REMEDIAL INVESTIGATION / FEASIBILITY STUDY QUALITY ASSURANCE PROJECT PLAN ADDENDUM No. 1a

Falcon Refinery Superfund Site
Ingleside
San Patricio County, Texas
TXD 086 278 058

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A1 TITLE AND APPROVAL SHEET

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ABBREVIATIONS AND ACRONYMS

AA	Alternative Action
AES	Atomic Emission Spectroscopy
ALGC	Accutest Gulf Coast, Inc
ANSI/ASQC	American National Standards Institute/American Society of Quality Control
AOC	Area of Concern
ARAR	Applicable or Relevant and Appropriate Requirement
ATSDR	Agency for Toxic Substances and Disease Registry
bgs	Below Ground Surface
BTEX	Benzene, Toluene, Ethylbenzene and Xylenes
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Registration
COC	Contaminant or Chemical of Concern
COPC	Contaminant or Chemical of Potential Concern
CRDL	Contract Required Detection Limit
CRQL	Contract Required Quantitation Limit
CSM	Conceptual Site Model
CVAA	Cold Vapor Atomic Absorption
DQO	Data Quality Objective
DS	Decision Statement
EPA	U.S. Environmental Protection Agency
ERA	Ecological Risk Assessment
ERAGS	Ecological Risk Assessment Guidance for Superfund
FM	Farm to Market Road
FS	Feasibility Study
FSP	Field Sampling Plan
GC	Gas Chromatography
GCC	Gulf Coast Conservation

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GC/MS	Gas Chromatography and Mass Spectrometry
HEAST	Health Effects Assessment Summary Tables
HHRA	Human Health Risk Assessment
H_o	null hypothesis
H_a	alternative hypothesis
HPLC	High Performance Liquid Chromatography
HRS	Hazard Ranking System Documentation Record, Falcon Refinery
HQ	Hazard Quotient
ICP	Inductively-Coupled Plasma
ICP-MS	Inductively-Coupled Plasma – Mass Spectrometry
ICS	Interference Check Sample
IDW	Investigation-Derived Waste
IRIS	Integrated Risk Information System
IS	Internal Standards
LCS	Laboratory Control Sample
MD	Matrix Duplicate
MDL	Method Detection Limit
mg/kg	milligram per kilogram
Miller	Miller Environmental
MRL	Minimum Risk Level
MS	Matrix Spike
MSD	Matrix Spike Duplicate
MSSL	Medium-Specific Screening Level (human health)
µg/L	microgram per liter
µg/kg	microgram per kilogram
NCP	National Oil and Hazardous Substance Pollution Contingency Plan
NORCO	National Oil Recovery Corporation
NPL	National Priorities List
OU	Operating Unit
PC	Project Coordinator
PCB	Polychlorinated biphenyl
PCL	Protective Concentration Level
PE	Professional Engineer
PG	Professional Geologist
PID	Photoionization Detector
PQL	Practical Quantitation Limit
PRG	Preliminary Remedial Goal
PSQ	Principal Study Question
QA	Quality Assurance
QAPP	Quality Assurance Project Plan
QC	Quality Control
RAGS	Risk Assessment Guidance for Superfund
RI/FS	Remedial Investigation/Feasibility Study
RL	Reporting Limit
RPD	Relative Percent Difference
RSD	Relative Standard Deviation
RPM	Remedial Project Manager
SIM	Selective Ion Monitoring
SOP	Standard Operating Procedure
SOW	Statement of Work

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SSL	Soil Screening Level
SVOC	Semi-Volatile Organic Compound
SW-846	EPA Solid Waste Methodologies
TAL	Target Analyte List
TCEQ	Texas Commission on Environmental Quality
TNRCC	Texas Natural Resources Conservation Commission
TPH	Total Petroleum Hydrocarbons
TWC	Texas Water Commission
UCL	Upper Confidence Limit
VOC	Volatile organic compound
VSP	Visual Sample Plan

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A3 DISTRIBUTION LIST

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A4 PROJECT / TASK ORGANIZATION

This addendum to the EPA approved Quality Assurance Project Plan (QAPP), dated August 24, 2008, has been prepared for the Remedial Investigation / Feasibility Study (RI/FS) at the Falcon Refinery Superfund Site in Ingleside, Texas. The approved QAPP was developed in accordance with the (1) Administrative Order on Consent for Remedial Investigation, Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Docket No. 06-05-04, (2) United States Environmental Protection Agency (EPA) Requirements for Quality Assurance Project Plans (EPA QA/R5), and (3) the national consensus standard, ANSI/ASQC E-41994.

This addendum provides the procedures for Phase II which will be employed to meet the project-specific data quality objectives (DQO) and to ensure the quality of data (precision, accuracy, completeness, comparability, representativeness and sensitivity) are known and documented.

The Phase II objectives include:

- Inputting Phase I analytical results into Visual Sample Plan software algorithms to statistically determine the minimum number of samples required to meet the Data Quality Objectives for the Site,
- Attaining the quality control (QC) requirements of this QAPP,
- Obtaining on-site and off-site data of known quality to define the horizontal and vertical extent of contamination, and
- Documenting the quality program including performance of the work and documentation of changes to work at the Falcon Refinery site.

Standard Operating Procedures (SOP) for Phase II activities are described and provided in the Field Sampling Plan (FSP), dated August 24, 2008, prepared for the Falcon Refinery site.

QC procedures used in this QAPP are based on:

- Information provided by the Region 6 EPA office,
- Data provided by the Texas Commission on Environmental Quality (TCEQ), formerly the Texas Natural Resources Conservation Commission (TNRCC) and Texas Water Commission (TWC),
- Historical information from record searches,
- Information from community meetings and interviews with neighbors,
- Scoping and project meetings with the EPA, Federal and State Trustees, and
- Phase I sampling results.

This addendum contains information for Phase II and only includes portions of the QAPP pertinent to Phase II. The section numbering is consistent with the sections in the approved QAPP.

A4.1 Task Organization

The EPA's Remedial Project Manager (RPM) will be the primary decision-maker for RI/FS activities conducted under the Administrative Order on Consent. The project organization chart is provided as Appendix B.

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Mr. Steve Miller of TRC Solutions (REM) will serve as the quality assurance (QA) Officer for the RI/FS and is responsible for the quality of all work conducted at the site. In this role he will work in an independent office from the units generating the data. Mr. Miller will maintain the approved QAPP.

Stephen Halasz of TRC Solutions is the project coordinator (PC) and is responsible for all activities at the site. Accutest Laboratories Gulf Coast, Inc. (ALGC) in Houston, Texas has been selected as the primary project laboratory providing all environmental analysis. Georgia Jones of ALGC will serve as the laboratory project manager and Tonya King-Cormier, also of ALGC, is the laboratory QA officer. Paul Supak of Gainco, Inc. is the on-site manager and is responsible for all field related activities.

All subcontractors used at the site will be required to adhere to the QA/QC requirements outlined in the QAPP. Specific roles for the organization members are described below:

A4.1.1 QA Officer – Steve Miller

The QA Officer is responsible for the quality of work conducted by all site and laboratory personnel. Specifically the QA Officer will:

- Review all sampling and analytical work orders;
- Randomly observe field sampling techniques;
- Coordinate with the laboratory QA Officer;
- Provide QA guidance to the project coordinator;
- Oversee all aspects of QC;
- Review all analytical data; and
- Approve the QAPP.

A4.1.2 Project Coordinator – Stephen Halasz

The PC will provide the major point of contact and control for matters concerning the project. Specifically the PC will:

- Define project objectives;
- Establish project policy and procedures to address the specific needs of the project;
- Acquire and apply technical resources as needed to ensure performance;
- Monitor and direct field personnel;
- Review work performed on each task to ensure its quality, responsiveness and timeliness;
- Approve all reports;
- Represent the project team at meetings and public hearings; and
- Approve the QAPP.

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A4.1.3 On-Site Manager – Paul Supak

The On-site Manager will be responsible for leading and coordinating day-to-day activities of the field team. The On-site Manager will report to the PC and his specific responsibilities will include:

- Providing day-to-day coordination with the PC;
- Developing and implementing field-related work plans;
- Coordinating and managing field staff including subcontractors;
- Performing field audits;
- Overseeing QC for technical data provided by the field staff;
- Adhering to work schedules;
- Identifying problems at the field team level and resolving difficulties in consultation with the Project Coordinator;
- Approving the QAPP; and
- Participating in the final report.

A4.1.4 Laboratory Project Manager – Georgia Jones

The Laboratory Project Manager will have overall responsibility for QA/QC at the laboratory. In addition the Laboratory Project Manager will:

- Manage and provide responses to customer inquiries related to the management of the project and status of work in progress;
- Define project requirements to ensure all contract requirements are met and communicate requirements to appropriate laboratory personnel;
- Prioritize client requests based on due dates and complexity of response required;
- Manage subcontracting of samples to other ALGC laboratories and external laboratories after project startup phase;
- Generate and reviews final report to ensure accuracy. Facilitate corrective action when needed.
- Prepare report narratives.
- Prepare invoices to customers and follows up on accounts receivable; and
- Approve the QAPP.

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A4.1.5 Laboratory QA Officer- Tonya King-Cormier

The Laboratory QA Officer has the overall responsibility for data after it leaves the laboratory and will communicate issues through the Laboratory Project Manager. In addition the QA Officer will:

- Overview laboratory quality assurance;
- Overview QA/QC documentation;
- Conduct data review;
- Determine whether to implement laboratory corrective actions, if required;
- Define appropriate laboratory QA procedures; and
- Approve the QAPP.

A4.1.6 Laboratory Sample Custodian – Edward Charles

The Sample Custodian will report to the Laboratory QA Officer and responsibilities will include:

- Receiving and inspecting the incoming sample containers;
- Recording the condition of the incoming sample containers;
- Signing appropriate documents;
- Verifying chain-of-custody and correctness;
- Assigning a unique identification number and customer number and entering each into the sample receiving log; and
- Control and monitor access and storage of samples.

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A5 PROBLEM DEFINITION / BACKGROUND

Analytical results were obtained during the data collection and reporting of Phase I. Analysis of the data indicated the information gathered was not sufficient to characterize the nature and extent of all contamination. Data collected during the RI/FS phases will allow assessment of human and ecological risks posed by the site. The information will then be utilized in determining an appropriate remedial response, if necessary.

A5.1 Problem Definition

The completed Phase I plan included both on-site and off-site sampling of soil, sediment, groundwater and surface water. The specific sampling rationale was described in detail in the approved Field Sampling Plan. Listed below is a summary of completed actions:

On-Site Phase I Sampling:

- Obtained surface and subsurface soil samples from one area of concern (AOC-1) within the former operating units (OU) and storage areas using judgmental sampling;
- Performed random grid sampling in on-site areas not associated with OUs or storage areas of the refinery;
- Obtained a composite surface and subsurface sample from random grid locations at the barge dock facility; and
- Installed, and sampled temporary groundwater monitor wells in the shallow aquifer.

