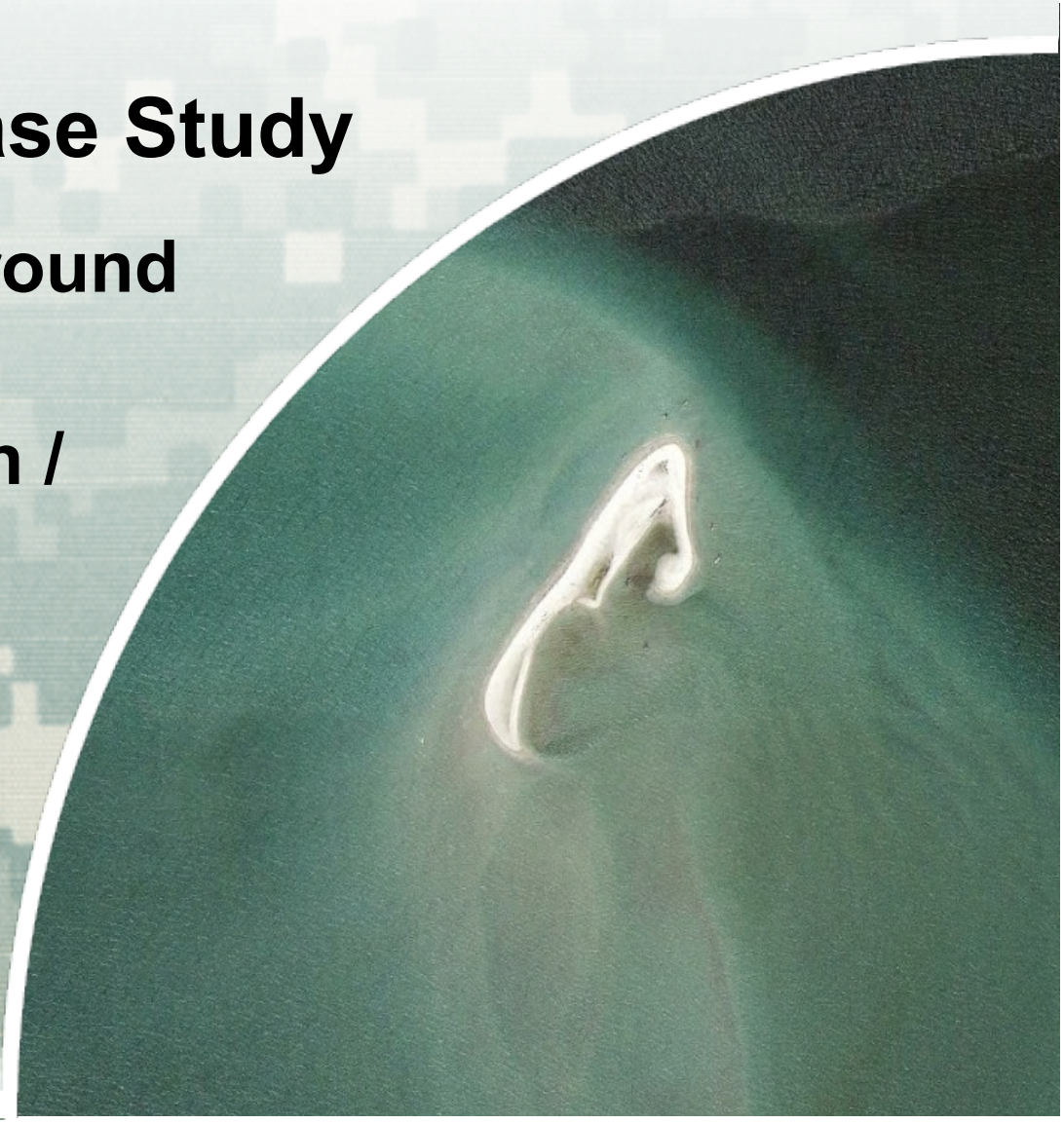
Data Quality Objective Development – It Takes a Village

A M2S2 Webinar Case Study

Passage Key Air-to-Ground Gunnery Range

Remedial Investigation / Feasibility Study

23 April 2015



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DQOs, CSM, and Remediation

- Remedial Investigation (RI) data should answer, or help answer, a specific question.
- The questions are derived from the Conceptual Site Model (CSM) and the answers will allow us to refine the CSM to the level of fidelity needed to make defensible decisions about remediation.

