Appendix N
Sampling and Analysis Plan
Vernal Pool Sampling and Monitoring

Draft Final
Sampling and Analysis Plan
Vernal Pool Sampling and Monitoring
Munitions Response Site 16
Former Fort Ord, California

Total Environmental Restoration Contract
Contract No. DACW05-96-D-0011
Task Order No. 016

Submitted to:
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Approved by: **Signature on File** Date: _____
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List of Acronyms and Abbreviations

Army	U.S. Department of the Army
CTS	California Tiger Salamander
DQO	data quality objective
EPA	Environmental Protection Agency
MRS	Munitions Response Site
QC	quality control
SAP	sampling and analysis plan
SQP/SOP	Standard Quality Procedure/Standard Operating Procedure

1.0 Introduction

This sampling and analysis plan (SAP) describes the methods and procedures for the sampling of a vernal pool associated with the prescribed burning of Munitions Response Site (MRS) -16. Vernal pools are dry most of the year and fill with the winter rains. Despite being dry most of the year, they serve as critical habitat for the threatened California Tiger Salamander (CTS) which requires seasonal ponds, or vernal pools, for successful breeding. The species breeds during the winter rainy season, but spends the majority of the year in underground refuges, primarily small mammal burrows, in grassland or oak woodland habitat. Figure 1-1 shows the location of MRS-16 and the vernal pool that will be sampled.

The MRS-16 project will involve activities associated with a prescribed burn, and a munitions response that will be conducted to remove Munitions and Explosives of Concern in this area. This SAP was prepared for the U.S. Department of the Army (Army) by Shaw Environmental, Inc. (formerly IT Corporation) under the Total Environmental Restoration Contract II No. DACW05-96-D-0011.

The sampling and monitoring presented herein is in accordance with the requirements of the *Biological Opinion, Cleanup and Reuse of Former Fort Ord, Monterey County, California, as it affects California Tiger Salamander and Critical Habitat for Contra Costa Goldfields (1-8-04-F-25R)* (USFWS, 2005) (Biological Opinion).

2.0 Sampling and Analysis

Samples will be collected following the requirements presented in the Standard Quality Procedures and Standard Operating Procedures Manual (SQP/SOP) (Shaw, 2003). Samples will be analyzed per the requirements of this SAP. Water samples will be collected from the vernal pool before and after the prescribed burn. Additional samples may be collected at the direction of the Army, Shaw Project Manager or quality control (QC) personnel.

2.1 Data Quality Objectives

Data generated from the sampling and analysis activities for this project will be verified against established data quality objectives (DQOs) to determine if the data are of sufficient quality to be used in meeting the primary end-use requirements.

The DQO process consists of the seven steps outlined below:

- State the problem
- Identify the decisions
- Identify inputs to decisions
- Define the study boundaries
- Develop decision rules
- Specify tolerable limits on decision errors
- Optimize investigation design for obtaining data.

2.1.1 Data Quality Objectives for Foam Retardant and Water Quality Sampling

This section presents the DQOs associated with the sampling of the vernal pool that is to be conducted to determine whether water has been impacted from the prescribed burning activities at MRS-16.

State the Problem

The deployment of foams or fire retardants at prescribed burn boundaries may injure or kill CTS through direct contact or contamination of their breeding sites. In addition, the increases in ash and sedimentation may affect CTS breeding habitat. Pre-burn, and post-burn water quality conditions need to be quantified to determine if a vernal pool adjacent to MRS-16 is affected by the prescribed burn activities.

Identify the Decisions

The primary decision is based on the analytical results obtained from vernal pond samples that will be collected from an area adjacent to MRS-16. The actions that could result from this

decision are that an assessment of the potential impact may or may not occur depending upon the differences in the pre-burn, and post-burn analytical results.

Identify Inputs to Decisions

To resolve the decision statement, analytical measurements are needed to verify the concentrations of ammonium and total phosphate (primary constituents Fire-Trol® LCA-F fire retardant), alpha-olefin sulfonate (primary constituent of Phos-Chek® WD881 foam retardant), along with pH and turbidity. Samples will be analyzed in the laboratory for ammonium using U.S. Environmental Protection Agency (EPA) 350.2, Nitrogen, Ammonia (Colorimetric, Titrimetric, Potentiometric Distillation Procedure) (EPA, 1974), total phosphate using EPA 365.2, Phosphorous, All Forms (Colorimetric, Ascorbic Acid, Single Reagent) (EPA, 1971a), alpha-olefin sulfonate using EPA 425.1, Methylene Blue Active Substances (EPA, 1971b), pH using EPA 150.1, pH (Electrometric) (EPA, 1982), and turbidity using EPA 180.1, Determination of Turbidity by Nephelometry (EPA, 1993). Pre-burn water results will be compared against post-burn water results to assess any potential impact.