Off-Site Phase I Sampling:

- Obtained random grid sediment samples from adjacent wetlands;
- Obtained judgmental sediment samples and seven surface and subsurface soil samples from locations adjacent to the underground pipelines and two former pipeline spill locations in the wetlands;
- Obtained surface water samples from adjacent wetlands;
- Obtained sediment samples and surface water samples from Redfish Bay adjacent to the barge docking facility;
- Obtained surface and subsurface soil samples from the neighborhood adjacent to the Refinery (Thayer Road);
- Obtained surface and subsurface soil samples from the neighborhood adjacent to the North Site (Bishop Road); and
- Obtained representative background samples of soil, sediment and surface water.

Phase II Investigation

The Phase II investigation may include the following activities:

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On-Site Phase II Investigation

- Install, develop, and sample permanent groundwater monitor wells;
- Sample surface and subsurface soil to complete the horizontal and vertical soil delineation; and
- Perform aquifer testing (if necessary).

Off-Site Phase II Investigation

- Collect additional samples to characterize soil, sediment, groundwater and surface water (if necessary);
- Install, develop, and sample permanent groundwater monitor wells;
- Sample biota (if necessary); and
- Evaluate suitable remedial alternatives, if needed.

After the work described in this Phase II plan is completed, the data will be merged with the Phase I data to ensure sampling and data quality objectives are met. If they are not, another mobilization and data collection effort will be recommended to the RPM.

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A6 DESCRIPTION OF PROJECT AND TASKS

The conceptual site model (CSM), provided in the QAPP, incorporates information obtained through review of project documents, available data and the results of Phase I. Preliminary contaminants of potential concern (COPC) for the site were identified from the document record and from Phase I results.

The COPCs to be sampled during Phase II include metals, volatile organic compounds (VOCs) and semi-volatile organic compounds (SVOCs). Areas of concern (AOC) have been assigned and are listed in Table 1 and depicted in Figure 1.

Objectives of Phase II include:

- Input Phase I data into Visual Sample Plan (VSP) software algorithms to statistically determine the minimum number of samples required to meet the Data Quality Objectives for the site;
- Define the nature and extent of contamination;
- Identify source areas which may continue to contaminate the site; and
- Obtain additional background data.

An updated project schedule is provided as Appendix A.

To obtain samples for Phase II sampling described in Table 2, the following tasks will be performed:

- Surface and subsurface soil sampling to define the extent of contamination to provide data for human health and ecological risk assessments and select an appropriate remedy, if needed;
- Groundwater sampling to determine COPCs and to delineate the extent of contamination and provide data for human health and ecological risk assessments and select an appropriate remedy, if needed;
- Sediment and surface water sampling to determine the nature and extent of contamination;
- Surface water sampling to determine COPCs and to delineate the extent of contamination and provide data for human health and ecological risk assessments and select an appropriate remedy, if needed;
- Background soil, groundwater, surface water and sediment sampling;
- Logging of soil borings to define the lithology; and
- Obtaining access agreements for off-site sample locations.

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A7 QUALITY OBJECTIVES AND CRITERIA

The EPA developed the Data Quality Objectives (DQO) Process to assure the appropriate type, quantity, and quality of data needed to support the decision is obtained. The project team developed this DQO plan, which will be iterative as additional data are obtained.

Also, Visual Sample Plan (VSP) was used in the DQO process.

A7.1 Data Categories

This element describes quality specifications at two levels:

- At the level of the decision or study question and
- At the level of the measurements used to support the decision or study question.

For this project, both screening-level and definitive data will be obtained to describe the two elements described above. Only definitive data will be used in the development of risk assessments.

Screening for the site will be limited to the use of a photoionization detector (PID) for soil and sediment and a water quality meter for general groundwater and surface water parameters. Procedures for use and data collection are described in SOPs. If additional sampling is necessary and the COPCs have been defined, future sampling may include on-site soil screening. If soil screening is used, the DQO process will be amended.

A7.2 Data Quality Objectives (DQO)

The QA objective for the project is to assure procedures used for field sampling, chain-of-custody documentation, laboratory analysis and reporting provide results of a known quality which can be used for the RI, human and ecological risk assessments and the FS.

The DQO process used in this RI follows *Data Quality Objectives Process for Hazardous Waste Site Investigations* EPA QA/G-4HW. The seven-step iterative process provides a systematic approach for defining criteria which satisfies a data collection design including: when, where and how to collect samples; determination of tolerable decision error rates and the number of samples to be collected.

A7.2.1 Step 1: State the Problem

Within Step 1 the planning team was selected and scoping meetings were held, the CSM was developed and available resources and constraints were described.

A7.2.1.1 Identify Members of the Planning Team

A revised project organization chart is provided as Appendix B**.**

A7.2.1.2 Develop the Conceptual Site Model (CSM)

As described in the approved QAPP dated August 24, 2007.

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A7.2.2 Step 2: Identify the Decision

There are four activities in this step:

- Identify the principal study question;
- Define the alternative actions;
- Combine the principal study question and alternative actions into a decision statement; and
- Organize multiple decisions.

A7.2.2.1 Identify the Principal Study Question (PSQ)

The principal study question (PSQ) for the Falcon Refinery RI is:

- Where do levels of preliminary COPCs exist either on- or off-site at concentrations above or below risk-based screening levels (RBSLs) and/or background concentrations along complete exposure pathways for relevant exposure scenarios?

Additional study questions:

- Where are COPC concentrations above or below human and ecological risk-based screening levels?
- What are the potential migration and exposure pathways and do the data indicate a possibility of COPCs being released from the site?
- What is the distribution of COPC risk drivers at the site, which will be used to determine the appropriate statistical parameters and the minimum number of samples required for Phase II of the RI and FS?

A7.2.2.2 Define Alternative Actions

The planning team will identify alternative actions (AA) which may be taken based on the outcome of the study while corresponding with the selected principal study question. In this early phase of the project, alternative actions may include:

- Recommending the site requires no further evaluation (AA-1);
- Recommending the some areas or pathways should be further assessed (AA-2);
- Recommend risks to human health or ecological receptors be further assessed (AA-3);
- Recommend adjoining facilities should be further assessed (AA-4); or
- Recommend a response action (AA-5).

A7.2.2.3 Consequences of Incorrectly Taking an Alternative Action

AA #	Alternative Action	Error if AA Incorrectly Taken	Consequences of Error	Severity of Consequences
1	No further action	Contaminated site left unabated.	Potential risk to human health and environment.	High
2	Additional assessment	Clean site undergoes additional sampling	Unnecessary financial impact	Moderate
3	Additional risk calculation	Clean site undergoes additional calculation	Unnecessary financial impact	Moderate
4	Adjoining facility assessment	Clean site undergoes additional sampling	Unnecessary financial impact	Moderate
5	Response Action	Clean site undergoes remedial action	Unnecessary financial impact	Moderate

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A7.2.2.4 Decision Statement (DS)

DS #1: Determine the nature and extent of any COPC on refinery property which is present at concentrations above or below risk-based screening levels and/or background concentrations along complete exposure pathways for relevant exposure scenarios and requires remedial action or no further action.

DS #2: Determine the nature and extent of any COPC in the wetlands, bay or neighborhoods adjacent to the refinery which is present at concentrations above or below risk-based screening levels and/or background concentrations along complete exposure pathways for relevant exposure scenarios and requires remedial action or no further action.

A7.2.3 Step 3: Identify Inputs to the Decision

The purpose of this step is to identify informational inputs needed to support the decision statement and to specify which inputs will require environmental measurements. This information is necessary so the proper data are collected to resolve the decision statement. To collect useful data to resolve the decision statement, the planning team should identify essential attributes. The action level, such as a soil screening level (SSL), PRG or ARAR, is another important input to be considered during this step.

A7.2.3.1 Identify the Information Required to Resolve the Decision Statement

Informational inputs necessary to resolve the decision statement include:

- **Mapping of specific on-site areas and locations to identify those requiring quantification of COPCs –** The HRS and site inspections have identified several areas of former operations and spills located at the refinery and along pipelines from the refinery. Complaints by neighbors have indicated additional areas of potential concern.
- **Determining concentrations of COPCs in all media of concern in each AOC –** Preliminary analytical results have identified VOCs, SVOCs, and metals at concentrations above laboratory detection limits. Next, approved laboratory sampling techniques will be employed to obtain more precise concentrations of reported COPCs. As instructed by EPA, "Concentrations will be compared to appropriate screening levels and background samples and the appropriate risk assessments, required by the NCP, will be performed."
- **Determining potential contaminant migration pathways –** Mapping will include site features, surface water drainage patterns, areas receiving complaints, and areas of visibly impacted soil. Also the hydrogeology will be defined to determine groundwater flow direction and if any impacted groundwater is leaving the refinery. Sediment and surface water in the wetlands and bay will also be evaluated.

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A7.2.3.2 Determine the Sources for Information Identified

The following information sources will be utilized:

- HRS Documentation Record, Falcon Refinery;
- 81 references cited in the HRS;
- Files related to spills in the area not included in the HRS;
- On- and off-site inspection data;
- Recent and historical aerial photographs;
- Door-to-door survey information regarding spill information and water well information;
- Information from former managers and workers at the facility;
- Regulatory files for adjacent facilities;
- Topographic and highway maps; and
- Results of Phase I.

A7.2.3.3 Identify the Information Needed to Establish the Action Level

Screening-level analyses will be performed to identify which of site-related chemicals tentatively identified during preliminary analyses must be evaluated further for human health and ecological risks.

To identify COPCs for human-health endpoints, reported concentrations will be compared to EPA Region 6 Medium-Specific Screening Levels (MSSLs) and TCEQ Tier 1 PCLs. For non-cancer effects, the hazard index should not be greater than 1. For cancer effects, carcinogens will be evaluated at a risk range of 1.0×10^{-4} to 1.0×10^{-6}. In other words, we will identify the subset of COPCs for which the cancer risk for any receptor is greater than 1 in 100,000 (one subset of COPCs) or between 1 in 100,000 and 1 in 1,000,000 (another subset of COPCs). For COPCs with cancer risks between 1.0×10^{-4} and 1.0×10^{-6} we will make recommendations pertinent to a risk management decision based on our understanding of the chemical's toxicology and site-specific exposure pathways.

EPA Region 6 and TCEQ ecological screening levels will be used for water, sediment and soil.

A7.2.3.4 Confirm the Appropriate Analytical Method

SW-846 methods will be used for both inorganic and organic constituents. Table 3 provides the appropriate method for each contaminant of potential concern (COPC).

As part of the selection process for COPCs, media-specific detection limits are compared with media-specific regulatory screening levels. The purpose of this comparison is to determine whether a given COPC's detection limit is sufficiently low to ensure there will be no non-cancer health hazards or elevated cancer risks in any exposed receptor at exposure levels below the detection limit (i.e., nondetects only). Contaminants not excluded by comparison with an appropriate screening level will be evaluated according to the full BHHRA process.

