Draft

Work Plan/Field Sampling and Analysis Plan

Supplemental Sampling for NDMA and PCB Congeners

Santa Susana Field Laboratory

Ventura County, California

Prepared for:

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I certify that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted.
Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete.

Prepared by: _____ 10/20/11
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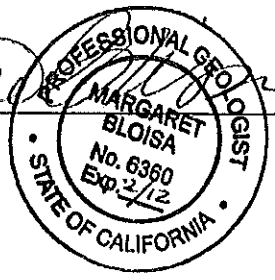

Approved by: _____ 10/20/11
John Wondolleck
CDM Project Manager
Date

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Acronyms and Abbreviations

°C	degrees Celsius
ASTM	American Society for Testing and Materials
bgs	below ground surface
Boeing	The Boeing Company
CAR	corrective action request
CDM	CDM Federal Programs Corporation
COC	chain of custody
DOE	Department of Energy
DL	detection limit
DQO	data quality objective
DTSC	Department of Toxic Substances Control
EDD	electronic data deliverable
ELAP	Environmental Laboratory Accreditation Program
EPA	United States Environmental Protection Agency
ETEC	Energy Technology Engineering Center
FSAP	field sampling and analysis plan
HAZWOPER	Hazardous Waste Operations and Emergency Response
IDW	investigative derived waste
LCS	laboratory control sample
LCSD	laboratory control sample duplicate
MRL	method reporting limit
MS	matrix spike
MSD	matrix spike duplicate
NASA	National Aeronautics and Space Administration
NDMA	n-Nitrosodimethylamine
NELAP	National Environmental Laboratory Accreditation Program
ng/kg	nanograms per kilogram
OPR	ongoing precision and recovery
PARCCS	precision, accuracy, representativeness, completeness, comparability, and sensitivity
PCB	polychlorinated biphenyl
QA	quality assurance
QAPP	quality assurance project plan
QC	quality control
%R	percent recovery
RCRA	Resource Conservation and Recovery Program
RFI	RCRA Facility Investigation
RPD	relative percent difference
SAP	sampling and analysis plan
SSFL	Santa Susana Field Laboratory

Section 1
Introduction

1.1 Overview of the Work Plan/FSAP

This combined Work Plan/Field Sampling and Analysis Plan (FSAP) addresses the field sampling, analytical, quality control, and data review procedures for the collection and analysis of soil samples to evaluate the potential for n-Nitrosodimethylamine (NDMA) and congeners of polychlorinated biphenyls (PCBs) to be present at extremely low concentrations in environmental samples due to either field and laboratory analytical sampling protocols or their presence in soil typical of that found at the Santa Susana Field Laboratory (SSFL).

Recent sampling of soil from Area IV at SSFL and chemical analyses of that soil using U.S. Environmental Protection Agency (EPA) Method 1625C shows low concentrations (parts per trillion [ppt]) of NDMA. There is a need to determine whether the NDMA detections are related to site activities, reflect ambient soil conditions, or are an artifact of sampling and analytical activities.

PCBs have been a commonly detected contaminant in soils collected from within Area IV and have been predominantly analyzed using EPA Method 8082 which reports PCBs as Aroclor mixtures. Toxicologists at the California Department of Toxic Substances Control (DTSC) have indicated the potential that PCBs may need to be analyzed for their congener constituents. However, specific data quality objectives for this type of analysis are still being developed and at this time it is not known whether the congener analysis will be required for Area IV soil samples. PCB congener analysis is also performed to a ppt level. Because PCBs were a ubiquitously used industrial chemical during the 1950s through 1970s (the most active period of operations at SSFL), and were released into the atmosphere world-wide, there is a potential for PCB congeners to be present at a “background” level at SSFL. Because of the long holding time for PCB analysis (365 days), soil samples will be held (frozen) by the analytical laboratory until a determination on PCB congener analysis is made.

DTSC is presently engaged in conducting a soil background study for selected metals and organic chemicals (DTSC 2011) at two chemical soil background reference areas (CBRAs) located approximately 4 miles west of SSFL. As discussed by DTSC in its Sampling and Analysis Plan (DTSC 2011) for the chemical soil background study, these locations are situated far enough away from SSFL such that potential impacts from SSFL operations are expected to be very minimal or even non-existent and would, therefore, be representative of ambient soil conditions.

Utilizing DTSC’s background study and sample location rationale, CDM Federal Programs Corporation (CDM), on behalf of the Department of Energy (DOE), will collect soil samples separately from DTSC at approximately 40 of the DTSC sample locations in the China Flat CBRA. Since soils at both the China Flat CBRA and Area

IV at SSFL are developed above the Chatsworth Formation, the geology and soil types of the proposed sample locations are considered to be similar enough that concentrations of NDMA and PCB congeners detected in samples collected from the China Flat CBRA may be considered representative of ambient NDMA and PCB congener soil concentrations at Area IV.

The soil samples will be analyzed for NDMA using EPA Method 1625C. Analysis of PCB congeners, using EPA Method 1668B, will be put on hold until PCB congener sampling data quality objectives are finalized.

CDM will be responsible for collection of soil samples in stainless steel sleeves, followed by preparation and shipment of the soil samples to Lancaster Laboratory Inc., a DTSC-approved laboratory. Analysis of NDMA will be performed by Lancaster Laboratories, Inc. Lancaster Laboratories will hold the unused portions of soil samples in cold storage [frozen] until data quality objectives for PCB congener analysis are finalized. Soil samples for PCB analysis can be held for 365 days when properly stored.

This Work Plan/FSAP addresses the management and quality control procedures for collection of the co-located soil samples for chemical analyses at the China Flat CBRA. This work effort adopts the Quality Assurance Project Plan (QAPP) that has been developed for the SSFL Resource Conservation and Recovery Act (RCRA) Field Investigation (RFI) program being administered by DTSC (MEC^X 2009). Therefore, a separate QAPP will not be developed for this co-located sampling effort.

1.2 Site Location and Description

The SSFL is located in southeastern Ventura County, California, and has an area of approximately 1,153 hectares (2,850 acres) near Simi Valley. The SSFL is separated into four administrative areas. The Boeing Company (Boeing) owns most of Area I, except for 42 acres that are owned by the federal government and administered by the National Aeronautics and Space Administration (NASA). Area II is also owned by the federal government and administered by NASA. The NASA portions are operated by Boeing. Boeing owns and operates Areas III and IV. The SSFL facility includes, within Area IV, a specific operational area that was dedicated to the development and testing of components used in metallic sodium systems that was a part of the federal government's Energy Technology Engineering Center (ETEC). Areas I, II, and III were used by predecessors of Boeing, NASA, and the Department of Defense for rocket engine and laser testing. Environmental contamination resulting from activities in Areas I, II, and III is the responsibility of Boeing and NASA. DOE was and remains responsible for operation of the ETEC located in Area IV.

From the mid-1950s until the mid-1990s, DOE and its predecessor agencies were engaged in or sponsored nuclear research operations including the development, fabrication, disassembly, and examination of nuclear reactors, reactor fuel, and other radioactive materials. Associated experiments included large-scale liquid sodium metal testing for fast breeder reactor components. Nuclear operations at ETEC

included 10 nuclear research reactors, seven critical facilities, the Hot Laboratory, the Nuclear Materials Development Facility, the Radioactive Materials Handling Facility, and various test and radioactive material storage areas. In addition to the handling and processing of radioactive materials, these DOE facilities also used non-radioactive chemicals, a variety of specialty metals, and other hazardous materials (e.g., PCBs, solvents, and lead-based paints) in their operations.

All nuclear research in Area IV was terminated in 1988 when DOE shifted its focus at SSFL from research to decontamination and decommissioning activities. Decontamination and decommissioning of the sodium test facilities started in 1996, when DOE determined that the entire ETEC facility was surplus to its mission. At that time, DOE began formal closure of its facilities in Area IV and began cleanup activities in preparation for return of the property to Boeing. DOE discontinued decontamination and demolition of the remaining facilities in 2008, but has continued surveillance, maintenance, monitoring and investigation activities. This includes investigation of soil and groundwater, as required under the DTSC RFI and the EPA radiological investigation programs.

1.3 Purpose of Supplemental NDMA and PCB Congener Co-Located Soil Sampling

The purpose of collecting chemical data for NDMA and PCB congeners co-located with DTSC's chemical background sampling sites is to evaluate the potential for an origin of NDMA and PCBs in soil from sources other than activities at SSFL. This information is necessary to support characterization and cleanup decisions relative to these chemicals. This co-located soil sampling plan presents an efficient and effective means for evaluating the potential presence of these chemicals within an off-site area chosen by DTSC to represent background for the SSFL site area. First, the planned approach is efficient because DTSC has already selected sample locations and mobilized crews to collect soil samples; co-locating the additional NDMA and PCB congener samples takes advantage of DTSC's planning and site access agreement efforts. Second, the planned co-located analyses are effective because it will provide additional chemical data at the same locations where chemical soil background data are being collected.

1.4 Technical or Regulatory Standards

This FSAP does not establish the final cleanup levels for SSFL. This study is being conducted to assess on-site characterization data. If NDMA and/or PCB congeners are detected in the samples collected as part of this study, the values derived from this study will be used to support additional sampling decisions onsite and data review/validation procedure requirements.

The sampling is intended as one line of evidence for the evaluation of detections at low concentrations of NDMA and PCB congeners. The primary objective at this stage is to determine or eliminate an ambient presence, an artifact of sampling, and/or

analytical considerations as factors in the reporting of NDMA and PCB congeners at low concentrations in SSFL site soil samples.

1.5 Work Plan/FSAP Organization

This Work Plan/FSAP includes the following sections:

Section 1 Introduction – Summarizes the basis and objectives of the supplemental sampling for NDMA and PCB congeners co-located with DTSC's chemical background study;

Section 2 Project Background – Provides details regarding the basis for the ongoing soil chemical background study by DTSC;

Section 3 Project Organization – Identifies the individuals responsible for implementing the FSAP, their specific responsibilities, and their organizations;

Section 4 Quality Objectives and Rationale – Provides the data quality objectives and their criteria;

Section 5 Sample Design and Rationale – Describes the rationale for DTSC's sample locations, rationale for chemical sample intervals, CDM's soil sampling procedures and intervals, and the management and shipment of soil sample material;

Section 6 Project Task Descriptions – Provides the procedures for conducting sampling, sample containers, labeling, paperwork, sample management, preservation, custody, and shipment to the analytical laboratories;

Section 7 Quality Control Criteria – Describes the analytical methods, and provides a summary of analytical quality control procedures, analytical detection limits, field quality control limits, and analytical quality control limits;

Section 8 Instrument/Equipment and Supplies – Describes all equipment and materials necessary to collect, preserve, package, record, and ship samples;

Section 9 Special Training and Certification – Describes training requirements for field staff, data reviewers and validators, and certifications of analytical laboratories;

Section 10 Documentation and Records – Describes requirements and procedures for documenting all aspects of sample collection, custody, and analytical reporting;

Section 11 Assessment and Oversight – Describes the assessments that will be performed to ensure that all procedures are adhered to, corrective measures are identified, and corrective actions completed;

Section 12 Data Review – Describes the procedures for reviewing field records for accuracy and completeness, verification of analytical records, data validation, and the overall assessment of data quality relative to project objectives and criteria; and

Section 13 References.