Simple Pictorial CSM Example

DQO Development Key Concepts

- Recognize the importance of Data Quality Objective (DQO) development and its role in the Systematic Planning Process
- Understand how the DQO development process can be used as a tool for project team planning and decision-making
- Become familiar with key elements and current presentation preferences for DQOs
  - DQOs can be summarized in tabular form.
  - There are seven key elements used to define DQOs.
  - These elements are used to answer questions about the study and to define the project end points.

DQO Table

Remedial Investigation / Feasibility Study
Passage Key Air-to-Ground Gunnery Range
Manatee County, Florida

Table 1 – Draft Data Quality Objectives (DQOs)

DQO	Problem Statement	Project Goals	Required Information Inputs	Input Boundaries	Analytical Approach	Performance Criteria	Plan for Obtaining Data
Explanation	*Define the problem that necessitates this study*	*Identify study questions*	*Identify data and information needed to answer study questions*	*Specify the target population and define spatial limits*	*Develop the logic for drawing conclusions from findings*	*Specify probability limits for false rejections and false acceptance decision errors*	*Select the plan that meets the performance criteria*

DQO Table Reference: Guidance on Systematic Planning Using the Data Quality Objectives Process, EPA QA//G-4, EPA/240/B-06/001, February 2006

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Seven Key DQO Elements

1. DQOs and Problem Statement – Explain for what the DQOs will be used (describe the study) and define the problem that necessitates the study
2. Project Goals – Identify the study questions
3. Required Information Inputs – Identify data and information needed to answer the study questions
4. Input Boundaries – Specify the target population and define the spatial limits (*e.g.*, horizontal, vertical, seasonal)

Seven Key DQO Elements (continued)

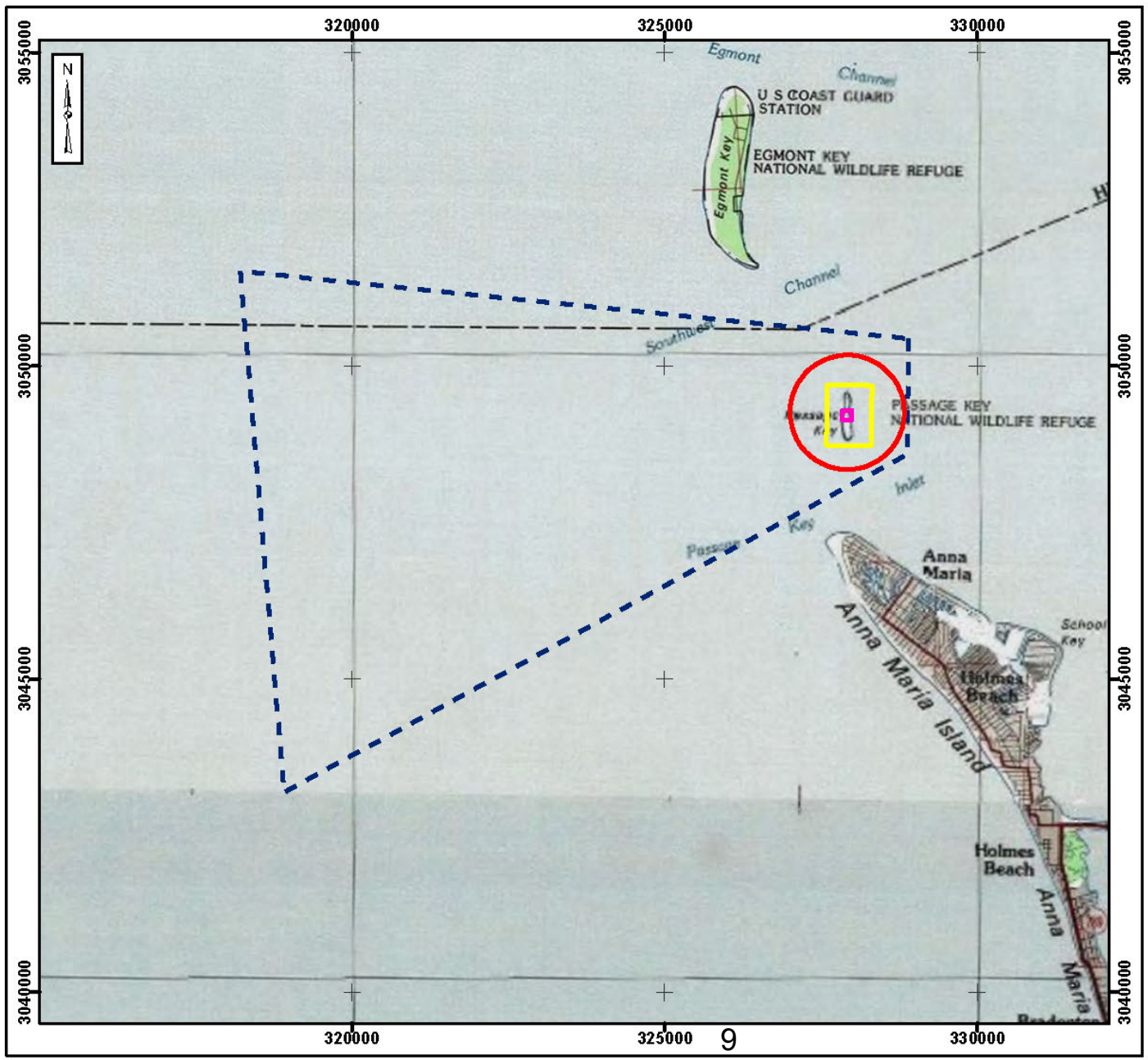
5. Analytical Approach – Develop the logic for drawing conclusions from the study findings (*e.g.*, suggest using if/then statements)
6. Performance Criteria – Specify probability limits for false rejections and false acceptance decision errors
7. Plan for Obtaining Data – Select the plan that meets the performance criteria