In Appendix B of the QAPP, media-specific detection limits for VOCs, SVOCs, metals, polychlorinated biphenyls (PCBs), pesticides, and herbicides which might reasonably be anticipated to be present at an oil refinery or a site for hazardous waste disposal (both applicable to the Falcon Site) are compared to media-specific ecological screening criteria derived from sources such as TCEQ ecological benchmarks, USEPA ambient water quality criteria, USEPA ecological soil screening criteria (Eco-SSLs), among others as indicated within the Appendix.

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In Appendix C of the QAPP, media-specific detection limits for the VOCs, SVOCs, metals, polychlorinated biphenyls (PCBs), pesticides, and herbicides which might reasonably be anticipated to be present at a site used as an oil refinery or for hazardous waste disposal (both of which apply to the Falcon Site) are compared to EPA Region 6 Human Health Media-Specific Screening Levels (MSSLs), TCEQ Tier 1 Protective Concentration Levels (PCLs), and EPA Maximum Contaminant Levels (MCLs) for drinking water.

A7.2.4 Step 4: Define the Boundaries of the Study

The purpose of this step is to clarify site characteristics which the environmental measurements are intended to represent. The set of circumstances to be covered by the decision include:

- Spatial conditions or boundaries of the site or release defining what should be studied and where samples should be taken and
- Temporal boundaries describing what the time frame of the study data should be and when the samples should be taken.

A7.2.4.1 Define the Sample Population of Interest

The sample population refers to the following media, each of which will be sampled during the RI:

- On-site (refinery property) soil and groundwater and
- Off-site soil, sediment and surface water.

A7.2.4.2 Define the Spatial Boundary

For Phase II of the RI, the spatial boundary includes all DS #1 on-site (refinery property) and DS #2 off-site AOCs. On-site activities will focus on soil to a depth of approximately eight feet below ground surface (bgs), which is the anticipated depth to groundwater in the shallow aquifer based on monitor well logs from an adjacent facility.

The off-site investigation will focus on surface and subsurface soil, groundwater, sediment and surface water. After the results of this Phase II sampling are completed, a decision will be made whether to include additional off-site areas.

A7.2.4.3 Define the Temporal Boundaries

Data will be obtained throughout a period of approximately two-months. On-site and off-site investigations will be conducted simultaneously. Criteria potentially affect the temporal boundaries include substantial rainfall and flooding in the wetlands and on-site.

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A7.2.4.4 Define the Scale of Decision Making

Decisions during the RI will be made based on the following area scales:

- On-site – where the initial decision-making scale will be based on judgmental sampling.
- On-site – where the decision-making scale will be based on composite random start systematic grid samples.
- Groundwater investigation – where the decision-making scale will be to go to the next water-bearing zone based on findings in the overlying shallow zone.
- Off-site wetlands investigation – where the decision-making scale will be the wetlands adjacent to the site and the wetlands leading to the bay, based on random start systematic grid samples.
- Off-site pipeline investigation – where the decision-making scale will be the pipelines leaving the refinery and connect to the current and former barge dock facility, based on judgmental sampling.
- Off-site soil investigation – where the decision-making scale will be two adjacent neighborhoods, based on judgmental sampling.
- Off-site sediment investigation (bay) – where the decision-making scale will be the sediments in Redfish Bay adjacent to the current and former barge docking facilities based on judgmental sampling.
- Off-site surface water sampling – where the decision-making scale will be surface water in the wetlands and bay, based on judgmental sampling and site conditions.

A7.2.4.5 Identify Practical Data Constraints

Potential on-site constraints potentially hindering sampling include:

- Presence of buildings, above ground storage tanks, above ground piping and former process equipment may prevent some soil and groundwater sampling;
- Active crude oil storage and transportation operations;
- Active removal action operations; and
- Underground utilities and piping may prevent sampling.

Potential off-site constraints potentially hindering sampling include:

- Restricted access to property by land owners;
- Flooding and drought in the wetlands; and
- Underground utilities.

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A7.2.5 Step 5: Develop a Decision Rule

The purpose of this step is to build on the previous components of the decision-making framework established in earlier steps of the DQO Process. Specifically, the planning team:

- Specifies statistical parameters used to characterize the sample population for the medium of interest;
- Specifies the action level for the decision;
- Confirms the action level is above measurement detection limits so reliable comparisons can be made; and
- Combines the statistical parameter, the scale of decision-making, and the action level into an unambiguous decision rule addressing the contamination problem.

A7.2.5.1 Specify the Statistical Parameters Characterizing the Population

Based on previous analytical results and reports of spills and releases, media to be evaluated under risk exposure scenarios include soil, sediment, groundwater and surface water. EPA Region 6 Human Health Medium-Specific Screening Levels (MSSLs), TCEQ Tier 1 PCLs, national primary drinking water standards and both EPA and TCEQ medium-specific ecological benchmarks will be used to define contaminants of potential concern (COPCs).

EPA risk-based screening approaches will be applied to the investigation. During the Phase II assessment, the approach will be a comparison of maximum observed concentrations to EPA Region 6 Human Health MSSLs (EPA 2002a), TCEQ Tier 1 PCLs (TCEQ 2007) and medium-specific ecological benchmarks (TCEQ 2006) to refine the list of COPCs.

For Phase II of the RI, the parameter which characterizes each population (medium) is the measured concentration in that medium. In subsequent phases, if the sample size is adequate, the parameter to characterize each population (medium) will include the 95-percent upper confidence level for a given exposure area. If the sample size is inadequate, the maximum concentration should be used as the parameter to characterize each population (medium). For Superfund risk assessments, required by the NCP, the concentration term in the intake equation is an estimate of the arithmetic average concentration for a contaminant based on a set of site sampling results. Because of the uncertainty associated with estimating the true average concentration at a site, the statistically-derived 95 percent upper confidence limit (UCL) of the arithmetic mean should be used for this variable. The 95 percent UCL provides reasonable confidence the true site average will not be underestimated. When determining maximum concentrations and 95% UCLs we will consider the size of the exposure area in accord with TCEQ guidance (TCEQ 2002).

The EPA's UCL exposure point concentration guidance document entitled *Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites* (OSWER 9285.6-10, December 2002) updates the May 1992 UCL guidance and provides alternative methods for calculating the 95% UCL. The statistical methods described in this guidance for calculating UCLs are based on the assumption of random sampling.

For sampling of surface waters and sediments we will ensure depositional areas are targeted and receptor exposure pathways are taken into account, in accord with TCEQ guidance (TCEQ 2002),
For the Phase II investigation, because of the possibility of other naturally occurring and anthropogenic sources of COPCs other than the site, background sampling is included. The mean concentration of the

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background results for soil and sediment will be compared to the mean of the similar depositional concentration to determine if site concentrations are statistically different from background concentrations.

A7.2.5.2 Identify ARARs

CERCLA §121(d) specifies on-site Superfund remedial actions must attain federal standards, requirements, criteria, limitations, or more stringent state standards determined to be legally applicable or relevant and appropriate to the circumstances at a given site. Such ARARs are identified during the RI/FS and at later stages during the remedy-selection process. For removal actions, ARARs are identified whenever practicable depending upon site circumstances. To be applicable, a state or federal requirement must directly and fully address the hazardous substance, the action being taken, and other circumstances pertinent to the site. A requirement which is not applicable may be relevant and appropriate if it addresses problems or pertains to circumstances similar to those encountered at a Superfund site.

Both chemical-specific and location-specific ARARs will be identified during the RI process and will be discussed with the project team during the Phase I scoping meeting after the Phase I data are gathered and the screening-level analysis is complete. Sources of chemical-specific ARARs include:

- Safe Drinking Water Act (42 U.S.C. 300(f)):
  - Maximum Contaminant Levels (MCLs) for chemicals, turbidity, and microbiological contamination; applicable to drinking water for human consumption (40 CFR 141.11-141.16).
  - Maximum Contaminant Level Goals (MCLGs) (40 CFR 141.50-141.51, 50 FR 46936).
- Clean Water Act (33 U.S.C. 1251).
- Requirements established pursuant to sections 301 (effluent limitations), 302 (effluent limitations), 303 (water quality standards, including State water quality standards), 304 (Federal water quality criteria), 306 (national performance standards), 307 (toxic and pretreatment standards, including Federal pretreatment standards for discharge into publicly owned treatment works, and numeric standards for toxics), 402 (national pollutant discharge elimination system, NPDES), 403 (ocean discharge criteria), and 404 (dredged or fill material) of the Clean Water Act, (33 CFR Parts 320-330, 40 CFR Parts 122, 123, 125, 131, 230, 231, 233, 400-469).
- Marine Protection, Research, and Sanctuaries Act (33 U.S.C. 1401).
- Toxic Substances Control Act (15 U.S.C. 2601).
- TCEQ regulatory guidance (TCEQ 2002) on developing protective concentration levels (PCLs) for COPCs in surface water and sediment for the protection of human and ecological receptors according to Texas Risk Reduction Program Rule 24 (TRRP-24).
- TCEQ regulatory guidance (TCEQ 2002) on developing source media PCLs for COPCs in soil and groundwater which may be released to surface water and sediment for the protection of human and ecological receptors according to TRRP-24.

A preliminary list of potential location-specific federal ARARs is presented in Table A7.2.1.2A.

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Table A7.2.1.2A. Potential Location-Specific Federal ARARs

Location	Citation
Within 100-year floodplain	40 CFR 264.18(a)
Critical habitat upon which endangered species or threatened species depend	Endangered Species Act of 1973 (16 USC 1531 et seq.) 50 CFR Part 200, 50 CFR part 402 Fish and Wildlife Coordination Act (16 USC 661 et seq.)
Wetlands	Clean Water Act section 404; 40 CFR Parts 230, 33 CFR Parts 320-330.
Within coastal zone	Coastal Zone Management Act (16 USC 3501 et seq.)

A7.2.5.3 Specify Risk-Based Screening Level for Decision

Screening levels will be evaluated using the sources described in Section A7.2.3.2 of this report and will be evaluated to the potential ARARs listed in Section A7.2.5.2. The following criteria will be used to specify the risk-based screening levels:

- Industrial exposure scenarios will be used on-site. The site will be deed recorded to only allow industrial uses for the land unless sampling data indicate the site meets residential criteria.
- EPA Region 6 residential MSSLs and TCEQ Tier 1 residential PCLs, whichever are more stringent, will be used for off-site human health exposures.
- TCEQ ecological screening levels will be used for off-site water, sediment and soil.

A7.2.5.4 Confirm that Risk-Based Screening Levels Exceed Measurement Detection Limits

Table 3 provides the analytical method to be used for each COPC. The practical quantitation limits for the listed methods are typically below the EPA Region 6 MSSLs, TCEQ PCLs and TCEQ ecological benchmarks as shown in Appendix B and C of the QAPP.

A preliminary analysis of analytical method requirements has been conducted. Quantitation limits associated with each analytical method have been compared to human health and ecological benchmark values.