Sampling will be performed per the requirements the Biological Opinion (USFWS, 2005). The sampling approach is discussed in Section 2.2.1.

Define Study Boundaries

The spatial boundaries are limited the vernal pond located to the northeast of MRS-16 (Figure 1-1). Samples are collected within this vernal pond as discussed in Section 2.2.1.

The key temporal requirement is that water sampling must occur no sooner 24 hours after a storm event (defined as 0.5 inches of rain within a 24-hour period). In addition, the monitoring period will span from the first significant rainstorm of the rainy season (0.5 inches of rain or greater) until the rainy season ends (defined as March 30).

Develop Decision Rules

Results from water samples are required to make decisions on whether the pond has been potentially impacted from the prescribed burn activities. The decision rules relate to whether or not an impact exists and are outlined below:

- If a comparison of the pre-burn and post-burn water sample results shows a significant difference then an assessment will be made on the potential impact to the pond and CTS; or
- If a comparison of the pre-burn and post-burn water sample results shows no significant difference then it will be assumed that the prescribed burn activities have had no affect on the water quality of the pond.

Specify Tolerable Limits on Decision Errors

Since decisions are predominantly based on analytical data, decision errors may result from the limits of the analyses. To limit decision errors, analytical method requirements have been established. Sampling and analysis will follow established standard operating procedures, and approved methods, respectively.

Optimize Design for Obtaining Data

Water sampling requirements are presented in Section 2.2.1.

2.2 Sampling Method Requirements

Water samples will be collected in accordance with the SQP/SOP (Shaw, 2003). Applicable SOPs are as follows:

SOP No.	SOP Title
1.1	Chain of Custody
2.1	Sample Handling, Packaging, and Shipping
3.1	Surface and Subsurface Soil Sampling
6.1	Sampling Equipment and Well Material Decontamination
17.1	Sample Labeling
17.2	Sample Numbering
18.1	Field QC Sampling
19.1	Onsite Sample Storage

The following table describes the samples that will be collected:

Sample Type	Sample Numbers	Sample	Analytes
Pre-burn pond samples	1 discrete sample1, from approximate midpool/ middepth	350.2, 365.2, 425.1, 150.1, and 180.1	Ammonia, Phosphorous, MBAS, pH and Turbidity
Post-burn pond samples	1 discrete sample1, from approximate midpool/ middepth	350.2, 365.2, 425.1, 150.1, and 180.1	Ammonia, Phosphorous, MBAS, pH and Turbidity

Samples will be sent to Applied Physics and Chemistry Laboratory, Chino, California, for analysis.

2.2.1 Vernal Pool Analytical Samples

Samples will be collected for analysis when the vernal pool is inundated after the initial fall flush storms, no sooner than 24 hours after a storm event. The monitoring period will span from the

first significant rainstorm [defined as 0.5 inches of rain (or greater) within a 24-hour period] until the rainy season ends. A total of two sampling events shall occur; one pre-burn and one post-burn event. Both sampling events shall occur after there is sufficient water in the vernal pool to collect a representative sample.

Since vernal pools are only temporary, the vernal pool will be closely monitored to determine the most appropriate time to collect samples (i.e., when the depth of the pond is sufficient to collect water samples). It is expected that the first rains of the fall will slowly saturate the soil; eventually the pool will start to collect sufficient water for sampling. Pre-burn, and post-burn water samples will be collected from the same pond conditions to the extent practicable.

During each sampling event, one sample will be collected approximately at midpool/middepth.

2.2.2 Vernal Pool Monitoring

During water quality parameter sampling, the area of ponding will be measured as feasible using a global positioning system (Trimble or equivalent). In addition, photographs will be taken of the pond to show the current conditions for comparability to pre- and post-burn sampling events.

2.2.3 Foam Retardant Use

If foam retardants are not used during prescribed burn activities, then the post-burn vernal pool sample will not be required. If foam retardants are used during prescribed burn activities in order to contain a fire escape, a post-burn vernal pool sample will be collected, and the area where foam retardant is used will be delineated using Global Positioning System for potential future monitoring requirements.