DQO Development for Project Planning

- If DQOs are not clear, well-defined, specific and measurable, or planning is an after-thought, then:
  - Project objectives will not be clear or well-defined.
  - An “exit” strategy or “end point” may not be clear.
  - The sampling and analysis program may not match the “data needs” required to make decisions.
- DQO development should be an integral part of project planning involving the project team.

Case Study: Passage Key RI/FS Project

- Former Passage Key Air-to-Ground Gunnery Range
  - Located at Passage Key in Tampa Bay/Gulf of Mexico
  - Once a 36-acre island; today the key is a sand bar
- Historical Use
  - Owned by Department of Interior (DOI) and used as a wildlife refuge prior to military use
  - During WWII (1943-1945), used as an aerial gunnery and bombing range
  - Returned to DOI in 1946; reverted back to a wildlife refuge
- Current and Future Use
  - Managed as a National Wildlife Refuge for migratory birds
  - Recreational use by local boaters



Remedial Investigation/Feasibility Study
Quality Assurance Project Plan
Passage Key Air-to-Ground Gunnery Range
Manatee County, Florida
I04FL040101

PIKA
ARCADIS MALCOLM PIRNIE

Map B-1
Site Location

Legend

- RI/FS Investigation Area
- Historical Air-to-Ground Gunnery Range and Bombing Target Area
- Approximate FUDS Boundary
- Historical Range Safety Fan