In identifying analytical needs for the human health risk assessment, EPA Region 6 MSSLs based on residential soil exposure and ingestion of tap water (as published on December 14, 2006) were compared to SW-846 reporting limits for “low” soil and “low” water, respectively. In addition, MSSLs were also compared to “low” water and “low” soil using selective ion monitoring analysis (SIM). EPA’s MSSLs (revised May 4, 2007) are based on achieving an excess cancer risk of 1.0×10^{-6} or a non-cancer Hazard Quotient of 1.0.

For non-detected COPCs where the detection limits exceed the cancer or non-cancer screening values (1.0×10^{-6} excess cancer risk or a Hazard Quotient of 1, respectively), the concentration will be reported as ½ of the detection limit and compared to the cancer or non-cancer screening values, as appropriate, and carried forward into the risk assessment. Discussions will be held with EPA risk assessors concerning these situations, which will also be described in the uncertainty analysis section of the HHRA and ERA.

A7.2.5.5 Combine Outputs and Develop Decision Rule

The decision rules for Phase II of the site RI are as follows:

Horizontal delineation determination will be made on-site through the use of judgmental and random start grid sampling in the OU areas of the site and random grid sampling in the on-site non-OU areas of the

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facility. As a result, the site boundary serves as the horizontal boundary. If outer perimeter samples are found to be above the appropriate risk-based screening level and background concentrations, then off-site sampling will be performed in addition to listed off-site sampling locations during Phase II. Off-site sampling at property not controlled by NORCO will be screened to residential standards. If concentrations are below risk-based screening levels or background levels, then the horizontal extent will be defined.

Vertical delineation determination will be determined through the sampling of soil borings or through the use of a Geoprobe®. Sample intervals will include a surface soil sample and a subsurface soil sample to determine the depth of impact based on PID readings, visual observation, the groundwater interface and risk assessment parameters.

Groundwater delineation of the shallow aquifer will be accomplished through the gauging and sampling of the temporary monitor wells. Potentiometric surface elevation data will be used to determine the groundwater gradient and direction. Analytical results will be compared to COPCs and if perimeter monitor wells have concentrations exceeding the appropriate risk-based human health or ecological risk level and the background concentration, then off-site monitor wells will be installed. Otherwise, if concentrations are found to be below risk-based levels or site-specific background levels, then the horizontal extent will have been defined.

During Phase I sampling, some COPCs were detected in the groundwater. During Phase II, permanent monitor wells will be installed. If the results of sampling from the monitor wells indicate COPCs then additional monitor wells will likely be installed.

If COPCs having a specific gravity in excess of 1.0 are detected in the groundwater from the monitor wells, then additional sampling of deeper aquifers will be performed.

Wetlands delineation of any COPCs will be based on the random grid sampling plan in the FSP. Sampling results will be compared to risk-based residential human health screening levels, ecological levels and site-specific background levels. If samples are found to be above the appropriate risk-based screening level and background concentrations, then additional wetlands sampling will likely be performed.

A7.2.6 Step 6: Specify Tolerable Limits on Decision Error

The purpose of this step is to specify quantitative performance criteria for the decision rule expressed as probability limits on potential errors in decision-making. The probability limits on decision errors specify the level of confidence desired in conclusions drawn from site data.

In this step, the following activities will be conducted:

- Determine possible range of parameters of interest;
- Define both types of decision errors and their potential consequences and select the baseline condition;
- Specify a range of possible parameter values where the consequences of a false negative decision are relatively minor (gray region); and
- Assign probability values to point above and below the risk-based screening level reflecting the tolerable probability for the occurrence of decision errors.

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A7.2.6.1 Determine the Parameters of Interest

Based on knowledge of activities at the site and analytical data from Phase I, the parameters of interest for sampling during Phase II are metals, VOCs and SVOCs. The list will be evaluated after the completion of Phase II of the RI.

A7.2.6.2 Define Decision Errors, Potential Consequences and the Baseline Condition

The probability of making a decision error can be controlled by adopting the scientific method of hypothesis testing. The decision error resulting in the most severe consequence is used to establish the null hypothesis (H_o), which is the condition of the site assumed to be true unless the data convincingly demonstrate otherwise. The alternative hypothesis (H_a) states the opposite of the null hypothesis. For example, suppose the decision not to clean up a contaminated site has more severe consequences than the decision to clean up an uncontaminated site. In this case, the null hypothesis would be the site was contaminated. This assumption will be maintained unless the sample data convincingly demonstrate otherwise.

A decision error occurs when the decision-maker rejects the true null hypothesis or fails to reject the false null hypothesis. The terms “false-positive” and “false-negative” are sometimes used to describe these types of decision errors. Statisticians refer to false-positive and false-negative decision errors as “Type I” and “Type II” errors, respectively, or as α and β errors respectively.

If the decision-maker assumes a site is clean until proven to be contaminated (i.e., H_o = site is clean; H_a = site is contaminated), then a false-positive error would conclude a clean site is contaminated, and a false-negative error would conclude a contaminated site is clean. On the other hand, if the decision-maker assumes a site is contaminated until proven to be clean (i.e., H_o = site is contaminated; H_a = site is clean), then a false-positive error would conclude a contaminated site is clean, and a false-negative error would conclude a clean site is contaminated.

The four boxes below represent the four hypothetical conditions potentially existing when environmental decision-making is based on environmental measurements and the true condition of the site is unknown. The two gray boxes in the figure indicate the conditions where erroneous decisions are made, and the two white boxes indicate the conditions where correct decisions are made.

The true condition is that the site is contaminated. The data show that the site is contaminated. **Data lead to a correct decision.**	The true condition is that the site is not contaminated. The data show that the site is contaminated. **Data lead to an erroneous decision that is costly in terms of unnecessary cleanup.**
The true condition is that the site is contaminated. The data show that the site is not contaminated. **Data lead to an erroneous decision of no remedial action, which leads to increased risk to human health and environment.**	The true condition is that the site is not contaminated. The data show that the site is not contaminated. **Data lead to a correct decision.**

To avoid an erroneous decision based on a false negative, our H_o for the site is the site is contaminated.

A7.2.6.3 Specify a Gray Region

The gray region is one component of the quantitative decision performance criteria specifically used to

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limit an impractical and non-feasible number of samples. The gray region is a range of true parameter values within the alternative condition near the Action Level where it is "too close to call." This gray region is where sampled data may correctly reject the baseline condition, but the sampled data frequently does not provide sufficient evidence to be overwhelming. In essence, the gray region is an area where it is not considered feasible to control the false acceptance decision error limits to lower levels because the high costs of sampling and analysis outweigh the potential consequences of choosing the wrong course of action. In identifying a gray region width for calculating the minimum number of samples for a site, there are several methods reflecting different purposes in the data analysis. The two approaches used for this site are discussed below:

When calculating the minimum number of samples necessary to differentiate between an analyte average concentration (arithmetic mean) and the analyte screening level, the gray region width (delta) is usefully defined as the difference between the screening level and the analyte average concentration. In this site analysis, delta subtracted from the screening level can be thought of as the minimum value above which decision makers will accept mis-classifying a clean site as contaminated. This method of identifying delta is useful when the analyte mean is significantly different from the screening level and the standard deviation is moderate. However, very large minimum sample quantities result when the analyte mean is nearly the same as the screening value and the standard deviation is larger than delta.

When evaluating the minimum number of samples independently of the analyte mean, delta can be defined as a fraction of the screening value. Recommendations for these delta values range from 0.2 to 0.95 of the screening value. In the analysis of site Phase I data, delta was identified as half of the screening level. This method of identifying delta is useful when the screening value is large relative to the standard deviation and the analyte mean is unknown. However, when half of the screening value (delta) is nearly the same or less than the standard deviation, a very large number will be calculated for the minimum sample quantity.

When a large minimum sample quantity was calculated, best professional judgment was used in proposing a minimum sample quantity based upon a review of the data for indications of localized high concentrations (hot spots) as well as weighing the impact fewer samples would have on site management decisions (i.e. analyte mean relative to expected background concentrations).

Decisions to remediate any portion of the site will be based on the HHRA and the ERA, required by the NCP, and not on screening level exceedence.

A7.2.6.4 Assign Probability Values to Points Above and Below Risk-Based Screening Level

A decision-error limit is the probability a decision error may occur for a specific value of the parameter of interest when making the decision using sampled data. This probability is an expression of the tolerance for uncertainty, but does not imply a decision error will occur.

Probability values are points assigned above and below the risk-based screening level, either human health or ecological screening level, and reflect the decision-maker’s tolerance for uncertainty, but do not imply a decision error will occur. Based on selected tolerable limits, the VSP program will be used to evaluate the feasibility of selected limits on error. As a baseline for determining limits on error, concentrations of COPCs both on- and off-site will be obtained from historical and Phase I sampling results. In the assessment of the sample number, using the VSP program, the appropriate screening levels will be used as the screening limit.

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A7.2.7 Step 7: Optimize Design for Obtaining Data

Activities in this step include:

- Reviewing existing environmental data including Phase I results;
- Developing general data collection design alternatives;
- Calculating the number of samples to be taken; and
- Selecting the most resource-effective data collection design.

A7.2.7.1 Review Existing Environmental Data

Outputs from previous DQO steps were reviewed to develop the data collection design in the following ways:

- Inputs, boundaries, and decision rules were used to determine the type, location, number and timing of samples and
- Limits on decision errors will provide information for selecting the number of samples to be collected and the number of analyses per sample.

In addition, data collected from several different historical sampling events provided limited information to be used in the design step.

A7.2.7.2 Develop General Data Collection Design Alternatives

Phase I

In this step, general data collection designs were evaluated by the project team and a combination of judgmental, random-start sampling grid and composite methods were selected based on site-specific information.

Records were available describing spills and releases at the site. In addition, visual contamination is evident. Based on these facts, the project team selected judgmental sampling in areas with historical releases and random-start grid sampling in areas for which there was insufficient data to choose specific sampling points.

The project team recognized judgmental sampling would result in conservatively biased sampling design. However, given the data, judgmental sampling was chosen in certain instances. TRRP guidance on statistical methods and assumptions will be consulted regarding the design of sampling protocols (*Determining Representative Concentrations*, RG-366/TRRP-15).

For areas without release information, the planning team decided to focus on a systematic grid sampling approach using a random-start sampling grid. This sampling scheme was the most practical and efficient sampling approach to achieve the off-site RI sampling objectives. This random/systematic approach would (1) achieve a uniform spread of sampling points, (2) easily define the largest unsampled area, (3) permit uncomplicated collection of stratified samples for the investigation of vertical extent, and (4) be easy to apply in the field.

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Judgmental sampling was also chosen:

- In the wetlands along the pipelines connecting the refinery to the former and current barge dock facilities;
- In Redfish Bay to obtain samples adjacent to the former and current barge dock facilities; and
- In residential areas to ensure sampling at areas where COPCs had been observed.

Surface water sampling locations will be selected in the field based on conditions encountered on the sampling day.