Section 2
Purpose of DTSC's Chemical Soil Background Study

The information in this section was taken from the *Final Sampling and Analysis Plan* (SAP)*, Chemical Soil Background Study, Santa Susana Field Laboratory, Ventura County, California* (DTSC 2011).

The purpose of the DTSC chemical soil background study is to establish a regulatory agency-approved, publicly-reviewed, and technically-defensible chemical soil background dataset for SSFL environmental programs. Both Cal-EPA and USEPA regulatory guidance state that a key criterion for the background dataset is site (i.e., SSFL) representativeness (DTSC 1997 and 2008; USEPA 2002a and 2002b). More specifically, these guidance documents state that the background samples should have the same basic characteristics as the site samples (i.e., similar soil depths and soil types) and should be representative of the site's physical, chemical, geological, and biological characteristics (USEPA 2002a). This requires that the SSFL background dataset be developed and used in a manner representative of the range of naturally occurring chemical concentrations that are related to topographical, geological, soil, and biological conditions present at SSFL.

The scope of the DTSC chemical soil background study includes developing the sampling rationale and design, performing sampling and analysis, evaluating data, finalizing the chemical soil background dataset, and reporting the study's results. The DTSC Background Study SAP addresses sampling rationale and design, field sampling activities, laboratory analyses, and quality assurance requirements for the study. DTSC prepared SAP and QAPP addenda (DTSC 2011) that include staked field sampling locations and additional laboratory requirements. DTSC secured, oversees, and directs the services of a separate, qualified, and experienced contractor to help conduct the field study, evaluate the background data, and report the results.

Based, in part, on community and stakeholder input, the planned chemical soil background samples will be collected from CBRAs located as far away as possible from SSFL operational areas while still meeting the other criteria required for the program. Samples will be collected from surface soil, subsurface soil, and ephemeral (typically dry) drainage sediments. Samples will be analyzed for naturally-occurring and regionally-present anthropogenic[1] chemicals. The objective is to collect background soil samples that represent the chemical composition of soil/sediment present at SSFL prior to SSFL operational activities.

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[1] Anthropogenic chemicals are derived from non-site-related human activity (e.g., lead from leaded gasoline along freeways).

It is important to emphasize that the sampling for NDMA and PCB congeners outlined in this WP/FSAP is not to establish a background concentration for either of these chemicals. DOE will utilize DTSC's field event planning and location access to the China Flat CBRA to conduct the field sampling. The purpose of this sampling will be to determine the ambient concentrations, if present, of NDMA and PCB congeners at the China Flat CBRA, which is presumed sufficiently distant from SSFL to have not been affected by former SSFL activities.

Section 3
Project Organization

The roles of all entities engaged in this effort are summarized below.

3.1 Department of Energy

DOE is the lead federal agency with ultimate responsibility for the investigation and cleanup of Area IV. DOE is funding the chemical soil background co-located sampling effort.

3.2 Department of Toxic Substances Control

DTSC is the agency with overall responsibility for ensuring that investigation and cleanup of SSFL is performed to state regulations. DTSC will have responsibility for oversight of field work, analytical laboratory acceptance, review of analytical results, and decisions related to cleanup of all SSFL, including Area IV. DTSC is the lead for conducting the soil chemical background study.

3.3 CDM

CDM is the DOE contractor responsible for collecting soil material at the China Flat CBRA, ensuring that the sample labels are correct and chain-of-custody (COC) paperwork complete, procurement of analytical services, preparation and shipment of samples to the laboratories, oversight of laboratory performance, review of laboratory data reports for completeness, and independent data validation of the results. CDM will also prepare the data report presenting the finding of the background co-located sampling effort. CDM will be assisted in this effort by geologists from MWH. MWH has been observing DTSC/URS sampling activities and has signed an access agreement with the local land-management agency allowing for support vehicles to traverse the main road leading to the China Flat CBRA. MWH personnel will be transporting CDM personnel to and from the project site.

3.4 Subcontractors

Lancaster Laboratories Inc. located in Lancaster, Pennsylvania, has been subcontracted to analyze the soil samples.

3.5 Community

The community was given the opportunity to review DTSC's CBRA selection as part of development of DTSC's SAP. The community has also reviewed CDM's sampling procedures and laboratory selection as part of the Area IV Co-Located Soil Chemical Sampling Program. Procedures in this Work Plan/FSAP are similar to those presented to the community for the Area IV Co-Located Soil Chemical Sampling Program.

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Section 4
Data Quality Objectives and Rationale

The data quality objective (DQO) process is a series of seven planning steps based on the scientific method, designed to specify the type, quantity, and quality of environmental data needed to support defensible decisions based on current conditions and proposed activities at an environmental site (EPA 2006). The EPA seven-step DQO process was used as general guidance during the development of this study's DQOs.

DQOs are qualitative and quantitative statements derived from the outputs of each step of the DQO process that:

- Clarify study objectives;
- Define data needs (type, quality, etc.); and
- Specify acceptable levels of decision errors that will be used as the basis for establishing the quantity and quality of data needed to support the decision.

The derived statements are then used to develop scientific, resource-effective, and defensible sampling designs. The DQO summary table is provided in Table 4-1.

Table 4-1
Data Quality Objectives

PROCESS	RESPONSE
STEP 1 State the problem.	NDMA has been consistently detected in soil samples collected from Area IV at low PPT concentrations. It is not known whether these detections: 1) reflect an ambient presence of this chemical, 2) are the result of sampling procedures, or 3) represent contamination resulting from laboratory procedures. PCBs are common contaminants detected in soil samples collected from within Area IV. PCBs were widely used for industrial operations in the 1950s-1970s that were released into the air, and it is possible that atmospheric deposition of PCBs from remote industrial sources may have resulted in a man-made background concentration for the congeners. It is unknown if PCB congeners may be detected at PPT concentrations due to ambient conditions in off-site soils at established DTSC background locations.
STEP 2 Identify the Goal of the Study.	The specific goal of this soil sampling is to answer the following questions: ▪ Is NDMA detectable in soils at DTSC's China Flat CBRA locations at PPT concentrations? ▪ Is NDMA detected in the SSFL on-site, co-located soil samples an artifact of soil sampling (i.e., from sampling equipment or decontamination fluids)? ▪ Is NDMA detected in the SSFL on-site, co-located soil samples from laboratory procedures, glassware, or blank water contamination? ▪ Are PCB congeners detectable in surface soils at the DTSC's China Flat CBRA locations at PPT concentrations?

Table 4-1
Data Quality Objectives

PROCESS	RESPONSE
STEP 3 Identify Information Inputs	▪ Soil samples will be collected from the DTSC China Flat CBRA locations and analyzed for NDMA and PCB congeners using low-level analytical methods. ▪ Rinsate, source water, clean soil and water trip blanks will be collected and prepared to assess the presence of NDMA only from sources other than ambient soil concentrations. ▪ Additional laboratory and glassware blanks will be analyzed to assess intra-laboratory sources. ▪ Existing SSFL on-site, validated, co-located sampling results for NDMA and PCBs will be used to develop a sampling scope
STEP 4 Define the Boundaries of the Study	The areal boundary of the study is the China Flat CBRA selected by DTSC. The vertical boundary is 5 feet bgs. Samples will be collected from 20 surface and 20 subsurface China Flat CBRA locations that DTSC will also sample.
STEP 5 Develop the Analytic Approach	NDMA will be analyzed by EPA Method 1625C and PCB congeners by EPA Method 1668B. The target MRL for NDMA is 30 nanograms per kilogram (ng/kg). The target MRLs for PCB congeners are shown in Table 7-1. Sufficient soil and quality control samples will be collected to assess the potential sources for the presence of low-level concentrations of NDMA and PCB congeners if detected in China Flat CBRA samples.
STEP 6 Specify Performance or Acceptance Criteria	Analytical data reported by the laboratory will be validated by a third party. Validation will be performed using Level IV protocols (full raw data review). Validated data will be assessed for usability as described in Section 12.4 to ensure that the PARCCS data quality indicators are met. Data assessment and validation will determine if collected data may be used for comparison. In general, it will ensure that: ▪ Appropriate field QC sample procedures were followed; ▪ Deviations were documented and assessed; ▪ Data met applicable criteria; and ▪ Data are usable for the stated project needs. All samples submitted to the analytical laboratory will be analyzed by the accepted EPA methods as defined in Step 5 above. Laboratory achievable MRLs for analytical methods are listed in Table 7-1. Measurement performance criteria for the data are presented in Sections 7.2 and 7.3. If either NDMA or one or more PCB congeners (if analyzed) are detected in a China Flat CBRA soil sample and the results are not due to sampling and/or laboratory procedures (based on review of both field and laboratory QC samples during the validation process), then the validated data will be evaluated to assess the ambient presence of NDMA and PCB congeners. If either NDMA is detected in a China Flat CBRA soil sample and the results are attributed to field sampling procedures based on data review and validation findings, then the offsite data collected will be qualified in accordance with the EPA Function Guidelines for Organic Data Review (see Section 12.4), and field sampling sources of NDMA will be identified and isolated as much as possible, and a corrective action plan will be developed for future sample collection for these compounds. If either NDMA is detected in a China Flat CBRA soil sample and the results are attributed to laboratory procedures based on data review and validation findings, then the offsite data collected will be qualified in accordance with the EPA Function Guidelines for Organic Data Review (see Section 12.4), and laboratory sources of NDMA will be identified and isolated as much as possible. Finally, a corrective action plan will be developed for future laboratory analysis for these compounds. If these chemicals are not detected in China Flat CBRA soil samples, then discussions will continue on the appropriate target MRLs for subsequent analyses and screening of these chemicals.

Table 4-1
Data Quality Objectives

PROCESS	RESPONSE
STEP 7 Develop the Plan for Obtaining Data	Soil samples (and appropriate QC samples; see Section 7.2) will be collected from surface soil and boring locations sited for DTSC's soil chemical background study (see Figure 1). The samples will be collected using a slide impact hammer with a stainless steel sleeve. Based on detections of NDMA in existing, validated co-located sampling results from SSFL HSA 5B and HSA 5C, 40 samples are needed to obtain data from shallow and subsurface soils. This number of samples should be sufficient to assess an ambient presence of the chemicals. Soil samples will be collected as follows: • Surface samples from 10 drainage locations • Surface samples from 10 non-drainage locations • Subsurface samples from 20 non-drainage locations Sample locations will be co-located with DTSC's drainage and non-drainage locations. The surface samples will be collected from the 0 to 0.5 feet bgs interval. The subsurface samples will be collected by hand augering to 5 feet bgs and collecting the sample using the impact hammer with an extension. Soil and water samples will be analyzed by an off-site laboratory for: ▪ NDMA using EPA Method 1625C ▪ PCB congeners using EPA Method 1668B.

Acronyms and Abbreviations:

bgs	=	below ground surface
CBRA	=	chemical background reference area
DTSC	=	California Department of Toxic Substances Control
EPA	=	United States Environmental Protection Agency
MRL	=	method reporting limit
ng/kg	=	nanograms per kilogram
NDMA	=	n-Nitrosodimethylamine
PARCCS	=	precision, accuracy, representativeness, completeness, comparability, and sensitivity
PCB	=	polychlorinated biphenyl
PPT	=	parts per trillion

Section 5
Sample Design and Rationale

This section describes the sampling location rationale and field sampling program to be followed during the performance of the soil sampling for NDMA and PCB congeners. Samples will be collected as described in this section and in accordance with the quality control (QC) criteria in Section 12. The field procedures are designed so that:

- Samples collected are consistent with project objectives; and
- Samples are collected in a manner so that data represent actual SSFL site conditions.

