REMOVAL ACTION WORK PLAN

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

Prepared for

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LIST OF ACRONYMS

AOC	Administrative Order on Consent
ACM	Asbestos Containing Material
AHERA	Asbestos Hazard Emergency Response Act
API	American Petroleum Institute
AST	Above-ground Storage Tank
ASTM	American Society for Testing Materials
BNC	BNC Engineering, LLC
BTEX	Benzene, Toluene, Ethylbenzene and Xylenes
CA	Corrective Action
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CID	Criminal Investigation Division
CRZ	Contaminant Reduction Zone
COC	Chain-of-Custody
EPA	Unites States Environmental Protection Agency
EZ	Exclusion Zone
FRC	Falcon Refining Company
HSP	Health and Safety Plan
mg/kg	Milligrams per kilogram
NCP	National Contingency Plan
NELAP	National Environmental Laboratory Accreditation Program
NESHAPS	National Emission Standards for Hazardous Air Pollutants
NORCO	National Oil Recovery Corporation
NPL	National Priority List
OMS	Odorless Mineral Spirits
OSC	On-Scene Coordinator
OSHA	Occupational Safety and Health Administration
PC	Project Coordinator
QAPP	Quality Assurance Project Plan
QA/QCPP	Quality Assurance / Quality Control Project Plan

RA	Removal Action
RAW	Removal Action Work Plan
RI/FS	Remedial Investigation / Feasibility Study
RCRA	Resource Conservation and Recovery Act
RRC	Railroad Commission of Texas
SAP	Sampling and Analysis Plan
SOP	Standard Operating Procedures
SOW	Scope of Work
SZ	Support Zone
TACB	Texas Air Control Board
TCEQ	Texas Commission on Environmental Quality
TDH	Texas Department of Health
TNRCC	Texas Natural Resource Conservation Commission
TPH	Total Petroleum Hydrocarbons
TRRP	Texas Risk Reduction Program
ug/l	micrograms per liter

1.0 INTRODUCTION

This Removal Action will be directed by the *Administrative Order on Consent for Removal Action, CERCLA Docket No 06-04-04*, ("the Order") between the United States Environmental Protection Agency (EPA) and National Oil Recovery Corporation (NORCO). The Removal Action is primarily designed to remove and dispose of source materials currently at the site. To accomplish the source removal, demolition activities may also be required at the site. The three governing documents for this phase of work are:

- Removal Action Work Plan
- Quality Assurance/Quality Control Project Plan
- Health and Safety Plan

These documents should be considered "living documents" and if it becomes necessary all three will be modified to address any change in condition at the site.

The Removal Action Work Plan (RAW) provides a description of planned field activities that will be conducted during this removal phase of work. The RAW does not provide specific methodologies for demolition activities. After an asbestos survey and inventory of liquid and sludge has been completed, a plan will be developed with the selected demolition contractor to remove any above ground storage tanks, piping and related equipment.

The Quality Assurance/Quality Control Project Plan (QA/QCPP) has been developed to ensure quality assurance/quality control (QA/QC) during field sample collection and analytical testing associated with the cleanup activities. A field sampling plan is also included as an appendix to the QA/QC Project Plan. The plan details sample collection methodology and the QA/QCPP covers a variety of activities, including soil, water and waste sampling. This field sampling plan has been designed to be used during this removal action. Further sampling will be performed under the Remedial Investigation/Feasibility Study (RI/FS).

All sampling and laboratory analytical methods and procedures to be performed will conform to EPA direction, approval and guidance regarding sampling, quality assurance/quality control, data validation and chain of custody procedures. Analytical laboratories used for this project will be accredited under the National Environmental Laboratory Accreditation Program (NELAP) and will comply with appropriate EPA guidance.

The Health and Safety Plan (HSP) is designed to be used during this and future phases of work at the site including issues such as handling chemicals, working with construction equipment, selection of proper personal protection equipment, as well as outlining emergency response procedures. The HSP is designed to provide guidance to both site workers and any potential visitors.

1.1 Project Objective

The objective of this Removal Action Work Plan is to remove and dispose source materials from the property as well as remove hazards and risks related to the property. Removal Actions that will be conducted include:

- Asbestos assessment and possible abatement;
- Characterization of source materials;
- Assessment and removal or appropriate temporary storage of oil, hazardous substances and/or other pollutants of concern;
- Decontamination of containers, equipment, piping, and structures;
- Removal and disposal of containers, equipment, piping, and structures; and
- Removal and treatment or disposal of grossly contaminated soil.

1.2 Site Location and Description

The Falcon Refinery a.k.a. National Oil Recovery Corporation (NORCO) site (the "site") consists of a refinery that operated intermittently and is currently inactive. When in operation, the refinery, which was never operated by NORCO, had a capacity of 40,000 barrels per day and the primary products consisted of naphtha, jet fuel, kerosene, diesel, and fuel oil.