Phase II

For Phase II sampling of surface soil, subsurface soil, groundwater, sediments and surface waters, additional sample locations were identified with VSP using random start grid placement. Provided in the Field Sampling Plan Addendum No. 1 are the VSP analyses used in the development of this sampling plan. If after the completion of the sampling described in Addendum No.1, and the sample size does not meet the DCO, then additional sampling will be proposed to the RPM.

A7.2.7.3 Select Sample Size that Satisfies the DQO

Phase I limited data, consisting predominantly of the data from the HRS, was used to determine the appropriate sample size. Since the goal of the HRS was different than that of the RI, the data were not appropriate to determine sample size.

Data from the Phase I RI were reviewed, and an analysis was made in VSP to determine if an adequate number of samples exist and the DQO process will be reexamined. Described in this section are the numbers of samples for each AOC, for Phase II.

AOC-1

AOC-1 is comprised of the North Site and the OU portions of the South Site; each will be discussed in this section.

A total of 14 random start grid surface soil and subsurface soil samples (Two from the North Site and 12 from the South Site) will be obtained to assess areas suspected of having had a historic release and discolored areas within former OUs (Figure 2). This area has been designated as AOC-1.

There are two random start grid locations (G2-01S and G2-02S) at the North Site, to characterize possible soil contamination as a result of releases from product storage, pipelines, the former oil and fuel storage racks, storm water run-off, the adjoining Plains site and a former surface impoundment.

There are 12 random start gird sampling locations (G2-03S through G2-14S) at the South Site to characterize possible soil contamination as a result of releases from product storage, pipelines, drums, debris, storm water run-off, an aeration pond and spent soil placed in berms.

Due to shallow groundwater depth, less than eight feet, two soil samples will be obtained for laboratory analysis from each boring. Samples will be obtained from the surface to 0.5 feet and from the interval with the highest photoionization detector (PID) reading. In the event of no PID readings, a soil sample from the groundwater interface or at a depth of five feet will be obtained. Samples will be analyzed in a fixed laboratory for metals, VOCs and SVOCs as shown in Table 2. Each boring will be advanced a minimum of five feet below the initial contact with groundwater.

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The objectives of on-site groundwater investigation are to determine whether site activities have impacted the shallow aquifer, deeper aquifers and to characterize basic hydrogeology of the site. Groundwater sampling during the Phase II investigation will be accomplished with permanent monitor wells at seven locations. Groundwater samples collected from the permanent monitor wells will be analyzed for metals, SVOCs, and VOC.

Locations for the permanent monitor wells (Figure 2) were selected by VSP using a random start grid pattern, including one at the North Site (MW01-01) and six at the South Site (MW02 through MW07). Groundwater samples will be analyzed in a fixed laboratory for metals, VOCs and SVOCs. as shown in Table 2. The groundwater data will be used to evaluate human health risk via the groundwater pathway and may be used to evaluate ecological risk through groundwater discharging to surface water. Monitor well installation, surveying and groundwater sampling will be conducted in accordance with the protocols discussed in Appendix A of the FSP.

AOC-2

Sampling objectives for the non-OU, on-site soil sampling, include determining the nature and extent of any contamination and collecting sufficient data of appropriate quality to assess whether the site poses risk to either human or ecological populations.

During Phase I, composite sampling was performed and only arsenic analysis was detected above the appropriate screening level. Several COPCs were analyzed below the MDL, yet the MDL exceeded screening criteria.

For Phase II, there are four random start grid sampling locations (Figure 3) at AOC-2 (G2-15S through G2-18S) selected at AOC-2 by the Visual Sampling Plan (VSP), which is comprised of non-OU areas of the site having no history of releases. Samples will be obtained from the surface to 0.5 feet and from the interval with the highest photoionization detector (PID) reading. In the event of no PID readings, a soil sample from the groundwater interface or at a depth of five feet will be obtained. Discrete surface and subsurface samples will be obtained from five sample locations. Samples will be analyzed in a fixed laboratory for metals, VOCs and SVOCs, as shown in Table 2.

AOC-3

Sampling objectives for off-site sediment sampling include determining the nature and extent of contamination and collecting sufficient data of appropriate quality to assess whether the site poses risk to either human or ecological populations.

For AOC-3, six random start grid sediment sampling locations (G2-01SD through G2-06SD) were selected utilizing VSP (Figure 4). Analysis of Phase I results indicated no additional sediment sampling was necessary; however, six locations have been selected to compare analytical results striving to attain MDLs lower than screening criteria.

Samples will be obtained from the sediment, or soils if the random wetland location is not inundated, in the 0.0 to 0.5 foot interval and will be analyzed in a fixed laboratory for metals, VOCs and SVOCs, as shown in Table 2.

Within AOC-3, surface water samples will be obtained from 16 locations (G2-01SW through G2-16SW) and analyzed for metals, VOCs and SVOCs. Specific sampling locations will be selected based on surface

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water conditions at the time of sampling.

The wetlands adjacent to the site are frequently dry and change configuration. Prior to sampling, the area within AOC-3 having surface water will be mapped and VSP will be used to select 16 random start grid locations and the RPM will be notified of the selected sampling locations.

All surface water sampling for metals will follow Chapter 5 of the TCEQ's guidance titled *Surface Water Quality Monitoring Procedures, Volume 1: Physical and Chemical Monitoring Methods*, RG-415; October 2008.

Based on the results of Phase I sampling and analysis, additional surface and subsurface soil sampling may be necessary to meet the DQO. However, surface and subsurface sampling results were based on judgmental samples along pipelines located adjacent to and in the wetlands. Due to limited area available for soil sampling, none are recommended at this time. After the proposed sampling addressed in Addendum No. 1 is completed, another evaluation will be made of the surface and subsurface soil in AOC-3 to determine if the DQO can be met. If not, additional sampling will be recommended to the RPM.

AOC-4

Sampling objectives for AOC-4 include determining the nature and extent of any contamination and collecting sufficient data of appropriate quality to assess whether the site poses risk to either human or ecological populations.

Similar to AOC-2, composite sampling was performed at AOC-4. Results of the sampling indicated several COPCs were detected above screening criteria. Five random start grid sampling locations (Figure 5) have been selected at AOC-4 (G2-19S through G2-23S). Samples will be obtained from the surface to 0.5 feet and from the interval with the highest photoionization detector (PID) reading. In the event of no PID readings, a soil sample from the groundwater interface or at a depth of five feet will be obtained. Discrete surface and subsurface samples will be obtained. from five sample locations. Samples will be analyzed in a fixed laboratory for metals, VOCs and, SVOCs, as shown in Table 2.

AOC-5

Sampling objectives for off-site sediment sampling include determining the nature and extent of contamination and collecting sufficient data of appropriate quality to assess whether the site poses risk to either human or ecological populations.

For AOC-5, seven random start grid sampling locations (G2-07SD through G2-13SD) were selected utilizing VSP, due to several detections above screening criteria (Figure 6). With the three results from Phase I, there will be a total of ten samples, allowing adequate statistical analysis of sampling data.

Samples will be obtained from sediment in the 0.0 to 0.5 foot interval and will be analyzed in a fixed laboratory for metals, VOCs and SVOCs as shown in Table 2.

AOC-6

No additional sampling is recommended in AOC-6 at this time. After sampling described in FSP Addendum No.1 is completed, the data from AOC-6 will be evaluated to determine if additional sampling is necessary to meet the DQO.

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AOC-7

No additional sampling is recommended in AOC-7 at this time. After sampling described in FSP Addendum No.1 is completed, the data from AOC-7 will be evaluated to determine if additional sampling is necessary to meet the DQO.

A7.2.7.4 Select Most Resource-Effective Design which Satisfies the DQO

Based on prior analytical sampling and historical information concerning the site, the design outlined in Table 2 provides the most resource-effective design for the DQOs for this phase of the project.

The sampling design was chosen based on VSP analysis of Phase I data and professional judgment.

A7.2.7.5 Document the Operational Details in the FSP and QAPP

All items in this QAPP, QAPP Addendum, FSP and FSP Addendum provide documentation of the final design and discussions of the key assumptions supporting the sampling design.

A7.3 Quality Assurance Objectives for Measurement Data

As described in the approved QAPP dated August 24, 2007.

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A8 SPECIAL TRAINING AND CERTIFICATION

As described in the approved QAPP dated August 24, 2007.

A9 ANALYTICAL DATA DOCUMENTATION AND RECORDS

As described in the approved QAPP dated August 24, 2007.

B1 SAMPLING PROCESS DESIGN

Sampling activities for the project are described in the site-specific FSP and FSP Addenda, which discuss the sample network design and rationale, including (1) the types of samples to be collected, (2) sampling locations, (3) sampling frequencies, (4) sample matrices, and (5) measurement parameters.

The sample network design and rationale was coordinated with the DQO process as described in Section A7 and presented in Table 2, which summarizes the sampling design discussed in the FSP and outlines the sampling scheme for investigation samples, remedy samples, and IDW.

QA objectives for the sampling and analysis program are as follows:

- Obtain samples representative of the media being sampled;
- Obtain a sufficient number of samples to make informed RI decisions;
- Obtain a sufficient amount of representative analytical data to meet sampling objectives;
- Obtain measurements of acceptable quality for the intended use of the data;
- Analyze samples using methods appropriate for the intended use of the data; and
- Obtain analytical data of a sufficient amount and quality to evaluate human health and ecological risks.

Because the sampling design scheme is fully discussed in the FSP and in Section A7 of this document, no further discussion is required in this section.

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B2 SAMPLING METHODS

Sampling methods and equipment were selected to meet project objectives. The field sampling team will collect samples in accordance with methods described in the site-specific FSP and FSP Addenda and the procedures outlined in SOPs listed in the FSP. The FSP describes (1) sampling methods and requirements, (2) methods used to select sampling locations for various matrices, and (3) sampling equipment. The site-specific FSP describes procedures for providing unique sample identification numbers, which will enable personnel to correlate analytical results and field information with sampling locations and field monitoring stations.

If failures in the field sampling or measurement systems are detected, TRC will implement corrective actions in these situations. In general, corrective actions for field sampling and measurement failures include recalibration of instruments, replacement of malfunctioning measurement instruments or sampling equipment, and repeated collection of samples or repetition of measurements.

B2.1 Sample Container, Volume, Preservation, Holding Time Requirements and Detection Limits

Table 4 specifies the required sample volume, container type, preservation technique, and holding time for each analysis to be conducted on each sample matrix to be analyzed. The table addresses all sample matrices and provides information for organic and inorganic parameters in each matrix.

Required containers, preservation techniques, and holding times for field QC samples, such as field duplicates, field blanks, trip blanks, and matrix spike (MS/MSD) samples, will be the same as for field samples.

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B3 SAMPLE HANDLING AND CUSTODY REQUIREMENTS

As described in the approved QAPP dated August 24, 2007.

B4 ANALYTICAL METHODS REQUIREMENTS

Analytical methods are specified on Table 3 and justified through the DQO process. Analytical methods recommended for guidance by the EPA for fixed location laboratories are listed in SW-846. The following procedures will be used to prepare and analyze soil and waste samples for this project. The reporting limits (RLs), QC procedures and data validation guidelines are provided. Analytical methods, method detection limits (MDL) and RLs are presented as Appendix B and C of the QAPP.