2.3 Analytical Method Requirements

Water samples will be analyzed for the parameters and the following EPA approved analytical methods:

Parameter	EPA Method
Ammonia	350.2
Total Phosphorous	365.2
Methylene Blue Active Substances	425.1
pH	150.1
Turbidity	180.1

It should be noted that the analysis for alpha olefin sulfonate surfactants (primary constituents of Phos-Chek® WD881) by EPA Method 425.1 will not differentiate between linear alkyl sulfonate and alkyl benzene sulfonate or other isomers of these types of compounds.

Samples will be analyzed per the requirements of the following tables:

- Table 2-1 Sample Container, Preservation, Holding Time, and Storage Requirements;
- Table 2-2 Analytical Methods, Parameters for Analysis, and Practical Quantitation Limits
- Table 2-3 Precision and Accuracy Goals
- Table 2-4 Summary of Laboratory Corrective Actions
- Table 2-5 Summary of Laboratory Calibration Procedures
- Table 2-6 Summary of Laboratory Quality Control Requirements

3.0 References

U.S. Environmental Protection Agency (EPA), 1971a, *Method 365.2, Phosphorous, All Forms (Colorimetric, Ascorbic Acid, Single Reagent)*

EPA, 1971b, *Method* 425.1, *Methylene Blue Active Substances (MBAS)*

EPA, 1974, *Method 350.2, Nitrogen, Ammonia (Colorimetric, Titrimetric, Potentiometric Distillation Procedure)*

EPA, 1982, *Method* 150.1, *pH (Electrometric)*

EPA, 1993, *Method 180.1, Determination of Turbidity by Nephelometry*

Shaw Environmental, Inc. (Shaw), 2003a, *Standard Quality Procedures and Standard Operating Procedures Manual*

U.S. Fish and Wildlife Service (USFWS), 2005, *Cleanup and Reuse of Former Fort Ord, Monterey County, California, as it affects California Tiger Salamander and Critical Habitat for Contra Costa Goldfields (1-8-04-F-25R)*

Tables

Table 2-1

Sample Container, Preservation, Holding Time, and Storage Requirements

Method Number	Parameters	Matrix	Holding Time (from collection date)	Field Containers	Preservative	
350.2	Ammonia	water	analysis - 28 days	1 L plastic	Store at 4 deg C, pH<2 with H2SO4	
365.2	Phosphorous (total)	water	analysis - 28 days		Store at 4 deg C, pH<2 with H2SO4	
425.1	Methylene Blue Active Substances	water	analysis - 48 hours	500 mL plastic	Store at 4 deg C	
150.1	pH	water	analysis - 24 hours		Store at 4 deg C	
180.1	Turbidity	water	analysis - 48 hours		Store at 4 deg C	

Table 2-2

Analytical Methods, Parameters for Analysis, and Practical Quantitation Limits

Method and Parameters	Practical Quantitation Limit
	Water (mg/L)
EPA Method 350.2	
Ammonia	0.2
EPA Method 365.2	
Phosphorus-P (Total)	0.1
EPA Method 425.1	
Methylene Blue Active Substances	0.1
EPA Method 150.1	
(PQL in pH units)	+/- 0.01
EPA Method 180.1	
Turbidity	0.1
(PQL in NTU units)	

Table 2-3

Precision and Accuracy Goals

Method and Parameters	Laboratory Control Sample		Matrix Spike/Matrix Spike Duplicate		Lab Duplicate	Field Duplicate
	Lab Control Limit	Rejection Criteria	Lab Control Limit	Rejection Criteria	Lab Control Limit	Advisory Limit**
	Water %	Water %	Water %	Water %	Water RPD	Water RPD
EPA Method 350.2						
Ammonia	80-120	<30	75-125	<30	20	35
EPA Method 365.2						
Phosphorus-P (Total)	80-120	<30	75-125	<30	20	35
EPA Method 425.1						
Methylene Blue Active Substances	80-120	<30	75-125	<30	20	35
EPA Method 150.1						
pH (in pH units)	+/- 0.2	+/- 0.4	NA	+/- 0.4	20	35
EPA Method 180.1						
Turbidity (in NTU)	80-120	<30	NA	NA	20	35