0 1 2
Kilometers

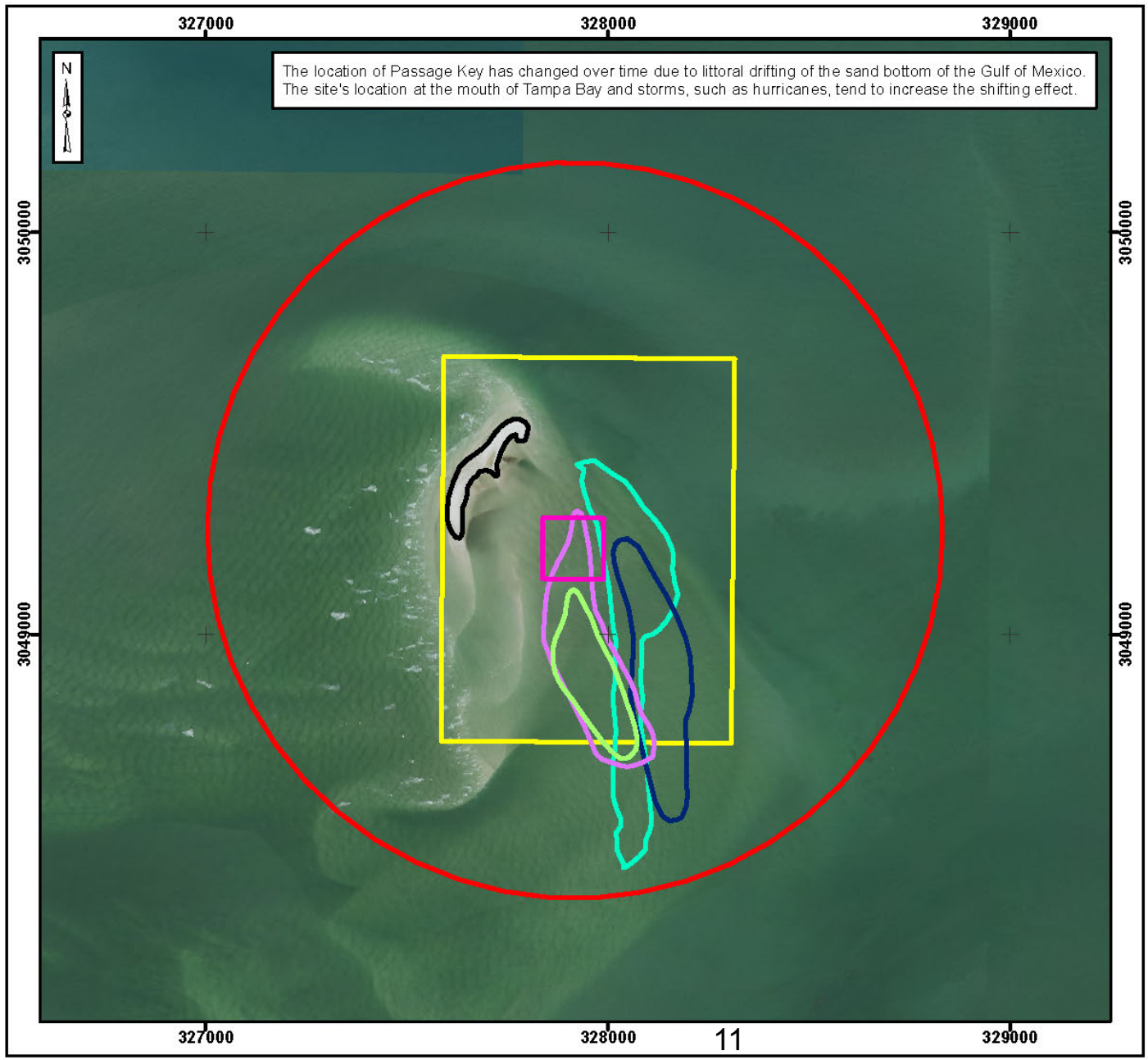
Data Source: ESRI, ArcGIS Online, USGS Topo Map

Coordinate System: UTM, Zone 17N
Datum: NAD 83
Units: Meters

Date: March 2015

Background (continued)

- 2 banks of targets facing north and south, each with 6 targets
- Location of Passage Key has shifted over time
- Unexploded ordnance (UXO) discovered in 1998
  - 3 – 100 lb (AN-M30) General Purpose Bombs
  - 1 – 100 lb (AN-M46) Photoflash Bomb
- Accessible only by boat; island off limits to public, but there are no physical barriers



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Map B-2
Site Details

Legend

- RI/FS Investigation Area
- Historical Air-to-Ground Gunnery Range and Bombing Target Area
- Approximate FUDS Boundary

Location of Passage Key

- 1942
- 1944
- 1951
- 1998
- 2014

0 0.2 0.4
Kilometers

Data Source: FLDOT, Aerial Imagery, 2014

Coordinate System: UTM, Zone 17N
Datum: NAD 83
Units: Meters

Date: March 2015

DQOs Development Process

- Initially developed for and presented at the Technical Project Planning meeting
  - Established to ensure data are sufficient, useable and meaningful to support the project objectives
  - Used to define the type, quantity and quality of data needed
  - Presented to solicit initial feedback and concurrence from stakeholders
- Refined and presented in the Draft Work Plan (UFP-QAPP Worksheet #11)
- Further refined and presented in the Draft Final Work Plan

Problem Statement Development

- Initial Problem Statement (*i.e.,* define the problem that necessitates this study):

  Determine the nature (type) and extent (density and distribution) of Munitions and Explosives of Concern (MEC).