If an analytical system fails, the QA officer will be notified, and corrective action will be taken. In general, corrective actions will include stopping the analysis, examining instrument performance and sample preparation information, and determining the need to re-prepare and reanalyze the samples.

Laboratories will conduct definitive laboratory analysis of samples. Table 3 lists the laboratory analytical methods for this project. In all cases, appropriate methods of sample preparation, cleanup, and analyses are based on specific analytical parameters of interest, sample matrices, and required quantitation limits.

Modifications to analytical methods which may be required to handle atypical matrices or to achieve low quantitation limits are presented in this section. Decisions regarding the use and type of method modifications will be made during the procurement of laboratories, since different laboratories have equipment and SOPs producing varying quantitation limits.

B4.1 Metals

Total Target Analyte List (TAL) metals will be analyzed in all matrices collected for this project. Dissolved metals analysis in addition to total metals will be conducted on surface water samples for the ERA. Samples will be analyzed using inductively-coupled plasma (ICP) atomic emission spectroscopy (AES), ICP mass spectrometry (ICP-MS), and cold vapor atomic absorption (CVAA) techniques. Table 3 lists the recommended analytical technique for each metal; however, many ICP AES instruments may be capable of achieving the required PQL without use of the ICP-MS, so the laboratory will be given the option to use either technique, as long as the required PQL is achievable. Mercury will be analyzed by cold vapor technique (CVAA).

Contaminants will be (1) transferred from the solid and aqueous sample matrices to the aqueous phase by digesting with dilute acid and (2) analyzed using SW-846 6010/7470/7471 for metals. Quantitation of metals will be conducted using external and internal calibration standards as dictated by the method. Sample results will be reported in milligrams per kilogram (mg/kg) dry weight for solid and waste matrices and micrograms per liter (µg/L) in aqueous matrices.

If modifications to any of the listed methods are required to achieve lower detection limits or to mitigate matrix interference, the laboratory will (1) document, in the case narrative, any modifications to the methods and (2) prepare all associated QC samples with identical modifications.

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B4.2 Volatile Organic Compounds

VOCs will be analyzed in all matrices collected for this investigation using gas chromatography and mass spectrometry (GC/MS). Contaminants will be (1) transferred from the sample matrix to the gaseous phase by purging with inert gas and (2) analyzed under SW-846 8260B for low-concentration waters. Quantitation of VOCs will be conducted using external and internal calibration standards as dictated by the method. Samples will be reported in micrograms per kilogram (µg/kg) dry weight for solid and waste matrices and µg/L in aqueous matrices.

If modifications to any of the listed methods are required to achieve lower detection limits or to mitigate matrix interference, the laboratory will (1) document, in the case narrative, any modifications to the methods and (2) prepare all associated QC samples with identical modifications.

B4.3 Semi-Volatile Organic Compounds

SVOC will be analyzed in all matrices for this investigation using GC/MS. Contaminants will be transferred from the sample matrix to a solvent phase and analyzed using organic solvents according to SW-846 8270C for low-concentration waters. The resulting solvent extract will be analyzed using GC/MS. Quantitation of SVOCs will be conducted using external and internal calibration standards as dictated by the method. Samples will be reported in µg/kg dry weight for solid and waste matrices and in µg/L for aqueous matrices.

If modifications to any of the listed methods are required to achieve lower detection limits or to mitigate matrix interference, the laboratory will (1) document, in the case narrative, any modifications to the methods and (2) prepare all associated QC samples with identical modifications.

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B5 QUALITY CONTROL

As described in the approved QAPP dated August 24, 2007.

B6 INSTRUMENT AND EQUIPMENT TESTING, INSPECTION AND MAINTENANCE REQUIREMENTS

As described in the approved QAPP dated August 24, 2007.

B7 INSTRUMENT/EQUIPMENT CALIBRATION AND FREQUENCY

As described in the approved QAPP dated August 24, 2007.

B8 REQUIREMENTS FOR INSPECTION AND ACCEPTANCE OF SUPPLIES AND CONSUMABLES

As described in the approved QAPP dated August 24, 2007.

B9 NONDIRECT MEASUREMENTS

As described in the approved QAPP dated August 24, 2007.

B10 DATA MANAGEMENT

As described in the approved QAPP dated August 24, 2007.

C1 ASSESSMENT AND RESPONSE ACTIONS

As described in the approved QAPP dated August 24, 2007.

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C2 REPORTS TO MANAGEMENT

As described in the approved QAPP dated August 24, 2007.

D1 DATA REVIEW AND REDUCTION REQUIREMENTS

As described in the approved QAPP dated August 24, 2007.

D2 VALIDATION AND VERIFICATION METHODS

As described in the approved QAPP dated August 24, 2007.

D3 RECONCILIATION WITH DATA QUALITY OBJECTIVES

As described in the approved QAPP dated August 24, 2007.

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Figures

Figure 1	Area of Concern Map
Figure 2	Area of Concern 1 Sampling Location Map
Figure 3	Area of Concern 2 Sampling Location Map
Figure 4	Area of Concern 3 Sampling Location Map
Figure 5	Area of Concern 4 Sampling Location Map
Figure 6	Area of Concern 5 Sampling Location Map

Legend

- Area of Concern (AOC) Boundary

Active NORCO Pipeline

- Above Ground
- Underground

Abandoned NORCO Pipeline

- Above Ground
- Underground

Outside Operations

- Gulf South Pipeline
- Boss Pipeline
- Gathering Line 2'
- Plains Marketing Pipeline

Source: National Agriculture Imagery Program (NAIP), 2009.

N

400 0 400

Feet

AREA OF CONCERN MAP

FALCON REFINERY
INGELSIDE, SAN PATRICIO COUNTY, TEXAS

PROJECT NO.: 182978 | DATE: 3/10/2011

TRC
505 EAST HUNTLAND DRIVE
SUITE 250
AUSTIN, TEXAS 78752
512-329-6080

FIGURE
1

Legend

- Proposed Soil Sample Location
- Proposed Monitor Well Location
- AOC 1 Boundary

Source: National Agriculture Imagery Program (NAIP), 2009.

N

400 0 400

Feet

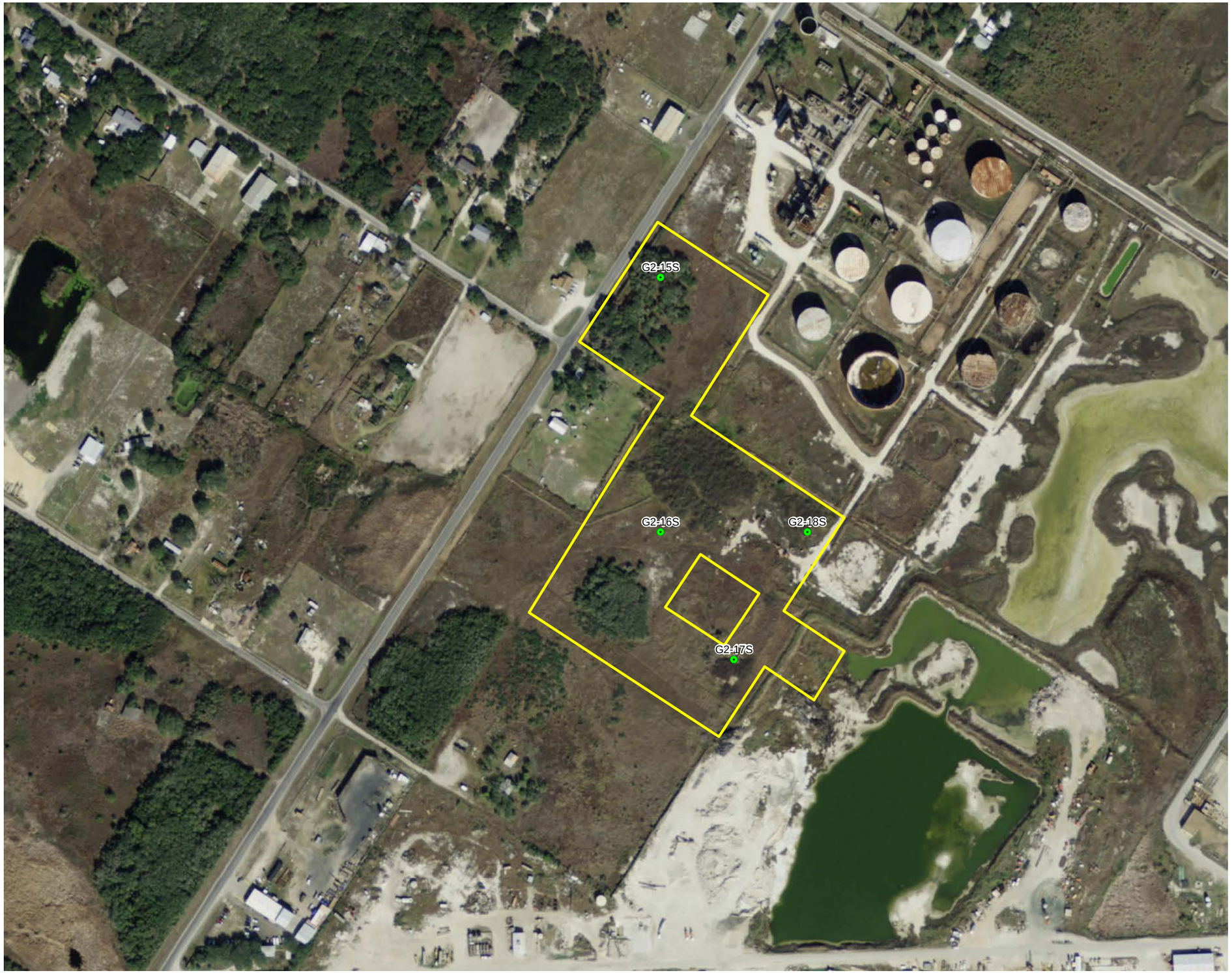
AOC 1
PROPOSED SAMPLE LOCATIONS

FALCON REFINERY
INGELSIDE, SAN PATRICIO COUNTY, TEXAS

PROJECT NO.: 182978 | DATE: 3/10/2011

TRC
505 EAST HUNTLAND DRIVE
SUITE 250
AUSTIN, TEXAS 78752
512-329-6080

FIGURE
2



Legend

- Proposed Soil Sample Location
- AOC 2 Boundary

Source: National Agriculture Imagery Program (NAIP), 2009.