Table 2-4

Summary of Laboratory Corrective Actions

QA/QC Parameter Out of Control	Corrective Action
Sample Handling (includes preservation and storage temperature)	(1) Do not proceed with analysis. (2) Contact Project Chemist immediately for instruction on how to proceed. (3) Analyze samples if so instructed. (4) Collect new samples (if needed).
Holding Times	(1) Do not proceed with analysis. (2) Contact Project Chemist immediately for instruction on how to proceed. (3) Analyze samples if so instructed. (4) Collect new samples (if needed).
Initial Calibration	(1) Evaluate system. (2) Recalibrate as necessary. (3) Analyze samples only after initial calibration is acceptable.
Continuing Calibration	(1) Evaluate system. (2) Reanalyze standard. (3) Recalibrate as necessary. (4) Reanalyze all project samples back to last passing CCV.
Method Blank	(1) If analytes not detected in samples, no action. If detects, proceed to (2) (2) Evaluate system. (3) Reextract and reanalyze method blank and associated samples within holding time requirements (4) Analyze samples only after method blank is acceptable.
LCS recovery	(1) Evaluate system. (2) Reextract and reanalyze LCS and associated samples within the holding time. (3) Report sample data only after LCS is acceptable.
MS/MSD recovery and RPD	(1) Evaluate system. (2) Reanalyze MS/MSD. If acceptable, report acceptable data only. (3) If unacceptable, reextract and reanalyze MS/MSD and report both sets of MS/MSD data.
Matrix Duplicate RPD	(1) Evaluate system. (2) Reanalyze matrix duplicate. If acceptable, report acceptable data only. (3) If unacceptable, reextract and reanalyze matrix duplicate and report both sets of matrix duplicate data.

Table 2-5

Summary of Laboratory Calibration Procedures

Method Number	Parameters	Calibration[1]	Frequency	Acceptance Criteria	Corrective Action
350.2	Ammonia	Continuing calibration check standard	Every 10 injections and at beginning and end of sequence	80-120% recovery	(1) Evaluate system (2) Reanalyze standard (3) Recalibrate as necessary (4) Reanalyze affected samples
365.2	Phosphorous-P (Total)	Continuing calibration check standard	Every 10 injections and at beginning and end of sequence	80-120% recovery	(1) Evaluate system (2) Reanalyze standard (3) Recalibrate as necessary (4) Reanalyze affected samples
425.1	Methylene Blue Active Substances	Continuing calibration check standard	Every 10 injections and at beginning and end of sequence	80-120% recovery	(1) Evaluate system (2) Reanalyze standard (3) Recalibrate as necessary (4) Reanalyze affected samples
150.1	pH	NA	NA	NA	NA
180.1	Turbidity	NA	NA	NA	NA

Notes:

[1] The low standard must be analyzed at the PQL. The initial calibration verification (ICV) and second source continuing calibration verification (CCV) standards must be run daily prior to analysis. The sensitivity of each method shall be demonstrated quarterly by analyzing the MDL check sample, or annually via an MDL study.

NA = Not applicable.