5.1 Sampling Location Rationale

The supplemental soil sampling for NDMA and PCB congeners is being conducted concurrently with DTSC's background soil sampling in order to expedite sampling and to take advantage of DTSC's rationale for selection of soil sample locations (DTSC 2011). The locations proposed for collection of soil samples under DTSC's sampling program at the China Flat CBRA are shown on Figure 5-1. DTSC plans on collecting samples from approximately 105 locations within the China Flat CBRA. DTSC has marked the sample locations and discussed the sampling approach with the community. The 40 China Flat locations to be sampled for NDMA and PCB congeners will be based on the sampling sequence employed by DTSC. CDM will accompany DTSC samplers until the sampling goals (10 non-drainage surface, 10 drainage surface, and 20 subsurface samples) have been met. Table 5-1 provides a summary of information for the background samples to be collected by DTSC.

5.2 Field Sampling Program

The field sampling activities will include surface soil sampling and subsurface soil sampling using a hand auger. Hand augering is needed due to the remote location of the reference site and the requirement from the land owner to minimize surface disturbance. All soil samples will be collected within 6-inch stainless steel sleeves. GPS coordinates for all soil sampling locations will be obtained by URS (DTSC's consultant) upon completion of sampling activities. Investigative derived waste (IDW) disposal activities will be performed by URS and CDM (see Section 6.9).

5.2.1 Soil Sampling Procedure

Each soil sample location will be prepared by removing leaves, grass, and other surface debris. All soil samples will be collected in 6-inch stainless steel sleeves using a slide impact hammer. After removal from the slide hammer, the sleeves will be capped on both ends, labeled, and submitted for analysis. Surface soil samples will be collected from the 0 to 6-inch bgs interval. Forty locations will be sampled by

CDM to access soil at no more than 5 feet bgs. Twenty locations will be sampled for surface soils, and 20 locations will be sampled for subsurface soils.

The general sampling procedure is as follows:

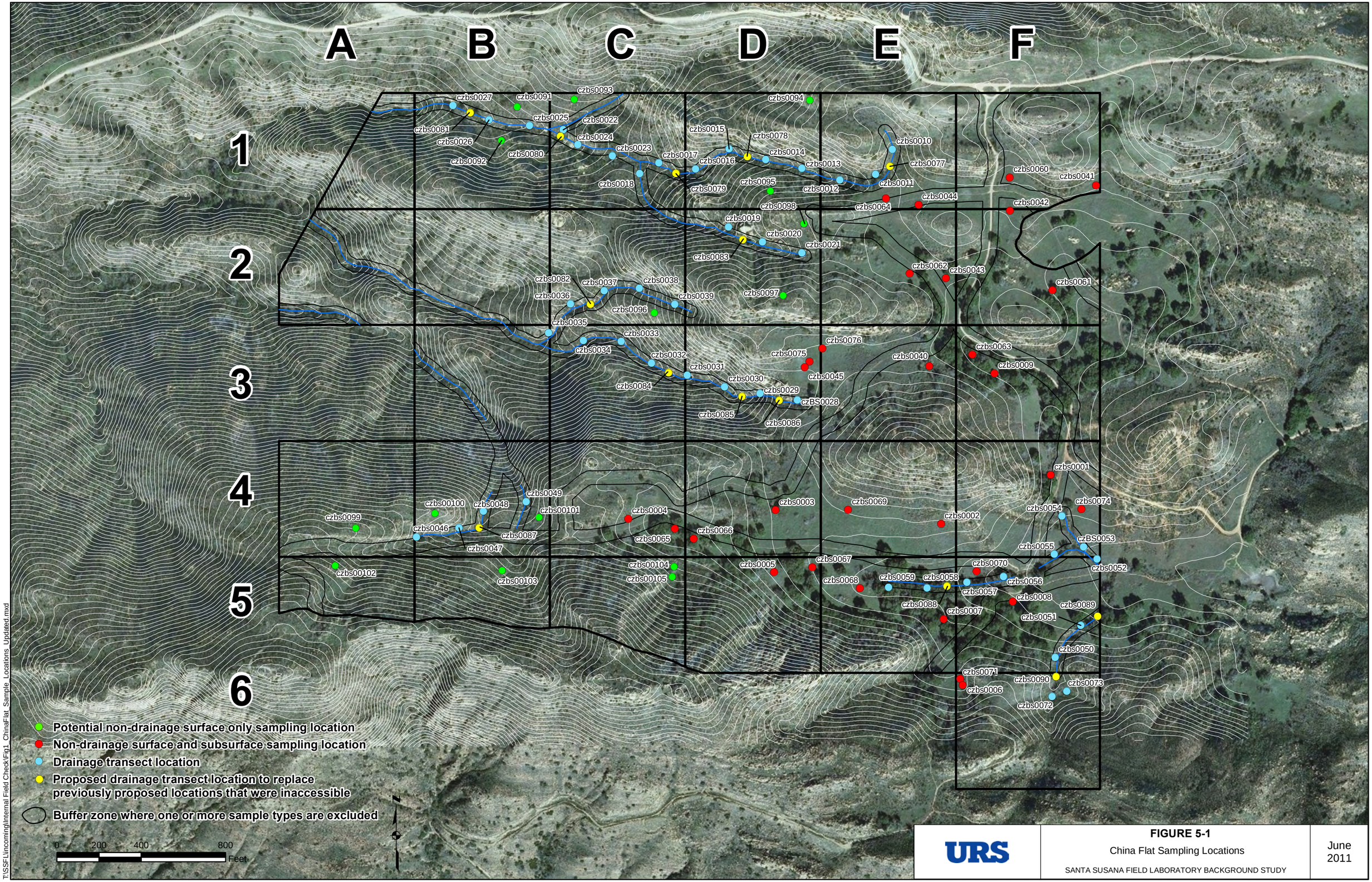
- For surface soils, drive the 2-inch inner diameter slide impact hammer to an approximate 6-inch depth to collect soil in the stainless steel sleeve.
- Retract and disassemble the sampler shoe to remove the sleeve.
- Cap each end of the sleeve.
- Label sleeve with sampling information and place in “Ziploc” baggie.
- Decontaminate sampler shoe.
- Insert clean stainless steel sleeve.
- For sub-surface samples, hand auger to the 5-foot bgs depth and collect soil sample in sleeve using impact hammer with extension.

The borehole will be backfilled with soil cuttings excavated by the hand auger. After completion of the sampling program, CDM will obtain from URS the GPS coordinates for the sample location.

The reader of this FSAP is referred to the DTSC’s SAP (DTSC 2011) for additional details regarding the soil background sampling program.

5.2.2 Chemical Sample Interval Selection

The surface chemical sample interval is 0 to 0.5 feet bgs. All samples will be collected within a 6-inch stainless steel or sleeve using an impact hammer. All samples will be analyzed for NDMA and subsequently analyzed for PCB congeners when associated DQOs are finalized. The subsurface chemical sample interval is 5 to 5.5 feet bgs.



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URS

FIGURE 5-1

China Flat Sampling Locations

SANTA SUSANA FIELD LABORATORY BACKGROUND STUDY

June 2011

TABLE 5-1
CHINA FLAT DTSC SOIL BACKGROUND LOCATIONS

Sample Type	Location	Map Cell	Latitude	Longitude	Easting (feet)	Northing (feet)	Pilot Boring Depth (feet bgs)
Drainage (Surface only)	CZ0010	E1	34°12'41.03"	118°46'16.41"	1766828.22	259783.58	
	CZ0011	E1	34°12'39.86"	118°46'17.35"	1766748.34	259666.39	
	CZ0012	E1	34°12'39.58"	118°46'19.36"	1766578.84	259639.05	
	CZ0013	D1	34°12'40.11"	118°46'21.51"	1766398.65	259694.51	
	CZ0014	D1	34°12'40.52"	118°46'23.56"	1766227.39	259736.43	
	CZ0015	D1	34°12'41"	118°46'25.63"	1766053.72	259786.46	
	CZ0016	D1	34°12'40.04"	118°46'27.51"	1765894.76	259690.90	
	CZ0017	C1	34°12'40.31"	118°46'29.59"	1765720.48	259719.33	
	CZ0018	C1	34°12'39.8"	118°46'30.66"	1765629.86	259668.76	
	CZ0019	D2	34°12'37.33"	118°46'25.63"	1766050.91	259416.06	
	CZ0020	D2	34°12'36.65"	118°46'23.71"	1766211.83	259345.79	
	CZ0021	D2	34°12'36.14"	118°46'21.47"	1766398.97	259293.30	
	CZ0022	C1	34°12'41.84"	118°46'35.01"	1765266.78	259877.42	
	CZ0023	C1	34°12'40.63"	118°46'32.21"	1765500.61	259753.56	
	CZ0024	C1	34°12'41.14"	118°46'34.18"	1765335.77	259806.31	
	CZ0025	B1	34°12'42.02"	118°46'36.91"	1765107.11	259896.85	
	CZ0026	B1	34°12'42.27"	118°46'39.21"	1764914.32	259924.25	
	CZ0027	B1	34°12'42.93"	118°46'41.24"	1764744.04	259992.21	
	CZ0028	D3	34°12'29.23"	118°46'21.66"	1766377.67	258594.84	
	CZ0029	D3	34°12'29.53"	118°46'23.77"	1766200.51	258626.62	
	CZ0030	D3	34°12'29.83"	118°46'25.78"	1766032.47	258657.31	
	CZ0031	D3	34°12'30.37"	118°46'27.9"	1765855.10	258713.48	
	CZ0032	C3	34°12'30.92"	118°46'29.92"	1765685.87	258771.04	
	CZ0033	C3	34°12'31.92"	118°46'31.64"	1765541.83	258872.85	
	CZ0034	C3	34°12'31.95"	118°46'33.78"	1765362.38	258877.58	
	CZ0035	B3	34°12'32.31"	118°46'35.74"	1765197.99	258915.11	
	CZ0036	C2	34°12'33.67"	118°46'34.51"	1765301.98	259051.36	
	CZ0037	C2	34°12'34.31"	118°46'32.62"	1765461.70	259114.65	
	CZ0038	C2	34°12'34.42"	118°46'30.63"	1765628.37	259124.76	
	CZ0039	C2	34°12'33.69"	118°46'28.62"	1765796.41	259049.66	
	CZ0046	B4	34°12'22.67"	118°46'43.12"	1764570.36	257944.84	
	CZ0047	B4	34°12'23.12"	118°46'40.72"	1764771.99	257988.86	
	CZ0048	B4	34°12'23.9"	118°46'39.36"	1764887.56	258067.40	
	CZ0049	B4	34°12'24.37"	118°46'36.95"	1765090.36	258113.54	
	CZ0050	F5	34°12'17.26"	118°46'07"	1767599.70	257374.77	
	CZ0051	F5	34°12'18.77"	118°46'05.57"	1767721.20	257527.22	
	CZ0052	F5	34°12'21.89"	118°46'04.68"	1767798.67	257841.66	
	CZ0053	F4	34°12'22.45"	118°46'05.44"	1767735.24	257898.34	
	CZ0054	F5	34°12'23.89"	118°46'06.68"	1767631.66	258044.68	
	CZ0055	F5	34°12'22.09"	118°46'07.09"	1767595.81	257863.51	
	CZ0056	F5	34°12'21.03"	118°46'09.95"	1767355.35	257757.77	
	CZ0057	F5	34°12'20.75"	118°46'12.02"	1767180.94	257730.70	
	CZ0058	E5	34°12'20.46"	118°46'14.27"	1766991.80	257703.50	
	CZ0059	E5	34°12'20.49"	118°46'16.43"	1766810.10	257707.29	
	CS0072	F6	34°12'15.42"	118°46'07.16"	1767585.35	257188.81	
	CS0073	F6	34°12'15.68"	118°46'06.33"	1767655.01	257214.51	
	CZ0077	E1	34° 12' 40.24"	118° 46' 16.55"	1766815.72	259703.97	
	CZ0078	D1	34° 12' 40.64"	118° 46' 24.6"	1766139.95	259748.89	
	CZ0079	D1	34° 12' 39.84"	118° 46' 28.62"	1765802.06	259670.77	
	CZ0080	D1	34° 12' 41.54"	118° 46' 35.17"	1765253.24	259846.54	
	CZ0081	C1	34° 12' 42.6"	118° 46' 40.27"	1764825.51	259957.86	
	CZ0082	C1	34° 12' 33.66"	118° 46' 33.4"	1765395.82	259049.72	
	CZ0083	D3	34° 12' 36.75"	118° 46' 24.82"	1766118.46	259356.34	
	CZ0084	C3	34° 12' 30.47"	118° 46' 28.95"	1765766.91	258723.57	
	CZ0085	C2	34° 12' 29.39"	118° 46' 24.8"	1766114.56	258612.25	
	CZ0086	C2	34° 12' 29.21"	118° 46' 22.71"	1766290.34	258592.72	