N

400 0 400

Feet

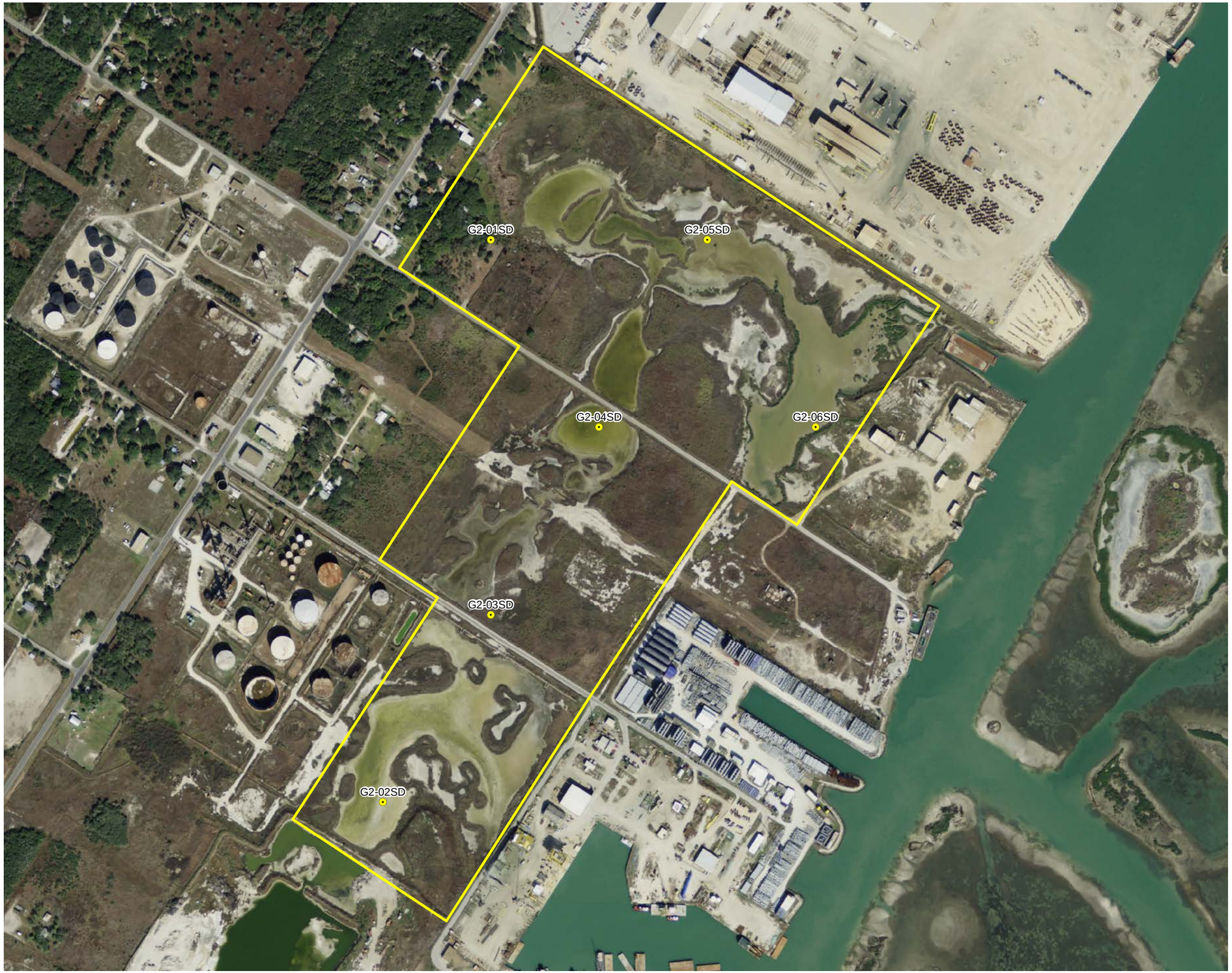
AOC 2
PROPOSED SAMPLE LOCATIONS

FALCON REFINERY
INGELSIDE, SAN PATRICIO COUNTY, TEXAS

PROJECT NO.: 182978 | DATE: 3/10/2011

TRC
505 EAST HUNTLAND DRIVE
SUITE 250
AUSTIN, TEXAS 78752
512-329-6080

FIGURE 3



Legend

- Proposed Sediment Sample Location
- AOC 3 Boundary

Source: National Agriculture Imagery Program (NAIP), 2009.

N

500 0 500

Feet

AOC 3
PROPOSED SAMPLE LOCATIONS

FALCON REFINERY
INGELSIDE, SAN PATRICIO COUNTY, TEXAS

PROJECT NO.: 182978 | DATE: 3/10/2011

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512-329-6080

FIGURE
4

Legend

- Proposed Soil Sample Location
- AOC 4 Boundary

Source: National Agriculture Imagery Program (NAIP), 2009.

N

200 0 200

Feet

AOC 4
PROPOSED SAMPLE LOCATIONS

FALCON REFINERY
INGELSIDE, SAN PATRICIO COUNTY, TEXAS

PROJECT NO.: 182978 | DATE: 3/10/2011

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FIGURE
5

Legend

- Proposed Sediment Sample Location
- AOC 5 Boundary

Source: National Agriculture Imagery Program (NAIP), 2009.

N

500 0 500

Feet

AOC 5
PROPOSED SAMPLE LOCATIONS

FALCON REFINERY
INGELSIDE, SAN PATRICIO COUNTY, TEXAS

PROJECT NO.: 182978 | DATE: 3/10/2011

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505 EAST HUNTLAND DRIVE
SUITE 250
AUSTIN, TEXAS 78752
512-329-6080

FIGURE
6

Tables

Table 1	Areas of Concern
Table 2	Sampling and Design Matrix
Table 3	Screening and Analytical Methods
Table 4	Sample Volumes, Containers, Preservatives, and Holding Times

TABLE 1
AREAS OF CONCERN
FALCON REFINERY SUPERFUND SITE
INGLESIDE, TEXAS

AOC	LOCATION		SURFACE WATER SAMPLE NUMBER	SAMPLE LOCATION NUMBER	MONITOR WELL/GROUNDWATER LOCATONS	COPCs
1N	North section of the Refinery complex, on the northeast side of the FM 2725/Bishop Rd. intersection.	Surface Soil Subsurface Soil Groundwater		G2-01S - G2-04S	MW01-01 - MW01-02	Metals VOCs SVOCs PCBs Pesticides
1S	South section of the Refinery complex, on the southwest side of the FM 2725/Bishop Rd. intersection.	Surface Soil Subsurface Soil Groundwater		G2-05S - G2-24S	MW-03 - MW-07	Metals VOCs SVOCs PCBs Pesticides
2	On-site non-process areas, west of the south section of the Refinery complex.	Surface Soil Subsurface Soil		G2-25S - G2-28S		Metals VOCs SVOCs PCBs Pesticides
3	Wetlands	Surface Soil Subsurface Soil Sediment Surface Water	G2-01SW - G2-16SW	G2-01SD - G2-06SD		Metals VOCs SVOCs PCBs Pesticides
4	Current barge docking site	Surface Soil Subsurface Soil		G2-29S - G2-33S		Metals VOCs SVOCs PCBs Pesticides
5	Redfish Bay adjacent to current barge docking facility	Sediment Surface Water		G2-07SD - G2-13SD		Metals VOCs SVOCs PCBs Pesticides
6	Neighborhood **					
7	Neighborhood **					
BG	To be determined	Surface Soil Subsurface Soil Groundwater Sediment Surface Water	BG-15SW - BG20-SW	BG-09S - BG-14S BG-15SDW - BG-20SDW BG-21SDI - BG-26SDI	TWBG-09 - TWBG-14	Metals VOCs SVOCs

* Due to flucuations in surface water locations within wetlands, exact locations are not listed.
** May require sampling after Phase II addendum No. 1

AOC	Area of Concern
COPC	Contaminant of Potential Concern
VOC	Volatile Organic Compound
GW	groundwater
BKG	Background
SVOC	Semi-volatile Organic Compound
SD	Sediment
SW	Surface water

TABLE 2
SAMPLING AND DESIGN MATRIX
FALCON REFINERY SUPERFUND SITE
INGLESIDE, TEXAS

SAMPLING TYPE	AREA OF CONCERN NUMBER	INTERVAL (feet bgs)	ANALYSES				
			TCL VOC	TCL SVOC	TAL METALS	PCBs	Herbicides and Pesticides
ON-SITE RANDOM GRID SURFACE AND SUBSURFACE SOIL SAMPLES							
Geoprobe	1N	0 to 0.5	4	4	4	1	1
		0.5 to 5.0	4	4	4	1	1
	1S	0 to 0.5	20	20	20	2	2
		0.5 to 5.0	20	20	20	2	2
TOTAL FOR ON-SITE AOC-1 RANDOM GRID SAMPLES			**48**	**48**	**48**	**6**	**6**
QC FOR RANDOM GRID SAMPLES							
QC MS/MSD* {1/20 organics}		Various	3	3	N/A	N/A	1
QC MS/MD* {1/20 organics}		Various	N/A	N/A	N/A	1	N/A
QC trip blank		1	N/A	N/A	N/A	N/A	N/A
QC field duplicate {1/10}		Various	5	5	5	1	1
QC EQUIPMENT RINSATE		N/A	2	2	2	1	1
TOTALGRID QC SAMPLES			**10**	**10**	**7**	**3**	**0**
Geoprobe	2	0 to 0.5	4	4	4	1	1
		0.5 to 5.0	4	4	4	1	1
	4	0 to 0.5	5	5	5	1	1
		0.5 to 5.0	5	5	5	1	1
TOTAL FOR ON-SITE AOC-2 and AOC-4 RANDOM GRID SAMPLES			**18**	**18**	**18**	**4**	**4**
QC FOR GRID SOIL SAMPLES							
QC MS/MSD* {1/20 organics}		Various	1	1	N/A	N/A	1
QC MS/MD* {1/20 organics}		Various	1	1	N/A	N/A	N/A
QC trip blank		1	1	1	N/A	1	N/A
QC field duplicate {1/10}		Various	2	2	2	1	1
QC equipment rinsate		N/A	1	1	1	1	1
TOTAL GRID QC SAMPLES			**6**	**6**	**3**	**3**	**3**