Table 2-6

Summary of Laboratory Quality Control Requirements

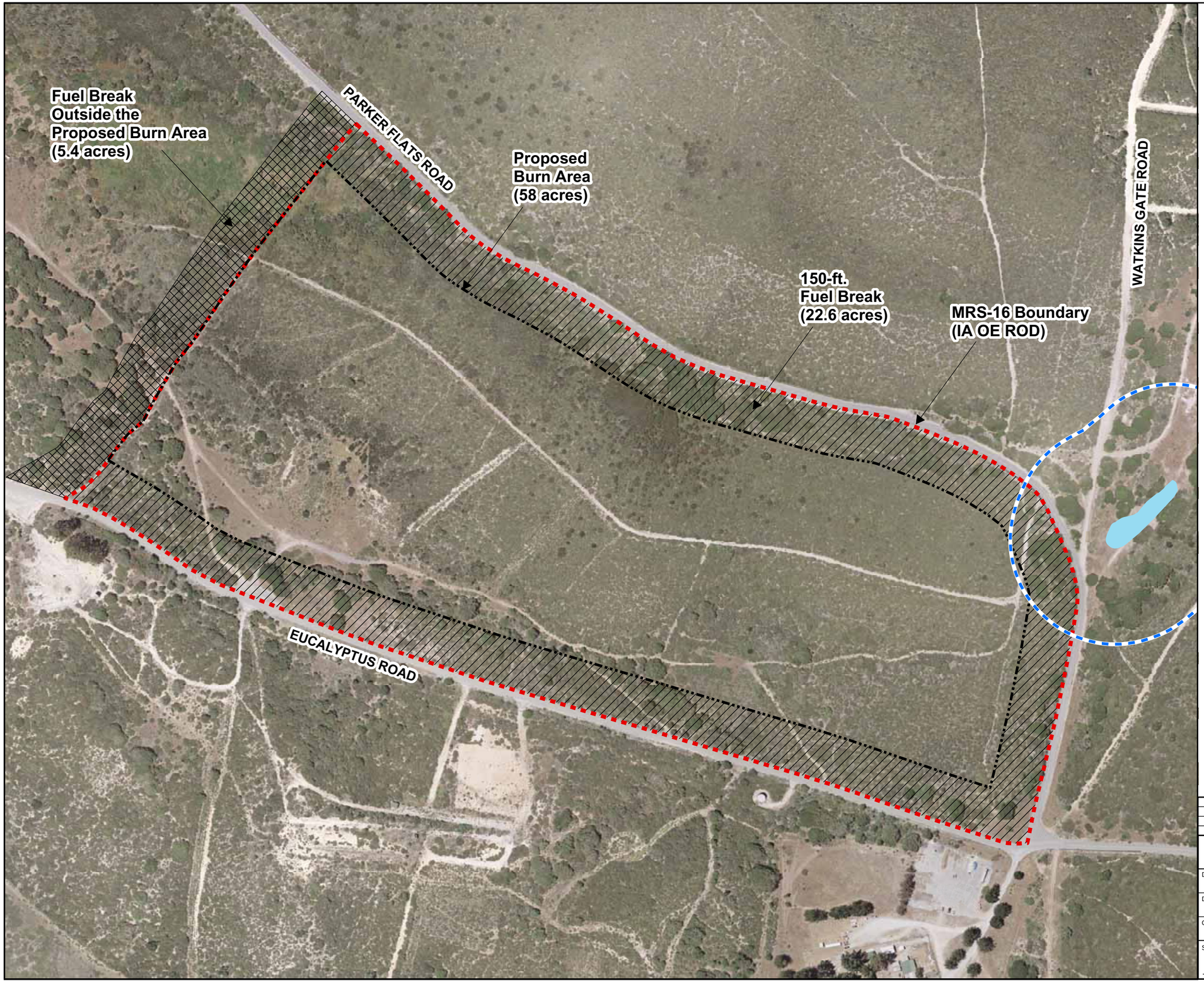
Method Number	Parameters	Method Blanks	Matrix Duplicate	Laboratory Control Sample	Matrix Spike/ Matrix Spike Duplicate[1]
350.2	Ammonia	1 per analytical batch[2]	1 per 10 samples	1 per analytical batch[2]	1 per 10 samples
365.2	Phosphorous	1 per analytical batch[2]	1 per 10 samples	1 per analytical batch[2]	1 per 10 samples
425.1	Methylene Blue Active Substances	1 per analytical batch[2]	1 per 10 samples	1 per analytical batch[2]	1 per 10 samples
150.1	pH	1 per analytical batch[2]	1 per 10 samples	1 per analytical batch[2]	Not applicable
180.1	Turbidity	1 per analytical batch[2]	1 per 10 samples	1 per analytical batch[2]	Not applicable

Notes:

[1] If matrix affects are observed, a post digestion spike, or method of standard additions may be performed depending upon the method. The post digestion spike and method of standard additions frequency is as needed for samples with suspected or confirmed matrix effects.

[2] Analytical batch is defined as a discrete group of 20 or fewer samples extracted and analyzed together by the laboratory.

Figures



LEGEND

- MRS 16 Boundary
- Proposed Burn Area
- Fuel Break Area
- Fuel Break Outside the Proposed Burn Area due to MEC
- Vernal Pool
- 300-ft Buffer from Vernal Pool

3

0 300 600

Feet

REVISION	DATE	DESCRIPTION	CHKD	APPR

Shaw Shaw Environmental, Inc.

Department of the Army
Sacramento District, Corps of Engineers
Sacramento, California

DESIGNED: E. SCHMIDT
DRAWN: K. BLACK
CHECKED: P. KELSALL

FIGURE 1

MRS 16 AND VERNAL POOL LOCATION

FORMER FORT ORD, CALIFORNIA

SUBMITTED: _____ DATE _____

SCALE: SPEC. No.

SHEET FILE No. MRS16_vernalpool.mxd