TABLE 5-1
CHINA FLAT DTSC SOIL BACKGROUND LOCATIONS

Sample Type	Location	Map Cell	Latitude	Longitude	Easting (feet)	Northing (feet)	Pilot Boring Depth (feet bgs)
Drainage Surface Only	***CZ0087***	C2	34° 12' 23.13"	118° 46' 39.58"	1764868.48	257989.24	
	CZ0088	F5	34° 12' 20.56"	118° 46' 13.14"	1767087.20	257711.92	
	CZ0089	F5	34° 12' 19.2"	118° 46' 4.62"	1767802.03	257569.35	
	CZ0090	F5	34° 12' 16.35"	118° 46' 6.94"	1767604.77	257282.26	
Non-drainage (surface/ subsurface)	CZ0001	F4	34°12'25.82"	118°46'07.33"	1767578.47	258240.15	6.0
	CZ0002	E4	34°12'23.48"	118°46'13.51"	1767058.32	258007.90	8.7
	CZ0003	D4	34°12'24.06"	118°46'22.85"	1766273.82	258072.94	3.5
	CZ0004	C4	34°12'23.61"	118°46'31.16"	1765575.32	258032.43	3.8
	CZ0005	D5	34°12'21.16"	118°46'22.9"	1766267.35	257779.31	5.0
	CZ0006	F6	34°12'15.92"	118°46'12.2"	1767162.17	257242.75	9.5
	CZ0007	E5	34°12'19.02"	118°46'13.32"	1767070.34	257556.60	5.8
	CZ0008	F5	34°12'19.86"	118°46'09.42"	1767398.84	257639.00	9.3
	CZ0009	F3	34°12'30.56"	118°46'10.54"	1767312.64	258721.29	10.0
	CZ0040	E3	34°12'30.87"	118°46'14.23"	1767002.86	258755.77	9.3
	CZ0041	F1	34°12'39.41"	118°46'04.89"	1767793.93	259612.69	10.0
	CZ0042	F2	34°12'38.2"	118°46'09.74"	1767386.12	259493.89	9.0
	CZ0043	E2	34°12'35.01"	118°46'13.33"	1767081.68	259173.22	6.3
	CZ0044	E1	34°12'38.44"	118°46'14.91"	1766951.70	259521.03	TBD
	CZ0045	D3	34°12'30.77"	118°46'21.26"	1766412.82	258749.98	7.0
	CZ0060	F1	34°12'39.76"	118°46'09.77"	1767384.74	259650.86	10.0
	CZ0061	F2	34°12'34.48"	118°46'07.31"	1767587.10	259115.80	8.8
	CZ0062	E2	34°12'35.2"	118°46'15.39"	1766909.07	259194.15	7.8
	CZ0063	F3	34°12'31.43"	118°46'11.81"	1767207.02	258810.27	6.2
	CZ0064	E1	34°12'38.73"	118°46'16.75"	1766798.01	259551.82	4.0
	CZ0065	C4	34°12'23.16"	118°46'28.53"	1765796.22	257985.71	6.8
	CZ0066	D4	34°12'22.69"	118°46'27.46"	1765885.94	257937.01	6.5
	CZ0067	D5	34°12'21.39"	118°46'20.75"	1766448.46	257801.37	10.0
	CZ0068	E5	34°12'20.42"	118°46'18.06"	1766673.60	257702.05	10.0
	CZ0069	E4	34°12'24.1"	118°46'18.76"	1766617.23	258074.41	10.0
	CZ0070	F5	34°12'21.27"	118°46'11.47"	1767227.50	257783.28	8.4
	CZ0071	F6	34°12'16.21"	118°46'12.35"	1767150.00	257272.31	4.6
	CZ0074	F4	34°12'24.22"	118°46'05.59"	1767723.95	258077.41	10.0
	CZ0075	D3	34°12'31.05"	118°46'20.99"	1766435.34	258777.67	10.0
	CZ0076	F3	34°12'31.66"	118°46'20.27"	1766496.28	258839.65	10.0
Non-drainage (surface only)	***CZ0091***	B1	34° 12' 42.89"	118° 46' 37.63"	1765327.38	259981.24	
	CZ0092	B1	34° 12' 41.32"	118° 46' 38.5"	1765253.00	259823.22	
	CZ0093	C1	34° 12' 43.27"	118° 46' 34.41"	1765598.27	260017.20	
	CZ0094	D1	34° 12' 43.31"	118° 46' 21.11"	1766715.56	260013.33	
	CZ0095	D1	34° 12' 39.04"	118° 46' 23.28"	1766529.34	259582.71	
	CZ0096	C2	34° 12' 33.28"	118° 46' 29.79"	1765978.45	259004.66	
	CZ0097	D2	34° 12' 34.14"	118° 46' 22.52"	1766589.44	259086.77	
	CZ0098	D2	34° 12' 37.52"	118° 46' 21.37"	1766688.40	259427.53	
	CZ0099	A4	34° 12' 23.08"	118° 46' 46.56"	1764562.44	257984.34	
	CZ0100	B4	34° 12' 23.8"	118° 46' 42.08"	1764938.75	258054.18	
	CZ0101	B4	34° 12' 23.64"	118° 46' 36.21"	1765431.44	258034.79	
	CZ0102	A5	34° 12' 21.3"	118° 46' 47.69"	1764465.46	257805.89	
	CZ0103	B5	34° 12' 21.13"	118° 46' 38.27"	1765256.86	257782.62	
	CZ0104	C5	34° 12' 21.37"	118° 46' 28.56"	1766072.36	257800.54	
	CZ0105	C5	34° 12' 20.89"	118° 46' 28.66"	1766063.89	257751.67	

Notes:

Blank rows indicate a break in location number sequence

Locations were not staked; their final coordinates will be determined in the field at the time of sampling

Northing and Easting coordinates are in feet based on NAD27 datum in Zone 0405 (Ventura County, CA)

TBD - to be determined

Section 6
Project Task Descriptions

The following project tasks will be performed during the supplemental NDMA and PCB congener soil sampling for chemical analyses.

6.1 Field Work Preparation

The CDM field team leader will coordinate with the subcontracted analytical laboratory in advance of field work to obtain water blank sample containers (pre-preserved as required) and coolers. CDM will be responsible for procuring a hand auger and extensions, slide hammer and sampler, and pre-cleaned stainless steel sleeves. The number and type of containers needed for each analysis and matrix are presented in Table 6-1. This table also lists preservatives and holding times for each analytical method. Holding time is the maximum time allowed between sample collection and extraction (if applicable) and sample analysis, during which the designated preservation and storage techniques are employed.

The field team leader will coordinate with DTSC/URS in advance of field work to verify mobilization and sampling start dates. The logistics of coordinating the subsurface soil sampling protocol and sample hand-off will be discussed in a conference call prior to the start of sampling.

DTSC/URS will be responsible for gaining access to the China Flat CBRA. Once in the field, DTSC/URS will determine an appropriate staging area for items and equipment generated from proposed field activities and specific access to each sample point.

6.2 Sample Container Labeling

The CDM field sampler collecting the co-located, ambient soil chemical samples will use sample identification similar to DTSC/URS to allow for correlation with DTSC's background samples.

A unique number code to indicate the sampling location will identify each sample using the numbering logic developed by DTSC/URS (DTSC 2011). The sample identification will include:

- Sample Location: CZ-001 to CZ-999;
- Sample Type: SS for surface soil; SB for subsurface soil;
- Beginning depth-End Depth: listed in feet;
- QA/QC samples: EB for equipment rinsate; FB for source water field blank; DUP for field duplicate; WTB for water trip blank, STB for solid trip blank, and MS for matrix spike.

An example **SURFACE SOIL** sample identification is:

CZ-004-SS-0.0-0.5 (surface soil sample collected at China Flat sample location 4 from 0 to 0.5 feet below ground surface [bgs]).

An example **SUBSURFACE SOIL** sample identification is:

CZ-056-SB-5.0-5.5 (subsurface soil sample collected at China Flat sample location 56 from 5 to 5.5 feet bgs).

An example **FIELD DUPLICATE** sample identification is:

CZ-DUP2-091311 (second field duplicate sample collected at China Flat on September 13, 2011)

Example QC sample identifications are:

CZ-EB03-101411 (third **EQUIPMENT RINSATE BLANK** collected at China Flat on October 14, 2011).

CZ-FB02-101311 (second **SOURCE WATER FIELD BLANK** collected at China Flat on October 13, 2011.

CZ-WTB01-102211 (**WATER TRIP BLANK** placed in cooler 1 and shipped on October 22, 2011. If only one cooler is shipped, then no number will be associated with "WTB."

CZ-STB02-102211 (**UNOPENED SOIL TRIP BLANK**) placed in cooler 2 and shipped on October 22, 2011. If only one cooler is shipped, then no number will be associated with "STB."

CZ-OPENSFB-092511 (**CERTIFIED CLEAN SOIL FIELD BLANK** opened in the field on September 25, 2011.

Sample labels will be used for all samples collected for this project. One label will be completed with the following information for each sample container collected.

- sample number
- date to indicate the month, day, and year of sample collection
- time (military) of sample collection
- sampler's initials
- preservative (other than ice)

- analyses for which the sample is to be analyzed
- any additional relevant information

The adhesive sample labels will be placed directly on the stainless steel sleeve, sample jar, and water blank sample containers and secured with clear tape over the label to protect from moisture. CDM will verify that the information recorded on the sample label is consistent with the information recorded on the COC record.