TABLE 2
SAMPLING AND DESIGN MATRIX
FALCON REFINERY SUPERFUND SITE
INGLESIDE, TEXAS

SAMPLING TYPE	AREA OF CONCERN NUMBER	INTERVAL (feet bgs)	ANALYSES				
			TCL VOC	TCL SVOC	TAL METALS	PCBs	Herbicides and Pesticides
OFF-SITE JUDGMENTAL SURFACE AND SUBSURFACE SAMPLES							
Geoprobe	3	0 to 0.5	0	0	0	0	0
		0.5 to 5.0	0	0	0	0	0
	5	0 to 0.5	0	0	0	0	0
	6	0 to 0.5	0	0	0	0	0
		0.5 to 5.0	0	0	0	0	0
	7	0 to 0.5	0	0	0	0	0
		0.5 to 5.0	0	0	0	0	0
TOTAL FOR ON-SITE JUDGMENTAL SAMPLES			**0**	**0**	**0**	**0**	**0**
QC FOR OFF-SITE JUDGMENTAL SAMPLES							
QC MS/MSD* {1/20 organics}		Various	0	0	N/A	N/A	0
QC MS/MD* {1/20 organics}		Various	N/A	N/A	N/A	0	N/A
QC trip blank {1/cooler for aqueous VOCs}		N/A	N/A	N/A	N/A	N/A	N/A
QC field duplicate {1/10}		Various	0	0	0	0	0
QC EQUIPMENT RINSATE		N/A	0	0	0	0	0
TOTAL JUDGMENTAL QC SAMPLES			**0**	**0**	**0**	**0**	**0**
OFF-SITE RANDOM GRID SEDIMENT SAMPLES							
Grab	3	0-0.5	6	6	6	1	1
	5	0-0.5	7	7	7	1	1
TOTAL FOR GRID SAMPLES			**6**	**6**	**6**	**1**	**1**
QC FOR GRID SOIL SAMPLES							
QC MS/MSD* {1/20 organics}		Various	1	1	N/A	N/A	1
QC MS/MD* {1/20 organics}		Various	N/A	N/A	N/A	N/A	N/A
QC trip blank {1/cooler for aqueous VOCs}		N/A	N/A	N/A	N/A	N/A	N/A
QC field duplicate {1/10}		Various	1	1	1	1	1
QC equipment rinsate		N/A	1	1	1	1	1
TOTAL GRID QC SAMPLES			**3**	**3**	**2**	**2**	**0**

TABLE 2
SAMPLING AND DESIGN MATRIX
FALCON REFINERY SUPERFUND SITE
INGLESIDE, TEXAS

SAMPLING TYPE	AREA OF CONCERN NUMBER	INTERVAL (feet bgs)	ANALYSES				
			TCL VOC	TCL SVOC	TAL METALS	PCBs	Herbicides and Pesticides
GROUNDWATER SAMPLING (7 Monitor Wells)							
Bailer	1N	Shallow aquifer	2	2	2	1	1
	1S	Shallow aquifer	5	5	5	1	1
TOTAL FOR MONITOR WELL SAMPLES			**7**	**7**	**7**	**2**	**2**
QC FOR AQUEOUS SAMPLES (MONITOR WELLS)							
QC MS/MSD* {1/20 organics}		Various	1	1	N/A	N/A	1
QC MS/MD* {1/20 organics}		Various	N/A	N/A	N/A	0	N/A
QC trip blank {1/cooler for aqueous VOCs}		N/A	2	1	N/A	N/A	N/A
QC field duplicate {1/10}		Various	1	1	1	1	1
QC Equipment Rinsate		Various	1	1	1	1	1
TOTAL MONITOR WELL QC SAMPLES			**5**	**4**	**2**	**2**	**3**
SURFACE WATER SAMPLING							
Grab	3	Surface	16	16	16	2	2
TOTAL FOR SURFACE WATER SAMPLES			**16**	**16**	**16**	**2**	**2**
QC FOR AQUEOUS SAMPLES (SURFACE WATER)							
QC MS/MSD* {1/20 organics}		Various	1	1	N/A	N/A	1
QC MS/MD* {1/20 organics}		Various	N/A	N/A	N/A	0	N/A
QC trip blank {1/cooler for aqueous VOCs}		N/A	2	2	N/A	N/A	N/A
QC field duplicate {1/10}		Various	2	2	1	1	1
QC Equipment Rinsate		Various	1	1	1	1	1
TOTAL QC SAMPLES			**6**	**6**	**2**	**2**	**3**

TABLE 2
SAMPLING AND DESIGN MATRIX
FALCON REFINERY SUPERFUND SITE
INGLESIDE, TEXAS

SAMPLING TYPE	AREA OF CONCERN NUMBER	INTERVAL (feet bgs)	ANALYSES				
			TCL VOC	TCL SVOC	TAL METALS	PCBs	Herbicides and Pesticides
BACKGROUND SAMPLES (JUDGMENTAL)							
Grab	Sediment	0-0.5	12	12	12	0	0
Geoprobe	Surface Soil	0-0.5	6	6	6	0	0
	Subsurface Soil	0.5-5.0	6	6	6	0	0
TOTAL FOR JUDGMENTAL SAMPLES			**24**	**24**	**24**	**0**	**0**
BACKGROUND GROUNDWATER SAMPLING (6 Temporary Wells)							
Bailer	Groundwater	Shallow aquifer	6	6	6	0	0
TOTAL FOR JUDGMENTAL SAMPLES			**6**	**6**	**6**	**0**	**0**
BACKGROUND SURFACE WATER SAMPLING							
Grab	Surface Water	Surface	12	12	12	0	0
TOTAL FOR GRID and BACKGROUND SW SAMPLES			**12**	**12**	**12**	**0**	**0**
QC FOR ALL BACKGROUND SAMPLING							
QC MS/MSD* {1/20 organics}		Various	2	2	N/A	N/A	0
QC MS/MD* {1/20 organics}		Various	N/A	N/A	N/A	0	N/A
QC trip blank {1/cooler for aqueous VOCs}		N/A	2	2	N/A	N/A	N/A
QC field duplicate {1/10}		Various	4	4	4	0	0
QC Equipment Rinsate		Various	1	1	1	0	0
TOTAL QC SAMPLES			**9**	**9**	**5**	**0**	**0**

TABLE 2
SAMPLING AND DESIGN MATRIX
FALCON REFINERY SUPERFUND SITE
INGLESIDE, TEXAS

SAMPLING TYPE	AREA OF CONCERN NUMBER	INTERVAL (feet bgs)	ANALYSES				
			TCL VOC	TCL SVOC	TAL METALS	PCBs	Herbicides and Pesticides
INVESTIGATION-DERIVED WASTE							
Hand sampling device	Site-wide	Drummed Waste	TO BE DETERMINED				
QC FOR INVESTIGATION-DERIVED WASTE							
QC MS/MSD* {1/20 organics}		Various	0	0	N/A	N/A	0
QC MS/MD* {1/20 organics}		Various	N/A	N/A	N/A	0	N/A
QC trip blank {1/cooler for aqueous VOCs}		N/A	0	N/A	N/A	N/A	N/A
QC field duplicate {1/10}		Various	0	0	0	0	0
QC Equipment Rinsate		Various	0	0	0	0	0
		TOTAL QC SAMPLES	**0**	**0**	**0**	**0**	**0**

* MS/MSD and MS/MDs: These samples do not increase the number of samples, but represent additional volume of sample for laboratory QA/QC.

AOC	Area of Concern	N/A	Not Applicable
bgs	Below Ground Surface	PCB	Polychlorinated Byphenyls
MD	Matrix Duplicate	QC	Quality Control
MS	Matrix Spike	SVOC	Semivolatile Organi
MSD	Matrix Spike Duplicate	VOC	Volatile Organic Compound

TABLE 3
SCREENING AND ANALYTICAL METHODS
FALCON REFINERY SUPERFUND SITE
INGLESIDE, TEXAS

PARAMETER	SCREENING METHOD	DEFINITIVE METHOD
SOIL/SEDIMENT SAMPLES		
TAL METALS	N/A	SW-846, EPA 6010/7471
TCL SVOCs	N/A	SW-846, EPA 8270
TCL VOCs	Hand-Held PID	SW-846, EPA 8260
PCBs	N/A	SW-846, EPA 8082
HERBICIDES/PESTICIDES	N/A	SW-846, EPA 8151 and 8081
GROUNDWATER/SURFACE WATER SAMPLES		
TAL METALS	N/A	SW-846, EPA 6010/7470
TCL SVOCs	N/A	SW-846, EPA 8270
TCL VOCs	N/A	SW-846, EPA 8260
PCBs	N/A	SW-846, EPA 8082
HERBICIDES/PESTICIDES	N/A	SW-846, EPA 8151 and 8081
DISSOLVED OXYGEN	Water Quality Meter	N/A
pH	Water Quality Meter	N/A
SPECIFIC CONDUCTANCE	Water Quality Meter	N/A
WATER TEMPERATURE	Water Quality Meter	N/A
POTENTIAL	Water Quality Meter	N/A
TURBIDITY	Water Quality Meter	N/A

CLP Contract Laboratory Program
EPA U.S. Environmental Protection Agency
N/A Not Applicable
PCB Polychlorinated byphenyl
PID Photoionization detector
SVOC Semivolatile Organic Compound
TAL Target Analyte List
TCL Target Compound List
VOC Volatile Organic Compound

TABLE 4
REQUIRED SAMPLE VOLUME, CONTAINERS, PRESERVATIVES AND HOLDING TIMES
FALCON REFINERY SUPERFUND SITE
INGLESIDE, TEXAS

INVESTIGATIVE SOIL SAMPLES

PARAMETER	ANALYSIS	VOLUME AND CONTAINER	PRESERVATIVES	HOLDING TIME EXTRACTION/ANALYSIS*
TAL METALS	SW-846, EPA 6010/7471	One 8-ounce wide-mouth glass jar with Teflon-lined cap	Store at 4±2 °C	6 months, except Mercury, which is 28 days
TCL SVOCs	SW-846, EPA 8270	One 4-ounce glass jar with Teflon-lined cap	Store at 4±2 °C	14 days from collection
TCL VOCs	SW-846, EPA 8260	One 4-ounce glass jar with Teflon-lined cap	Store at 4±2 °C	14 days from collection
PCBs	SW-846, EPA 8082	One 4-ounce glass jar with Teflon-lined cap	Store at 4±2 °C	14 days from collection
HERBICIDES/PESTICIDES	SW-846, EPA 8151 and 8081	One 4-ounce glass jar with Teflon-lined cap	Store at 4±2 °C	14 days from collection

INVESTIGATIVE AQUEOUS SAMPLES

PARAMETER	ANALYSIS	VOLUME AND CONTAINER	PRESERVATIVES	HOLDING TIME EXTRACTION/ANALYSIS*
TAL METALS	SW-846, EPA 6010/7471	One 1-liter polyethylene bottle	Field filtered with a 0.45 µ filter, preserved with HNO_3 to a pH < 2; Store at 4+2 °C	6 months, except Mercury, which is 28 days
TCL SVOCs	SW-846, EPA 8270	Two 1,000 mL amber	No preservation at 4+2 °C	7 days from collection
TCL VOCs	SW-846, EPA 8260	Three 40 ml	Preserved with HCl to pH < 2; Store at 4+2 °C	14 days from collection
PCBs	SW-846, EPA 8082	Two 1,000 mL amber	No preservation at 4+2 °C	7 days from collection
HERBICIDES/PESTICIDES	SW-846, EPA 8151 and 8081	Two 1,000 mL amber	No preservation at 4+2 °C	7 days from collection

* Holding time is measured from the time of sample collection to the time of sample extraction and analysis

CLP	Contract Laboratory Program
EPA	U.S. Environmental Protection Agency
µ	Micron
N/A	Not Applicable
PCB	Polychlorinated byphenyl
PID	Photoionization detector
SVOC	Semivolatile Organic Compound
TAL	Target Analyte List
TCL	Target Compound List
VOC	Volatile Organic Compound

Appendix A: Project Schedule

Appendix B: Project Organization Chart