The site occupies approximately 104 acres in San Patricio County, Texas, and is located 1.7 miles southeast of State Highway 361 on FM 2725 at the northwest and southeast corners of FM 2725 and Bishop Road (Figure 1, Area Map). Another portion of the site includes a dock facility on Redfish Bay where materials were transferred between barges and storage tanks. The site is bordered by wetlands to the northeast and southeast, residential areas to the north and southwest and a construction company to the southwest.

The site (Figure 2, Site Map) has been owned, leased and/or operated under several different companies. The Oil and Gas Company of Texas, Inc. originally owned the site. A deed search revealed that the facility was leased to UNI Refining, Inc., from the UNI International Corporation and the UNI Pipeline, Inc., for seven years, 1979-1986. UNI Refining Co. obtained an air permit in 1979 and commenced construction of the facility in April 1980. In March 1981, UNI Oil, Inc., the parent corporation of UNI Refining Company and UNI Pipeline Company, was sold to new owners operating under the name of Texas Independent Oil Corporation. In late 1983 to early1984, the refinery was sold and operated under the name Mid Gulf Energy, Inc.

The Falcon Refining Company (FRC) purchased the site from Texas Independent Refining facility in November 1985. In 1986, production at the refinery once again ceased, Falcon Refining, Inc. declared bankruptcy and the facility came under the ownership of American Energy Leasing, Inc. In May 1990, Impexco of Texas, Inc. acquired the site from American Energy Leasing, Inc.

National Oil Recovery Corporation (NORCO) gained title to the refinery in December 1990 from Impexco of Texas, Inc. In June 1991, NORCO acquired the dock facility from the Sun Operating Limited Partnership. In the mid-90s, MJP Resources, Inc. began leasing/operating the

tanks on the northwest corner of the FM 2725 and Bishop Road and the dock facility. In 1998, Pi Energy Corporation acquired 2.5 acres of the dock facility from NORCO.

Currently, Superior Oil Company is leasing several above-ground storage tanks and the docking facility, for crude oil storage and transportation.

1.3 Inspection History

The refinery processed material that consisted of not only crude oil but also contained hazardous substances as defined by 40 CFR Part 261.32. In a Notification of Hazardous Waste Activity, signed on October 20, 1980 by Mr. Eugene W. Hodge, Vice President of UNI Refining, Inc. four hazardous wastes from specific sources were listed; K048 (dissolved air flotation float), K049 (slop oil emulsion solids), K050 (heat exchanger bundle cleaning sludge), and K051(API separator sludge). Of these sources, the listed hazardous waste K051, API separator sludge from the petroleum refining industry based on the toxicity of the sludge, was documented in an inspection report to have been deposited inside the walls of a tank berm. Other hazardous substances at the site include; vinyl acetate detected inside tanks during a EPA Criminal Investigation Division (CID) criminal investigation and a TNRCC Region 14 sampling event, the chromium detected in deposited cooling tower sludges and untreated wastewater release inside tank berms.

On March 12, 1986, an inspection conducted by the Texas Water Commission revealed that the Falcon Refinery had disposed of cooling tower sludges on-site. These sludges were sampled and revealed Total Chromium of 8020 mg/kg and EP Tox Chromium of 46 ug/kg. The inspector noted that, during December 1985, the Falcon Refinery made a 100,000 barrels run of slop oil which generated a substantial amount of very odorous wastewater. The refinery's wastewater treatment system was inoperable during this run. The refinery placed untreated wastewater in tankage and then, ultimately, discharged the untreated wastewater into sandy, unlined containment structures (fire walls). According to a 1986 inspection report, the untreated wastewater was discharged into the bermed areas around tanks 10, 11, 26, and 27. A sludge which had been dumped inside the fire walls of tank 13 was observed and sampled during the inspection of July 1986 by TNRCC Region 14 staff. Constituents found in the sample included naphthalene, 2,4-dimethylphenol, acenaphthene, fluorene, phenanthrene, fluoranthene, pyrene, and chrysene.

On January 13, 1987, TACB took a sample from a wastewater storage tank at Falcon Refining. Records indicate that the refinery received 104,000 barrels (bbl) of material from Tenneco in January 1986. A substantial amount of this waste remained in the pipelines and tanks. TACB officials noted that noxious odor complaints from surrounding residents began when the refinery started processing this material. TACB concluded that the Tenneco material was not virgin petroleum, but a mixture of organic solvents and, probably, waste. TACB analytical results from a sample of material taken from a tank on January 13, 1987 support the conclusion that this material contained constituents not normally occurring in crude oil Butanol, cyclohexanediol, 1 phenylethanol, N,N-diphenylamine, and xylene were detected in the sample of wastewater from the refinery.