6.3 Sample Container Filling

All soil samples will be collected in stainless steel sleeves and water blanks in 1-liter amber bottles. The sleeves and containers will be labeled immediately after filling (see Section 6.2 for sample labeling procedures). The exteriors of sample containers will be wiped with a clean paper towel to remove residual soil from the exterior of the containers prior to labeling. Each sleeve will be marked to indicate the bottom. A note will be included on each COC that any aliquots needed for analysis will be taken from the bottom of the sleeve. The labeled container will be placed in a Ziplock plastic bag. After each Ziplock plastic bag is sealed, it will be placed in a cooler containing ice.

6.4 Sample Handling

After a sample has been collected it will be immediately prepared for shipment. The following steps will be followed when packing sample bottles and jars for shipment:

1. Verify the samples undergoing shipment meet the definition of “environmental sample” and are not a hazardous material defined by the Department of Transportation. Professional judgment and/or consultation with qualified persons such as the appropriate health and safety coordinator or the health and safety manager shall be observed.

2. Select a sturdy cooler in good repair. Tape any interior opening in the cooler (drain plug) from the inside to ensure control of interior contents. Also, tape the drain plug from the outside of the cooler. Line the cooler with a large heavy duty plastic bag. A set of cardboard dividers provided by the laboratory will be placed inside of the plastic bag.

3. Be sure the caps on all bottles are tight (will not leak); check to see that labels and COC records are completed properly.

4. Place all sleeves, bottles, and jars (enclosed in Ziplock plastic bags) into the cardboard dividers. While placing sample containers into the cooler, conduct an inventory of the contents of the shipping cooler against the COC record. Place a temperature blank on top of containers so that it is contact with the bagged ice.

5. Put ice in large plastic Ziplock bags (double bagging is preferred) and properly seal. Place the ice bags on top of the samples. Securely fasten the top of the large plastic bag with a plastic cable tie or fiber or duct tape.

6. Retain the bottom copy of the completed COC form. Place the top two copies for the laboratory into a plastic Ziplock bag, seal the bag, and tape it to the inner side of the cooler lid and close the cooler.

7. Attach a completed custody seal across the opening of the cooler, one on front, and over one of the hinges on the back. The cooler lid shall be secured with nylon reinforced strapping tape by wrapping each end of the cooler a minimum of three times over the custody seals so that the cooler cannot be opened without breaking the seal.

8. The shipping container lid must be marked **"THIS END UP"** and arrow labels that indicate the proper upward position of the container shall be affixed to the cooler. Labels used in the shipment of hazardous materials (such as Cargo Only Air Craft, Flammable Solids, etc.) are not permitted on the outside of containers used to transport environmental samples and shall not be used. The name and address of the laboratory shall be placed on the container, or when shipping by common courier, the bill of lading shall be completed and attached to the lid of the shipping container.

6.5 Sample Preservation

6.5.1 Soil

Soil samples will be maintained at a temperature of 4°C ±2°C. No other preservative is required.

6.5.2 Water

Aqueous samples will be collected for QC purposes (see Section 7.2). Aqueous samples will also be maintained at a temperature of 4°C ±2°C.

6.6 Sample Documentation

Sample documentation will be tracked with the COC forms and the Federal Express airbill number. Copies of the COC forms will be maintained in the project files. The field logbook provides a means of recording all data collection activities performed at the site. As such, entries should be as descriptive and detailed as possible so that a sample's history can be reconstructed without relying on the collector's memory. The field logbook will be completed, tracked, and maintained in accordance with Section 10.1. Any deviations from these procedures will be noted in the field logbook.

6.7 Sample Custody

This section establishes a method for maintaining custody of samples through use of a COC record. These procedures will be followed for all samples collected or split samples accepted.

The following steps describe the procedures required to maintain field custody:

- As few people as possible shall handle samples.

- Complete sample labels or tags for each sample using waterproof ink.
- Maintain personal custody of the samples (in your possession) at all times until custody is transferred for sample shipment or directly to the analytical laboratory.

A COC record will be completed for all samples. When transferring the possession of samples, the individuals relinquishing and receiving will sign, date, and note the time on the record. This record documents sample custody transfer from the sampler, often through another person, to the sample custodian in the appropriate laboratory. The date/time will be the same for both signatures when custody is transferred directly to another person. When samples are shipped via common carrier (e.g., Federal Express), the date/time will not be the same for both signatures. Common carriers are not required to sign the COC record. In all cases, it must be readily apparent that the person who received custody is the same person who relinquished custody to the next custodian. If samples are left unattended or a person refuses to sign, this must be documented and explained on the COC record. If a field sample custodian has been designated, he/she may initiate the COC record, sign, and date as the relinquisher. The individual sampler(s) must sign in the appropriate block, but does (do) not need to sign and date as a relinquisher.

The samples will be packaged properly for shipment and dispatched to the appropriate laboratory for analysis. Each shipment must be accompanied by a separate COC record. If a shipment consists of multiple coolers, a COC record shall be filled out for each cooler documenting only samples contained in that particular cooler.

The original COC record will accompany the shipment, a copy retained by CDM and, if applicable, distributed to the appropriate sample coordinators. The shipping number from the Federal Express air bill shall be recorded on the applicable chain-of custody record and field logbook.

The following procedure is to be used to fill out the COC record. The COC record shall be filled out in its entirety.

1. Record project number.
2. Record the field team leader for the project (if a field sample custodian has been designated, also record this name in the “Remarks” or “Notes” box).
3. Record the name and address of the laboratory to which samples are being shipped.
4. Enter the project name/location or code number.
5. Record Federal Express airbill number.
6. Record sample number.

7. Note preservatives added to the sample (or pre-preserved in the sample container).

8. Note media type (matrix) of the sample.

9. Enter date of sample collection.

10. Enter time of sample collection in military time.

11. List parameters for analysis and the number of containers submitted for each analysis.

12. Enter appropriate designation for laboratory quality control (e.g., matrix spike [MS]/matrix spike duplicate [MSD], or other remarks).

13. Sign the COC record(s) in the space provided. All samplers must sign each record.

14. The originator checks information entered on the COC and then signs the "Relinquished by" box, prints his/her name, and enters the current date and time (military).

15. Send the top two copies (usually white and yellow) with the samples to the laboratory; retain the third copy (usually pink) for the project files. Retain any additional copies for the project file.

16. The laboratory sample custodian receiving the sample shipment checks the sample label information against the COC record. Sample condition is checked and anything unusual is noted under "Remarks" or "Notes" on the COC record. The laboratory custodian receiving custody signs in the adjacent "Received by" box and keeps the copy. The white copy is returned to CDM.

6.8 Equipment Decontamination

Equipment decontamination minimizes the risk of cross-contamination of samples and ensures the collection of representative samples. All sampling sleeves will be cleaned prior to the start of sampling and stored in clean plastic bags. All equipment decontamination will be conducted by CDM using the following decontamination procedure.

Before use, and between each site, all sampling equipment (i.e., the auger bucket and sampler cup and cap that screw onto the bottom end of the slide hammer) will be decontaminated using a triple-bucket wash with potable water and a non-phosphate detergent (e.g., Liquinox) in bucket 1 and potable water in buckets 2 and 3. Equipment will be sprayed with clean potable water between rinse buckets 2 and 3 to remove detergent. The equipment will be given a final rinse with ASTM Type II water before use.

The equipment shall be decontaminated prior to use and after collection of samples at each location. Clean equipment shall be kept on plastic or protected in another suitable fashion until used for sampling.

Any deviations will be noted in the CDM field logbooks. All equipment and decontamination materials, manufacturer's names, lot numbers (if applicable) will be documented in the field logbook with notations of how the equipment/material may come into contact (even incidentally) with the samples. Drawings or photo may be beneficial to supplement the evaluation process for contamination potential.

6.9 Investigative Derived Waste Management

IDW such as sampling gloves will be placed in garbage bags and disposed of as common garbage. Decontamination fluids will be added to DTSC/URS' fluids for off-site disposal.

Table 6-1
Analytical Methods, Containers, Preservatives, and Holding Times

Analyte	Analytical Method	Matrix	Sample Container	Preservation	Maximum Holding Times	
					Extraction	Analysis
NDMA	EPA 1625C	Soil	6 inch Stainless Steel Sleeve	Ice to 2 to 6ºC	14 days	40 days
PCB Congeners	EPA 1668B	Soil	6 inch Stainless Steel Sleeve	Ice to 2 to 6ºC	1 year [(a)]	1 year[(a)]
NDMA	EPA 1625C	Water (source blank & equipment blank)	1 x 1 L amber glass	Ice to 2 to 6ºC	7 days	40 days

(a) If stored at or less than -10 degrees Celsius

Acronyms and Abbreviations:

ºC = degrees Celsius
L = liter
PCB = polychlorinated biphenyl

Section 7
Quality Control Criteria

The field quality assurance (QA) program has been designed in accordance with CDM's *Quality Assurance Manual, Revision 11* (CDM 2007), *Guidance for the Data Quality Objectives Process* (EPA 2006), and *EPA Requirements for Quality Assurance Project Plans* (EPA 2001).

All project deliverables will receive technical and QA reviews prior to being issued to DOE. Signed review forms documenting the reviews will be maintained in the project file. Corrective action of any deficiencies will be the responsibility of the project manager, with assistance from the QA staff.

This section describes the QC criteria used to ensure that the data collected during this sampling effort will be used appropriately to meet the project objectives.

7.1 Analytical Methods and Estimated Minimum Levels

All samples will be submitted to a fixed-base laboratory certified by the California Department of Health Services through Environmental Laboratory Accreditation Program (ELAP) or National Environmental Laboratory Accreditation Program (NELAP). The samples collected during this investigation will be analyzed using the methods provided below. These methods are described in detail in *Test Methods For Evaluating Solid Waste, Physical/Chemical Methods, SW-846, Third Edition* as updated by revisions I, II, IIA, IIB, III, IIIA, IIIB, IVA, and IVB (EPA 1997).

When a positive detection is greater than the laboratory detection limit (DL), but less than the estimated minimum level (as shown in Table 7-1), the value will be reported and qualified (J flagged) as an estimated concentration. DLs are attained contingent upon instrument sensitivity and sample matrix effects. It is important to monitor the sensitivity of data-gathering instruments to ensure data quality through constant checks of instrument performance.

Soil and water samples will be analyzed for PCB congeners using EPA Method 1668B and NDMA using EPA Method 1625C. Laboratories will follow standard protocols as outlined in the afore mentioned methods.

7.2 Field QC Samples and Frequencies

The following field QC samples will be required during sampling. All QC samples will be analyzed for NDMA and PCB congeners (with the exception of the trip blanks to be submitted for NDMA analysis only).

7.2.1 Field Duplicate

Soil duplicates will be collected in separate containers, but from the same location as the original primary samples. The duplicate samples will be analyzed as a separate sample from the primary samples. This type of field duplicate measures the total system variability (field and laboratory variance), including the variability component resulting from the inherent heterogeneity of the soil. Field duplicates will be collected at a frequency of one per ten primary soil samples.

7.2.2 Equipment Rinsate Blank

An equipment rinsate blank will be prepared and submitted for analysis at a minimum frequency of one per sampling technique per day and additionally whenever there are changes in the sample collection procedures, sampling decontamination procedures, or sampling equipment. The equipment rinsate blank will consist of analyte-free water used to rinse sampling equipment as the last step in the decontamination process. This QC sample serves as a check for effectiveness of the decontamination process.

7.2.3 NDMA Water Trip Blank

Trip blanks consisting of target analyte-free water will be provided by the laboratory. The trip blank is a sealed container that accompanies the samples from collection at the site through shipment. This QC sample serves as a check for cross-contamination of NDMA as part of sampling, handling, and shipment. Trip blanks will be submitted to the laboratory at a frequency of one per cooler for NDMA analysis. Water trip blanks will not be submitted for PCB congener analysis because of their relatively low volatility.

