019/20

Worksheet 37: DUA (cont'd.)
The DUA Process

Step 3: Document data usability, update the CSM and draw conclusions

- Can the data be used as intended?
- Are data sufficient to answer the study questions?

Step 4: Document lessons learned and make recommendations

- Summarize lessons learned
- Make recommendations for future investigations
- Prepare the data usability summary report

Summary

- Project-planning process is flexible and should be adapted to specific site under investigation
- Module 1 illustrates application to a complex site. For less complex sites, both the planning process and the technical approach can be simplified
- A working version of the CSM is a valuable tool for decision-making, and should be updated throughout the project, as agreed during planning
- The DUA is key to determining whether DQOs were achieved, i.e., the data can be used as intended, with an acceptable level of confidence

Next Steps

IDQTF MR-QAPP Subgroup

- Complete and deliver 2-day Module 1 classroom training (CY 2019)
- Update AGC-QAPP and reissue as MR-QAPP Module 2: Remedial Action (mid CY 2020)

EDQW

- Continue implementation and oversight of DAGCAP
- Provide government oversight assistance
- Monitor development of advanced classification technology

Questions?