An Inspection by the Texas Air Control Board (TACB) on April 10, 1987 revealed a black, liquid substance beneath a pipeline rack on the north side of the refinery from a leak in the third pipeline (10-inch diameter) from Bishop Road. The black, liquid appeared to be either a solvent with hydrocarbon/carbon or a crude oil with solvents intermixed. The pipeline connects the tank farm in the refinery to a run-of-pipe from the docks which were used to transfer material into and out of the Falcon Refinery tank farm. The final spill covered an area approximately 30 feet by 60 feet. Investigations on April 20 and 21, 1987 did not indicate any apparent effort to remove the spilled material, which was creating an odor problem. ARM Refining, located on the west side of FM 2725 and on the north side of Bishop Road, covered the spill on April 22, 1987.

On November 15, 1995, a spill was reported south-southeast of FM 2725 on Bishop Road, in the wetlands adjacent to the Brown & Root Facility. The spill occurred during an hydrostatic test of a pipeline prior to bringing the line back into service. The underground pipeline runs from the dock facility to the main facility. Approximately less than eight barrels of "crude oil" were spilled. According to Mr. Bernie Eickel of the Railroad Commission of Texas (RRC), the sample analyses on February 7, 1996 indicated the presence of substances other than crude oil. Two contaminated soil piles and two roll-off containers containing regulated waste associated with the spill resulted from the waste removal activity. Analyses of the February 7, 1996 samples (collected from one roll-off and liquid material leaking from the roll-off) indicated constituents not normally found in crude oil and elevated levels of the following constituents: tetrachloroethene, 2-methylnapthalene, phenanthrene, toluene, and total xylenes.

On February 16 and 19, 1996, an inspection was conducted by the TNRCC Region 14 staff at the NORCO facility in response to an alleged crude oil pipeline spill from the facility on November 15, 1995. Analysis of the spilled residuals revealed constituents not naturally occurring in crude oil. Mercury, lead, 1,2, dichloroethane, benzene, ethyl benzene, styrene, toluene, total xylenes, chrysene, m-creosol, o-creosol, p-creosol, fluorene, methyl isobutyl ketone, 2-methylnaphthalene, naphthalene, phenanthrene, pyrene, methyl t-butyl ether, total organic halogens, and vinyl acetate were detected in the samples collected. Vinyl acetate was detected in tanks N1 and N2. Vinyl acetate is not an ingredient in crude oil nor does it substitute for other products as it has no solvent properties, thus exempting the chemical from the petroleum exclusion.

On April 4, 1996, Jones & Neuse conducted grid sampling at the spill site. The samples were analyzed for benzene, toluene, ethyl benzene, and xylene (BTEX) and total petroleum hydrocarbons (TPH). No BTEX content was detected in the soil samples taken, but TPH levels were detected ranging from 67 to 1930 mg/kg.

The EPA CID of the Houston Area Office conducted a criminal investigation from January 1996 until August 2000 on the activities at Gulf Conservation Corporation (GCC), a facility located north of the dock facility, at the NORCO facility which was being operated by MJP Resources, Inc. Specifically the investigation concerned a vinyl acetate slop stream delivered to GCC. According to Mr. Ronald Cady, Louisiana Department of Environmental Quality Regional Hazardous Waste Coordinator, and Mr. Brian Lynch, CID, this stream consisted of odorless mineral spirits (OMS) that were used as a carrier for the reactant in the production of polyethylene at Westlake Polymers in Sulphur, Louisiana. In this process, the mineral spirits are recycled until they become too contaminated to use and would be classed as a spent solvent.

Westlake Polymers segregates the two streams and labels them V-240 (OMS) and V-242 (OMS with VA). In the past they had been classifying the mineral spirits as a co-product. The vinyl acetate is not an excluded substance under the petroleum exclusion.

Samples were collected by the CID in February 1996 from the two tanks (N1 and N2, also referred to as 32 and 33) in the main processing area of the NORCO facility. The liquid samples collected revealed high concentrations of vinyl acetate in two tanks; 1,360,000 ug/L and 36,600,000 ug/L.

On January 4, 2000, TNRCC Region 14 inspectors completed a compliance inspection pertaining to the air quality requirements for permitted tanks. These tanks are located on the northwest quadrant of the FM 2725 and Bishop Road and are authorized in three active TNRCC air permits. The naphtha stabilizer unit, located in the main processing area in the southeast quadrant of FM 2725 and Bishop Road, was observed to be leaking from a valve between the sight glass and the tank. This valve was approximately 20 feet high and the wind was blowing a shower of leaking fluid on to an area of soil and vegetation surrounding the tank. Two 8-ounce jars of sample were collected of the liquid as it leaked from the valve. Based upon the flow rate of the leak observed on January 7, 2000, and the site inspections conducted on January 4, 6, 7, 10, and 11, 2000, it was determined by the TNRCC Region Office that a total volume of at least 220 gallons of material had leaked from the tank.