7.2.4 NDMA Soil Trip Blank

The NDMA soil trip blanks will consist of a solid matrix material, certified clean by the laboratory that will be shipped to the field with the water trip blanks and other sampling containers. For each day of sampling, two soil trip blanks will be placed into the sampling cooler used in the field. One of the soil trip blanks will remain in the cooler without being opened. The second soil trip blank will be opened in the field and the contents transferred into a stainless steel sampling sleeve capped at one end. At the completion of soil sampling at the one location, the sleeve will be capped on the other end and placed back in the sample cooler. Both soil trip blanks will be handled and packaged in the same manner as the collected soil samples, and shipped back to the laboratory with the other soil samples. This QC sample serves as a check for cross-contamination of NDMA as part of sampling handling and shipment. The unopened soil trip blank will be submitted to the laboratory at a frequency of one per cooler with samples shipped for NDMA analysis. The opened soil field blank will be collected at a frequency of one per day for NDMA analysis. Soil trip blanks will not be submitted for PCB congener analysis because of their relatively low volatility.

7.2.5 Source Water Field Blank

A source water field blank consists of the American Society for Testing and Materials (ASTM) Type II water used for equipment decontamination. The sample is used to represent chemical characteristics of the decontamination water. The ASTM Type II water is placed into the sampling container and analyzed for the same parameters as the soil samples. This QC sample serves as a check on cleanliness of the water used for decontamination. One source blank will be prepared and submitted for each lot number of ASTM Type II water used during the sampling event.

7.2.6 Temperature Blank

A temperature blank will be used to notify the receiving laboratory if samples exceed the acceptable temperature (4°C ± 2°C) during transport. This QC measure serves as a check of adequate cooling of samples to be analyzed. The temperature blank will indicate the current temperature of the cooler upon receipt by the laboratory. Temperature blanks will be submitted to the laboratory at a frequency of one per cooler.

7.2.7 Blank Acceptance Criteria

For the water and soil trip blanks, equipment rinsate blanks, and source water field blanks, analytical results will be evaluated for the presence of target analytes. These blank samples will also be evaluated as to whether they meet the method specified identification criteria such as signals within the same two scans, relative retention time, ion abundance ratios, and signal-to-noise ratios. A blank with a positively identified congener or NDMA will be reported and considered in the evaluation of source of contamination.

7.3 Laboratory QC Samples

Laboratory QC data are necessary to determine precision and accuracy and to demonstrate the absence of interference by and/or contamination of laboratory glassware and reagents. Laboratory QC results will be included in the data package.

The types of QC spike samples the laboratory will use include: laboratory control samples (LCSs)/LCS duplicates (LCSDs) (or method blank spikes), matrix spike (MS)/MS duplicate (MSD) samples, and surrogates. An LCS is a clean matrix (i.e., the same used for a method blank) spiked with a known concentration(s) of target analyte(s). The LCS will be carried through the entire analytical procedure to assess the overall accuracy of the method. An MS is an aliquot of a parent sample spiked with target analyte(s) of known concentration(s) prior to sample preparation. The impact of the sample matrix on target analyte recovery (i.e., accuracy) will be assessed by evaluating the percent recovery of the spiked analytes in the LCS and MS. Precision will be assessed by evaluating the relative percent difference between the LCS and LCSD and/or the MS and MSD. A surrogate is a non-target analyte spiked at a known concentration prior to sample preparation. Surrogate analytes will be used to monitor method performance on a matrix-specific/sample-specific basis.

Acceptance limits for precision and accuracy for MS and surrogate percent recovery for this project are presented in Table 7-2. Each analytical preparation batch must contain an MS/MSD pair. Matrix QC samples will be analyzed with each batch of 20 or fewer samples analyzed by the laboratory. Table 7-3 presents the precision criteria for labeling analogs of the PCB congeners and NDMA. Isotope dilution quantitation uses an isotopically labeled analog of the target compounds to allow identification and correction of concentrations in the analytical process and to track recoveries through the various steps during preparation of the samples. For PCB congeners, all 12 carbon atoms in the biphenyl atom are enriched with carbon-13 to produce $^{13}C_{12}$-labeled analogs of the chlorinated biphenyls. The labeled compound for NDMA is n-Nitrosodimethylamine-d6.

A calibration standard is prepared in the laboratory by dissolving a known amount of a pure compound in an appropriate matrix or dilution of commercially obtained solution. The final concentration calculated from the known quantities is the true value of the standard. Where applicable, reference standard solutions will be traceable to National Institute of Standards and Technology or another nationally recognized reference standard source. The analytical results obtained for these standards are used to prepare a standard curve and thereby quantify the compounds found in the environmental samples. The number of calibration standards is prescribed by each analytical method procedure.

A method blank will be prepared and analyzed with each batch of samples. The blank will be of similar matrix as the site samples. Each method blank will be evaluated as to whether it met the method specified identification criteria such as signals within the same two scans, relative retention time, ion abundance ratios, and signal-to-noise ratios. A blank with a positively identified congener or NDMA will be reported and considered in the evaluation of source of contamination. Additionally, the 20 method blank samples preceding the first batch of site samples will be evaluated and considered as indicative of systemic sources of laboratory contamination.

A glassware blank will be prepared by selecting extraction and concentration glassware randomly from the population of glassware utilized by the laboratory during the processing of samples for EPA Methods 1625C and 1668B. The final extraction solvent (equivalent to the total solvent volume specified in the method) will be rinsed through the glassware and concentrated to the final extract volume for analysis. The glassware blank will be evaluated as to whether it meets the method specified identification criteria such as signals within the same two scans, relative retention time, ion abundance ratios, and signal-to-noise ratios. A blank with a positively identified congener or NDMA will be reported and considered in the evaluation as indicative of systemic sources of laboratory contamination.

If evidence of systemic contamination is identified, the lab must conduct an evaluation as to the potential sources of contamination. The lab should first identify all apparatus and materials coming into contact with the samples and the sample preparation apparatus during the process and secondly evaluating the potential for introducing PCBs or NDMA as appropriate.

Table 7-1
n-NDMA and PCB Congener
Estimated Minimum Levels

Method/Analyte	Estimated Minimum Levels Soil	Estimated Minimum Levels Water
PCB Congeners by EPA 1668B	**ng/kg**	**pg/L**
3,3',4,4'-TeCB (Congener 77)	50	500
3,4,4',5-TeCB (Congener 81)	50	500
2,3,3'4,4'-PeCB (Congener 105)	100	200
2,3,4,4',5-PeCB (Congener 114)	50	500
2,3',4,4',5-PeCB (Congener 118)	50	500
2',3,4,4',5-PeCB (Congener 123)	50	500
3,3',4,4',5-PeCB (Congener 126)	50	500
2,3,3',4,4',5-HxCB (Congener 156)	50	500
2,3,3',4,4',5'-HxCB (Congener 157)	50	500
2,3',4,4',5,5'-HxCB (Congener 167)	50	500
3,3',4,4',5,5'-HxCB (Congener 169)	50	500
2,3,3',4,4',5,5'-HpCB (Congener 189)	50	500
NDMA by EPA 1625C	**ng/kg**	**µg/L**
n-Nitrosodimethylamine	30	1.0

Estimated minimum levels for PCB congeners derived from EPA Method 1668, Table 2.

Estimated minimum levels for NDMA provided by Lancaster Laboratories, Inc.

EPA = U.S. Environmental Protection Agency

HxCB = Hexachlorobiphenyl

HpCB = Heptachlorobiphenyl

ng/kg = nanograms per kilogram

µg/L = micrograms per liter

PeCB = Pentachlorobiphenyl

TeCB = Tetrachlorobiphenyl

Table 7-2
Quality Control Objectives for Analytical Methods

Congener	Method Number	LCS Recovery Limits (%)	Matrix Spike Recovery Limits (%)	LCSD & MSD Precision (RPD)	Surrogate Recovery (%)
3,3',4,4'-TeCB (Congener 77)	EPA 1668B	50 - 150	50 - 150	50	50 - 150
3,4,4',5-TeCB (Congener 81)		50 - 150	50 - 150	50	50 - 150
2,3,3'4,4'-PeCB (Congener 105)		50 - 150	50 - 150	50	50 - 150
2,3,4,4',5-PeCB (Congener 114)		50 - 150	50 - 150	50	50 - 150
2,3',4,4',5-PeCB (Congener 118)		50 - 150	50 - 150	50	50 - 150
2',3,4,4',5-PeCB (Congener 123)		50 - 150	50 - 150	50	50 - 150
3,3',4,4',5-PeCB (Congener 126)		50 - 150	50 - 150	50	50 - 150
2,3,3',4,4',5-HxCB (Congener 156)		50 - 150	50 - 150	50	50 - 150
2,3,3',4,4',5'-HxCB (Congener 157)		50 - 150	50 - 150	50	50 - 150
2,3',4,4',5,5'-HxCB (Congener 167)		50 - 150	50 - 150	50	50 - 150
3,3',4,4',5,5'-HxCB (Congener 169)		50 - 150	50 - 150	50	50 - 150
2,3,3',4,4',5,5'-HpCB (Congener 189)		50 - 150	50 - 150	50	50 - 150
n-Nitrosodimethylamine-d6	EPA 1625C	70 - 130	70 - 130	50	50 - 150

NOTES:

Method 1668B values from Columbia Analytical Services (Houston, Texas)

Method 1625C values from Lancaster Laboratories, Inc.

LCS – laboratory control sample

LCSD – laboratory control sample duplicate

MSD – matrix spike duplicate

RPD – relative percent difference

Table 7-3
Quality Control Objectives for Labeling Analogs per Methods 1668B and 1625C

Labeled Analog (spike)	Method Number	Recovery in Sample (%)	Initial Precision and Recovery Standard (%)	Ongoing Precision and Recovery Spike (%)	Calibration Verification (%)	Calibration Verification (RSD)
$^{13}C_{12}$-3,3',4,4'-TeCB	EPA 1668B	31 – 109	57 - 100	43 - 105	50 - 150	35
$^{13}C_{12}$-3,4,4',5-TeCB		14 – 127	57 - 100	44 - 102	50 - 150	33
$^{13}C_{12}$-2,3,3'4,4'-PeCB		50 – 111	66 - 101	52 - 116	50 - 150	31
$^{13}C_{12}$-2,3,4,4',5-PeCB		41 – 121	57 - 100	39 - 117	50 - 150	41
$^{13}C_{12}$-2,3',4,4',5-PeCB		49 – 111	65 - 102	51 - 117	50 - 150	33
$^{13}C_{12}$-2',3,4,4',5-PeCB		49 – 116	66 - 103	52 - 118	50 - 150	32
$^{13}C_{12}$-3,3',4,4',5-PeCB		50 – 106	67 - 100	54 - 113	50 - 150	29
$^{13}C_{12}$-2,3,3',4,4',5-HxCB		40 – 120	61 - 100	46 - 115	50 - 150	35
$^{13}C_{12}$-2,3,3',4,4',5'-HxCB		40 – 120	61 - 100	46 - 115	50 - 150	35
$^{13}C_{12}$-2,3',4,4',5,5'-HxCB		45 – 118	74 - 103	63 - 115	50 - 150	24
$^{13}C_{12}$-3,3',4,4',5,5'-HxCB		37 – 117	66 - 103	51 - 117	50 - 150	33
$^{13}C_{12}$-2,3,3',4,4',5,5'-HpCB		47 – 116	68 - 100	55 - 112	50 - 150	28
n-Nitrosodimethylamine-d6	EPA 1625C	NS	NS	NS	44 - 120	33

NOTES:

NS – not specified

RSD – relative standard deviation

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Section 8
Instruments/Equipment and Supplies

8.1 Laboratory Instruments/Equipment

Calibration of laboratory equipment will be based on written procedures approved by laboratory management. Instruments and equipment will be initially and continuously calibrated at approved intervals as specified by either the manufacturer or other requirements (e.g., methodology requirements). The laboratory will provide their respective SOPs.