- Factors that should be addressed:
  - Shifting sands
  - Location moving throughout the years
  - Historical use
  - The need to determine if there is a concentrated munitions use area that would present a hazard to potential receptors

Problem Statement (continued)

- Refined Problem Statement:

  Passage Key Air-to-Ground Gunnery Range was formerly used as a bombing range during World War II; however, the nature and extent of munitions that could present an explosive hazard is not known.

  In addition, the site is a shifting sand bar and it is unknown how the dynamic nature of the currents and shifting sands may have affected the density and distribution of MEC at the site, if present.

Problem Statement (continued)

- Additional factors to consider:
  - The potential hazard to receptors is also a reason the study is needed.
  - It is not clear how the dynamic nature of the site, as part of the "problem," will be evaluated.
  - Is it a project goal to figure out how the dynamic nature may have affected density and distribution? Would this require some additional data that isn't already captured?
  - The problem is also whether we will be able to detect items if they are covered with several feet of sand.

Problem Statement (continued)

- Further Refined Problem Statement:

  Passage Key Air-to-Ground Gunnery Range was formerly used as a bombing range during World War II.

  As a result of the site's use as a bombing range, there is a potential for MEC to be present which may pose a threat to human health and the environment; however, the nature and extent of MEC is not known.

Problem Statement (continued)

In addition, the site is a shifting sand bar and it is unknown how the dynamic nature of the currents and shifting sands may have affected the density and distribution of MEC at the site, if present, and if these items will be detected if covered with several feet of sand.

As a result, information from existing studies on sediment deposition and movement will be needed to evaluate the RI findings.

Project Goals Development

- Initial Project Goals (*i.e.,* identify the study questions):
  - *Determine the spatial extent of areas impacted by concentrated munitions use.*
  - *Determine the nature of munitions within the concentrated munitions use areas.*
  - *Assess the potential for UXO in areas outside of the concentrated munitions use areas.*
  - *Use this information to revise the CSM and determine if MEC exposure pathways for humans are complete.*

Project Goals (continued)

- *Possible Actions:*
  - *No DoD Action Indicated*
  - *Institutional Controls*
  - *Public Education Materials*
  - *MEC Removal*
  - *Combination of Actions*

- Factors that should be addressed:
  - Suggest describing the goals as study questions.
  - The Possible Actions are really General Response Actions and should be less specific.
  - Never use No DoD Action Indicated; instead, use No Further Action.

Project Goals (continued)

- Refined Project Goals/Study Questions:
  - *Are there areas that have been impacted by concentrated munitions use?*
  - *Where are they and what is the spatial extent of those areas?*
  - *What is the statistical upper bound of concentration (MEC/acre) in areas outside of the concentrated munitions use areas?*
  - *What type of MEC are potentially present and what is the nature of those items in terms of explosive hazards?*
  - *Is there a potential for contaminant movement (e.g., due to currents, storm events)?*
  - *What are the receptors at the site and what are the activities that may result in interaction with MEC?*

Project Goals (continued)

- *Use this information to revise the CSM and determine if MEC exposure pathways for humans are complete.*
- *General Response Actions:*
  - *No Further Action*
  - *Source Removal*
  - *Prevent Receptor Interaction with MEC*

Required Information Input Development

- Initial Required Information Inputs (*i.e.,* identify data and information needed to answer study questions):
  - *Data collected during previous activities, such as historical information, previous visual survey findings, anomaly locations, and MEC/munitions debris (MD) locations prior to removal*
  - *Results of visual observations within transects and in grids*
  - *Analog (anomaly location) or digital (instrument response and anomaly location) geophysical data*
  - *Results of intrusive investigation of identified anomalies*
  - *Survey of site receptors and land use(s)*

Required Information Inputs (continued)

- Factors that should be addressed:
  - Add oceanographic data to help in this investigation (*e.g.,* currents, tides, sediment transport, storm frequency, etc.).
  - This information will be important in the Feasibility Study when discussing fate and transport.
  - Regarding "Survey of site receptors and land use(s)," include how receptors are accessing the site and using the site.

Required Information Inputs (continued)

- Refined Required Information Inputs:
  - *Data collected during previous activities, such as historical information, previous visual survey findings, anomaly locations, and MEC/MD locations prior to removal*
  - *Oceanographic data, such as bathymetric and side scan sonar (SSS) data*
  - *Results of visual observations within transects and in grids located on land and/or in shallow water*
  - *Analog (anomaly location) or digital (instrument response and anomaly location) geophysical data*

Required Information Inputs (continued)

- *Results of intrusive investigation of identified anomalies*
- *Survey of site receptors who access the site via boat and use the land for either recreational activities or ecological monitoring*

- Additional factors to consider:
  - In addition to oceanographic data (*i.e.,* bathymetric/SSS data), recommend adding studies documenting currents, sediment deposition/erosion, and storms/hurricanes.