8.2 Inspection/Acceptance of Supplies and Consumables

Prior to acceptance, supplies and consumables will be inspected to ensure that they are in satisfactory condition and free of defects.

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Section 9
Special Training and Certification

All CDM field personnel will be required to demonstrate successful completion of health and safety training prescribed by 29 Code of Federal Regulations 1910.120 also known as Hazardous Waste Operations and Emergency Response (HAZWOPER) regulations. All employees and subcontractor personnel will have completed 40-hours of HAZWOPER instruction in addition to receiving 8-hours of refresher training on a yearly basis. Minimum course requirements included in the HAZWOPER training is described in the Site Health and Safety Plan.

All field personnel will be required to read and understand the procedures described in this Work Plan/FSAP and the DTSC/URS SAP (DTSC 2011) before beginning field work. The CDM QA Coordinator will conduct a field planning meeting with CDM field personnel prior to commencement of field work to discuss the understanding of the Work Plan/FSAP.

All samples will be submitted to a laboratory that has been certified by the state of California through the ELAP or NELAP for the methods that California certifies.

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Section 10
Documentation and Records

CDM's local administrative staff has the responsibility for maintenance of the document control system for the project. This system includes a document inventory procedure and a filing system. Project personnel will be responsible for project documents in their possession while working on a particular task.

Electronic copies of project deliverables, including graphics, will be routinely backed up and archived. Final reports will be submitted to DOE on compact disks in Microsoft Word, Microsoft Excel for certain tables, and geographical information system for figures.

Records that will be controlled on this project will include at a minimum the following:

- Work plans
- Field plan and addendums
- Project reports, including letter reports
- Chain-of-custody records
- Audit and surveillance reports
- Completed technical review forms and QA review forms
- Laboratory/data reports
- Comment resolutions
- Training records
- Field notebooks
- Laboratory data
- Change requests

10.1 Field Logbook and Records

A permanently bound and consecutively paginated field logbook will be maintained daily by the CDM field team in accordance with the procedures below. Documentation modification requirements are also described below. In general, a single strikeout, initialed and dated, is required for each documentation change. URS will maintain a separate field logbook in accordance with the DTSC/URS SAP (DTSC 2011).

The CDM field team leader is responsible for ensuring that the format and content of data entries are in accordance with this procedure. The field team leader will provide field logbooks to site personnel who will be responsible for their care and maintenance while in their possession. Site personnel will return field logbooks to the field team leader at the end of the assignment.

All markings and notes will be made with indelible black or blue ink pen. All pages must be numbered before initial use of the logbook. Before use in the field, each logbook will be sequentially numbered by the CDM field team leader. The following information shall be recorded on the cover of each logbook:

- Field logbook number.
- Start date of entries.
- Activity, site name, and location.
- Name of CDM contact and phone number(s) (typically the project manager).
- End date of entries.

The first few (approximately five) pages of the logbook will be reserved for a table of contents. Mark the first page with the heading (Table of Contents) and enter the following:

- Date/Description Pages
- (Start Date)/Reserved for Table of Contents 1-5

The remaining pages of the table of contents will be designated as such with "Table of Contents" written on the top center of each page. The table of contents should be completed as activities are completed and before placing the logbook in the records file.

The requirements that must be followed when using a logbook are:

- Record work, observations, quantities of materials, calculations, drawings, and related information directly in the logbook. If data collection forms are specified by an activity-specific plan, this information does not need to be duplicated in the logbook. However, any forms used to record site information must be referenced in the logbook.
- Do not start a new page until the previous one is full or has been marked with a single diagonal line so that additional entries cannot be made. Use both sides of each page.
- Do not erase or blot out any entry at any time. Indicate any deletion by a single line through the material to be deleted. Initial and date each deletion. Take care to not obliterate what was written previously.
- Do not remove any pages from the book.

Specific requirements for field logbook entries include:

- Initial and date each page.
- Sign and date the final page of entries for each day.
- Initial and date all changes.

- If authors change within the course of a day, the original author must insert the following:

  Above notes authored by:

  (Sign name)

  (Print name)

  (Date)

  The new author must sign and print his/her name before additional entries are made.

- Draw a diagonal line through the remainder of the final page at the end of the day.

- Record the following information on a daily basis:

  - Date and time
  - Name of individual making entry
  - Names of field team and other persons onsite
  - Description of activity being conducted including sampling location numbers
  - Weather conditions (i.e., temperature, cloud cover, precipitation, wind direction, and speed) and other pertinent data
  - Level of personal protection used
  - Serial numbers of instruments
  - Equipment calibration information
  - Federal Express tracking numbers for coolers shipped

Entries into the field logbook shall be preceded with the time (written in military units) of the observation. The time should be recorded frequently and at the point of events or measurements that are critical to the activity being logged. All measurements made and samples collected must be recorded.

Other events and observations that should be recorded include:

- Changes in weather that impact field activities.

- Deviations from procedures outlined in any governing documents. Also record the reason for any noted deviation.

- Problems, downtime, or delays.
- Upgrade or downgrade of personal protection equipment.
- Visitors to the site.

Due to the nature of the sampling covered under this plan, additional information to be recorded in the field logbook includes:

- A list of all decontamination equipment and chemicals including soap and lot number (if applicable), source of the ASTM water used for decontamination and rinsate blanks and their lot numbers.
- Type and manufacturer of all gloves used during sampling and decontamination.
- Manufacturer of sampling equipment including observed plastic and/or rubber components.
- Field team must prepare a detailed, step-by-step documentation of the collection process including all points of contact will all materials and personnel.

To guard against loss of data as a result of damage or disappearance of logbooks, completed pages shall be periodically photocopied (weekly, at a minimum) and forwarded to the field or project office. Other field records shall be photocopied and submitted regularly and as promptly as possible to the office. When possible, electronic media such as disks and tapes should be copied and forwarded to the project office.

At the conclusion of each activity or phase of site work, the individual responsible for the logbook will ensure that all entries have been appropriately signed and dated and that corrections were made properly (single lines drawn through incorrect information, then initialed and dated). The completed logbook shall be submitted to the records file.

The on-site URS geologist will prepare detailed boring logs in accordance with the DTSC/URS SAP (DTSC 2011).

10.2 Photographs

Photographs may be taken at the site to visually document field activities and site features. Digital photographs will be submitted to the electronic project files.

All digital photographs should have a caption added after the photographs are downloaded. This information should also be recorded in the field logbook as the photographs are taken. The caption should contain the following information:

- Photograph sequence number
- Description of activity/item shown (e.g., name of facility/site, specific project name, project number)
- Date and time
- Direction (if applicable)
- Photographer

10.3 Laboratory Data

The laboratory will submit an analytical data report to CDM. The data report will contain a case narrative that briefly describes the numbers of samples, the analyses, and noteworthy analytical difficulties or QA/QC issues associated with the submitted samples. The data report will include signed COC forms, cooler receipt forms, analytical data, a QC package, raw data, and an electronic copy of the data in a format compatible with the established SSFL data management system. The data package will also include all QC sample results and associated calculations (i.e., percent recovery [%R] and relative percent difference [RPD]).

Hard copies and electronic copies of the data report on compact disks will be archived by CDM at off-site storage for a minimum of five years and will be made available to the regulatory agencies upon request by DOE. DOE will maintain hard copies and electronic files per federal requirements. The analytical results and environmental data will be submitted to the established SSFL data management system using the semi-colon delimited text file submittal requirements specified in the extended electronic data deliverable (EDD) specification within 30 days of receiving all data validation reports.

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Section 11
Assessment and Oversight

11.1 Planned Project Assessments

System assessments are qualitative reviews of different aspects of project work (e.g., field and office assessments) to check on the use of appropriate QC measures and the functioning of the QA system. Determinations for project assessments will be performed under the direction of the CDM QA director, who reports directly to the CDM president. Quality Procedure 6.2, as defined in the CDM Quality Assurance Manual, Part Two (CDM 2007), defines CDM's corporate assessments procedures and requirements.

11.1.1 Field Planning Meeting

Prior to initiating field work, a Field Planning Meeting directed by the CDM Project Manager will be held with DTSC/URS to assess the readiness for field work start up. The Field Planning Meeting will be documented using the form presented in Figure 11-1. The CDM project manager will work with the Field Team Leader to ensure that all deficiencies identified during the meeting are corrected prior to the initiation of field work.

11.1.2 Laboratory Assessments

Performance assessments are quantitative checks on the quality of a measurement system (e.g., proficiency testing) and will be scheduled for this project.

CDM chemists will perform a formal review of laboratory activities including sample logging, recording, handling, preparation, and analysis procedures the first week of sampling to verify that the procedures described in planning documents such as the Work Plan/FSAP are being followed. If the CDM chemist(s) observe deviations from the planning documents, a formal performance assessment will be performed within one week.

11.2 Assessment Findings and Response Actions

Any conditions or problems identified during routine activities or through assessments that may impair the quality of work will be addressed through either rapid corrective response actions or formal corrective action processes. All response actions will be implemented on a case-by-case basis to correct quality problems.

Minor rapid response actions taken in the field immediately (within 24 hours) to correct a quality problem will be documented in the field logbook and verbally reported to the CDM project manager.

Major rapid response actions taken in the field will require notification (within 24 hours) and approval by the DOE project manager, DTSC project manager, CDM QA

Coordinator, and CDM project manager prior to implementation. Such actions may include revising procedures in the field or retesting.

Minor or major quality problems that cannot be corrected quickly through rapid routine procedures require implementation of a corrective action request (CAR) form (see Figure 11-2). The CAR will be initiated by the person identifying the problem and forwarded to the CDM QA Coordinator within 48 hours of identifying the problem. In consultation with the CDM QA Director, the CDM QA Coordinator will be responsible for investigating and following up on the quality problem; the timeframe for response will be determined by the CDM QA Coordinator based on the specific quality problem.

The DOE project manager will approve any major response actions in writing.

11.3 Reports to Management

During the anticipated short period of field sampling, expected to last less than two weeks, CDM will schedule, three phone calls with the DOE and DTSC project managers to provide a verbal status report identifying activities performed, significant conversations, planned activities, and an updated schedule.

The laboratory will inform the CDM chemist of within 24 business hours regarding any non-conformance issues. Corrective actions, as appropriate, will be completed by the laboratory within one week of identification of the non-conformance.

QA reports will be provided to management when significant quality problems are encountered. Field staff will note quality problems on field data sheets. The CDM project manager will inform the CDM QA coordinator upon encountering quality issues that cannot be immediately corrected. Monthly QA reports will be submitted to CDM's QA director by the CDM QA coordinator. These reports will be provided upon request of the DOE project manager.

The measurement report (to be prepared by CDM) will contain a QA section that will discuss adherence to governing documents, extent to which DQOs were met, deviations from the Work Plan/FSAP, data precision and accuracy goals met, and changes, if any, to the governing documents. It will also provide a summary of QA activities performed as well as a description of quality problems encountered and corrective actions implemented. QA reports and CARs will be included in the measurement report as appropriate.

Figure 11-1
Field Planning Meeting Form

CDM FIELD PLANNING MEETING FORM

Assignment No./Name:_____

Date of Meeting:_____

ATTENDEES

Project Manager:_____

Field Team Leader:
_____

Site Health and Safety Officer:
_____

Additional Sampling Personnel:_____

QA Coordinator:_____

AGENDA

I. PERSONNEL, FIELD SCHEDULES, TASKS

A. Who is doing the sample collection? List personnel and responsibilities.

B. What media are being sampled? List here.

C. Identify sample locations and requested analytical parameters here. Attach map if needed.

D. How long will personnel be in the field?

Figure 11-1 (continued)
Field Planning Meeting Form

II. PRE-PLANNING

A. Are site-specific Work Plan, SAP and H&SP ready?

B. Have other necessary documents been assembled (Client SOPs, CDM SOPs, other applicable client documents)?

C. Review status of procurement of field supplies, equipment and subcontracts.

D. Reservation of Laboratory Space.

E. Arrangement for QC Samples (Spikes, trip blanks, rinsates, temperature blank, duplicates, MS/MSD, others if necessary).

F. Coordination with client project manager and subcontractors.

G. Have chain-of-custody forms and sample labels been prepared?

H. Are field equipment calibration logs prepared/available for all the field equipment to be used?

III. TRAINING

A. Are sampling personnel familiar with sample collection procedures and requirements, CDM SOP requirements, or other applicable client requirements?

B. Review sampling procedures as needed (logbook entries, non-CLP tracking form, spike submittal, etc).

IV. CHAIN-OF-COMMAND

Figure 11-1 (continued)
Field Planning Meeting Form

A. Who will talk to client project manager?

B. Have back-ups been established for the client project manager and the CDM project manager?

C. If applicable, has a client contract specialist or client technical/field procedure contact been established?

Figure 11-2
Corrective Action Request Form

CAR No. _____

CDM CORRECTIVE ACTION REQUEST

Project: _____

Contract/Project No: _____ Project Manager: _____

Description of problem and date identified: _____

Requested by: _____ Date: _____

Submit this form to the QA Director promptly.

Significant Condition Adverse to Quality? Yes / No

Responsible for Action: _____ Response Due: _____

Submit completed response to: _____

[To be completed by the responsible person. Attach additional pages as required. **Include evidence that corrective action has been implemented.]**

State cause of problem (if known or suspected): _____

_____

_____

Corrective Action(s) Taken to Correct Problem and Prevent Recurrence: _____

_____

_____

Signature: _____ Date: _____

Corrective Action Plan Accepted: _____ Date: _____

Corrective Action Verified By: _____ Date: _____

Corrective Action Accepted: _____ Date: _____

Section 12
Data Review

The data review process includes four distinctive steps to evaluate and ensure that project data quality will meet the project needs and requirements. The data review process is comprised of verification, validation and usability assessments. Each of these is conducted to ensure that project data are of known and documented quality. The following sections provide details associated with each step in the data review process.

12.1 Field Record Verification

Data verification consists of a completeness review that is performed in order to ensure that required information is available. This step provides examination of objective evidence to ensure that sampling and analytical requirements have been completed. Several inputs will be examined. Table 12-1 provides a summary of the verification steps for this project.

12.2 Laboratory Data Verification

Data verification consists of a completeness review that is performed in order to ensure that required information is available. This step provides examination of objective evidence to ensure that sampling and analytical requirements have been completed. Several inputs will be examined. Table 12-1 provides a summary of the verification steps for this project.

12.3 Data Validation

The data validation process consists of two steps to be completed. The first step consists of determining compliance with methods, procedures, and contracts for sampling and analysis. The second step of the data validation process consists of comparing information collected with measurement performance criteria presented in the Work Plan/FSAP and data validation guidance. Several validation inputs will be examined.

All data validation will be conducted in accordance with, *EPA Contract Laboratory Program National Functional Guidelines for Superfund Organic Methods Data Review* (EPA 2008). *EPA Contract Laboratory Program National Functional Guidelines for Chlorinated Dioxin/Furan Data Review* (EPA 2005) will also be used to the extent to which it is applicable for validation of the PCB congeners data. The data validation strategy to be employed is to validate 100% of the data according to EPA Level IV protocols. Data validation will be conducted by an independent data validation subcontractor.

12.4 Data Usability Assessment

The data usability assessment will be performed on the validated data by a team of personnel at CDM under the responsibility of the project manager. The results of the data usability assessment will be presented in the measurement report and data deemed appropriate for use will be used in the project decision making process. Data qualified as rejected are considered unusable. All other data are considered to be valid and acceptable, including those analytes that have been qualified as estimated or non-detect.

The following sections describe the precision, accuracy, representativeness, completeness, comparability, and sensitivity (PARCCS) goals for this project and describe how they will be used to conduct the data usability assessment.

12.4.1 Precision

The precision of a measurement is an expression of mutual agreement among individual measurements of the same property taken under prescribed similar conditions. Precision is quantitative and most often expressed in terms of RPD. Precision of reported results is a function of inherent field-related variability plus laboratory analytical variability. Various measures of precision exist, depending upon "prescribed similar conditions." Field duplicate samples will be collected to provide a measure of the contribution to overall variability of field-related sources. Contribution of laboratory-related sources to overall variability is measured through various laboratory QC samples. The acceptable RPD limits for field duplicates are less than 50% for soil. Chemical analytical data will be validated for precision using field duplicates, MS/MSDs, and LCS/LCSDs for EPA Method 1668B, as applicable.

Precision of the laboratory analysis will be assessed by comparing the analytical results and the laboratory duplicate results. The RPD will be calculated for each pair of duplicate analyses using the following equation:

$$RPD = \left(\left| S - D \right| / \left(S + D \right) / 2 \right) \times 100$$

Where S = First sample value (original value); and
D = Second sample value (duplicate value).

A discussion summarizing the results of laboratory and field precision and any limitations on the use of the data will be described in the measurement report.

12.4.2 Accuracy

Accuracy is the degree of agreement of a measurement with an accepted reference or true value, and is a measure of the bias in a system. Accuracy is quantitative and usually expressed as the %R of a sample result. Ideally, it is desirable that the reported concentration equals the actual concentration present in the sample. Acceptable QC limits are presented in Table 7-2 for EPA Methods 1668B and 1625C.

Chemical analytical data will be validated for accuracy using labeled compounds, MS/MSDs, and LCS/LCSDs, as applicable.

The %R of spiked and labeled compounds will be calculated using the following equation:

$$\%R = \left(\left(A - B \right) / C \right) \times 100$$

Where A = Analyte concentration determined experimentally from the spiked sample;
B = Background level determined by a separate analysis of the unspiked sample; and
C = Amount of the spike added.

A discussion summarizing the results of laboratory accuracy and any limitation on the use of the data will be described.

12.4.3 Representativeness

Representativeness expresses the degree to which sample data accurately and precisely represent: (a) a characteristic of a population, (b) parameter variations at a sampling point, and/or (c) an environmental condition. Representativeness is a qualitative and quantitative parameter that is most concerned with the proper design of the sampling plan and the absence of cross-contamination. Good representativeness will be achieved through:

- Careful, informed selection of sampling sites;
- Selection of testing parameters and methods that adequately define and characterize the extent of possible contamination and meet the required parameter DLs;
- Proper gathering and handling of samples to avoid interference and prevent contamination and loss; and
- Collection of a sufficient number of samples to allow characterization.

Representativeness is a consideration that will be employed during sample location and collection efforts and will be assessed qualitatively by reviewing field procedures and reviewing actual sampling locations versus planned locations. Representativeness will be reviewed quantitatively using blank samples. If a concentration in a sample is less than five times the concentration in an associated blank, the sample concentration is considered non-detect. Conclusions drawn based on these reviews will be presented and any impacts discussed in the measurement report.

12.4.4 Completeness

Completeness is a measure of the amount of usable data obtained from a measurement system compared to the amount that was expected to be obtained under normal conditions. Usability will be assessed by evaluating the PARCCS parameters. Those data that are validated and need no qualification, or are qualified as estimated data, are considered usable. Rejected data are not considered usable. Completeness will be calculated following data evaluation. For this work, a completeness goal of 90% is projected for each analytical test. If this goal is not met, additional sampling may be necessary to adequately achieve project objectives. An evaluation of the impact of missing information and any project limitations with respect to completeness will be discussed in the measurement report.

12.4.5 Comparability

Consistency in the acquisition, handling, and analysis of samples is necessary for comparing results. Where appropriate, the results of analyses obtained will be compared with the results obtained in previous studies. Standard EPA analytical and QC methods will be used to ensure comparability of results with other analyses performed in a similar manner. Comparability is a qualitative parameter and cannot be assessed using QC samples. Any comparability limitations will be presented and discussed in the measurement report.

12.4.6 Sensitivity

Sensitivity is the ability of the method or instrument to detect target analytes at the level of interest. Examples of QC measures for determining sensitivity include method detection limit studies, and low initial calibration standards at the quantitation/detection limit. A review of initial calibration data (specifically low standards at the detection limit) will be completed to determine if project required sensitivities (detection limits) were achieved. The measurement report will discuss sensitivity and any impacts and limitations on the use of project data.

Table 12-1
Verification Process

Verification Input	Description	Internal/ External	Responsible for Verification
Chain-of-custody forms	Chain-of-custody forms will be reviewed internally upon their completion and verified against the packed sample coolers prior to shipment to the laboratory. Copies of the COC forms will be reviewed again and verified against field logs, analytical laboratory reports, and the Work Plan/Field Sampling and Analysis Plan (FSAP) prior to completion of the measurement report.	Internal	Field team leader
Field logbooks and field forms	Field logbooks and field forms will be reviewed to ensure accuracy and completeness. The field logbook will be maintained in the project file and field forms will be included in the measurement report.	Internal	Field team leader
Laboratory Data Reports	Data validation reports will be reviewed to ensure they represent the data collected during the project. The laboratory data will be evaluated against the project data quality objectives and measurement performance criteria established in the Work Plan/FSAP.	Internal	Project manager and/or database coordinator
Sampling Procedures	The implementation of sampling procedures will be reviewed and evaluated through the use of audit reports, sampling reports, field change request forms, the Work Plan/FSAP, and/or field logbooks to determine proper equipment use and sampling processes.	Internal	Field team leader
Electronic Data Deliverables (EDD)	The electronic data deliverable will be compared to the EDD guidance for compliance with required fields and format. The results will be reviewed to ensure that they have been transferred correctly from laboratory data printouts to the laboratory report and to the EDD.	Internal	Database coordinator
Work Plan/FSAP	All planning documents (including the Work Plan/FSAP) will be reviewed to evaluate whether planned activities and objectives were actually implemented and to document deviations to the plans as necessary.	Internal and External	All data users
Laboratory data	All laboratory data packages will be verified internally by the laboratory performing the work and by the data validators for completeness and technical accuracy prior to submittal to CDM.	Internal and External	Subcontracted analytical laboratory and data validators

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Section 13
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