Required Information Inputs (continued)

- Further Refined Required Information Inputs:
  - *Data collected during previous activities, such as historical information, previous visual survey findings, anomaly locations, and MEC/MD locations prior to removal*
  - *Oceanographic data, such as bathymetric and SSS data, and existing studies documenting currents, sediment deposition and erosion, and frequency of storms/hurricanes in the vicinity of the project site*
  - *Results of visual observations within transects and in grids located on land and/or in shallow water*

Required Information Inputs (continued)

- *Analog (anomaly location) or digital (instrument response and anomaly location) geophysical data*
- *Results of intrusive investigation of identified anomalies*
- *Survey of site receptors who access the site via boat and use the land for either recreational activities or ecological monitoring*
- *Boundary for public education based on the nature and extent of MEC, if present, and the survey of site receptors and uses*

Input Boundaries Development

- Initial Input Boundaries (*i.e.,* specify the target population and define spatial limits):
  - *The horizontal input boundary is the RI/FS investigation area.*
  - *The horizontal boundary of the investigation will be extended if MEC is found at the investigation area boundary.*
  - *The vertical extent of the investigation will be the maximum instrument detection depth or a maximum depth of intrusive investigations of 4 feet below sand/sediment surface.*

Input Boundaries (continued)

- *Constraints: Weather, wind, tides, currents, underwater visibility, sea turtle nesting and beach nesting birds from May to September, and heavier public use periods in March/April.*

- Factors that should be addressed:
  - Include identifying the boundary for public education (if that is a chosen remedy). *See Information Inputs for how DQO details were added to address this consideration.*

Input Boundaries (continued)

- Additional factors to consider:
  - Define the horizontal input boundary in specific terms (e.g., FUDS boundary, MRS boundary), or at least reference a figure to eliminate any ambiguity.
  - For the vertical extent of the investigation, specify whether it will be the lesser of the two depths referenced (i.e., instrument detection depth or planned depth of intrusive investigation).

Input Boundaries (continued)

- Further Refined Required Information Inputs:
  - *The horizontal input boundary is the RI/FS investigation area shown on Figure B-2, included in Appendix B to the QAPP.*
  - *The horizontal boundary of the investigation will be extended if MEC is found at the investigation area boundary.*
  - *The vertical extent of the investigation will be the lesser of the maximum instrument detection depth or 4 feet which is the planned maximum depth of intrusive investigation below the sand/sediment surface.*

Input Boundaries (continued)

- *Constraints: Weather, wind, tides, currents, underwater visibility, sea turtle nesting and beach nesting birds from May to September, and heavier public use periods in March/April.*

Additional DQO Suggestions

- Analytical Approach:
  - Use if/then statements aimed at identifying when enough data has been collected and that it is of sufficient quality.
  - Describe the logic if nothing is found during the investigation? If we can't say there is nothing there even if we don't find anything, then one could question the purpose of doing any investigation at all.
  - What will the historical finds be used to show?
  - Include a decision rule for step-outs.
  - Define allowable data gaps – not just horizontally, consider vertical data gaps too.

Additional Suggestions (continued)

- Be careful how UXO estimator data is presented – it is a statistical upper bound, not an actual density. Use qualitative data to better estimate where we are within the range.

- Performance Criteria
  - Consider criteria regarding blind seeds.
  - Make sure to provide a reference for the measurement quality objectives.
  - Include what will happen if the project's measurement quality objectives are not met.

Additional Suggestions (continued)

- Plan for Obtaining Data:
  - Define amount of data and parameters. For example: the amount and spacing of geophysical transects will be designed to achieve what level of confidence of what interval/radius?
  - The amount of data and parameters should relate to the design criteria selected.
  - Make sure the plan supports the primary assumptions of the methods planned – if using statistical tools, random selection is critical.
  - Support selection of the technology by defining data gaps and how they will be handled.
  - Avoid using subjective terms in DQOs. Define terms, such as "inaccessible" or "sufficient."

Questions?

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