Groundwater at the NORCO facility has been contaminated as a result of the release, per the March 7, 2000 report. Laboratory analyses received by the TNRCC Region 14 Office on February 25, 2000 revealed the following constituents; 1,2 dichloroethane, 4-methyl-2-pentanone (Ref. 38, p. 180), benzene, ethyl benzene, m,p,oxylenes, styrene, and toluene (Ref. 38, pp. 44-50). The analyses also revealed that the fluid sample exceeded the maximum concentration of benzene for toxicity characteristic using the TCLP.

The hazardous substances identified on-site included such chemicals as nitric acid, acetic acid, cupric chloride, potassium chromate, silver nitrate and potassium hydroxide. Additionally, the EPA believes that hazardous wastes and residues identified by the RCRA waste numbers D002, K049 and K051 are also present. All of the hazardous wastes and substances are “hazardous substances” as defined by Section 101(14) of CERCLA, 42 U.S.C. § 9601(14), and CFR § 302.4. The US EPA estimated that approximately 30,000 gallons of hazardous substances were present.

1.4 Regulatory Framework

This project is regulated under the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA). An Administrative Order on Consent for Removal Action (CERCLA Docket No**.** 06-04-04) has been entered into between the US EPA and NORCO. Although the site is considered a CERCLA site it is not on the National Priority List (NPL).

1.5 Project Organization

The project organizational structure for this removal action is presented on Figure 3. The US EPA has designated Mr. Gary Moore of the Emergency Response and Prevention Branch, Region VI as the On-Scene Coordinator (OSC). Mr. Moore is the lead EPA representative for

the site and serves as a central contact point and has the authority to halt, conduct, and direct the work at this Site under the Administrative Order.

The Project Coordinator (PC) for this site is Stephen Halasz with BNC Engineering, LLC (BNC). Mr. Halasz is responsible for administration of all actions required under the Administrative Order with the approval of Richard Bergner, the NORCO representative. The Project Engineering Team, which includes Jim Blackwell (PE), Dustin Goss (PE) and Russell Storm-Olsen (EIT), will be responsible for all engineering aspects of the project including the design and development of construction drawings. Steve McCollough will be the On-site Construction Manager, Richard Jennings is the Safety Coordinator, Theresa Nix is the On-Site QA/QC Manager and Olga McDonald is the Laboratory QA/QC manager.

BNC will serve as the primary contractor and will provide technical assistance and oversight in the field for the duration of the removal action. Selected removal action contractors will report directly to Mr. Halasz.

1.6 Regulatory Agency Notifications

Prior to initiation of site work related to this Removal Action Work Plan various regulatory notifications will be required. Notifications will include:

- US Environmental Protection Agency (US EPA)
  After the Removal Action Work Plan is approved, the project coordinator (PC) will notify the US EPA five working days prior to the start of site activities. The PC will also notify US EPA of the selected remedial contractor(s) at least 15 days prior to the commencement of the removal action.
- Texas Department of Health (TDH)
  TDH will be notified ten days prior to the start of any potential asbestos abatement activities.
- Ingleside City Manager
  As a courtesy the City Manager for the Town of Ingleside will be notified one week prior to the start of removal actions.

2.0 DATA MANAGEMENT

Data management for this removal action will consist of documenting site activities by use of a field log book, daily work logs, site photographs, and sample chain of custody forms. Use of these documents will assist in documenting and tracking data collected in the field during removal actions. Additional guidance is provided in Section 4 of the Field Sampling Plan (Appendix A of the QA/QC Project Plan). Sample documentation and field forms collected during this project will ultimately be stored in the project files at BNC, in Georgetown, Texas. Stephen Halasz will be the file custodian. Project files will be stored in an organized and accessible manner. At the completion of this removal action, a Removal Action Completion Report will be developed that provides a summary of methodologies used, a tracking of waste disposal/recycling operations and documents project details and activities.

2.1 Field Log Book

During field activities, it will be necessary for the project field staff to record site specific data from sampling activities, demolition actions, etc. These data will be recorded in project field log books dedicated to the project. The field log books will be bound, sturdy, of water repellant construction, with numbered pages and entries will be in indelible ink. Each field book will be assigned by the Project Coordinator to a team member and identified by a site specific title. The assignment of the field book and its identifier will be recorded in the Daily Work Logs. Upon filling a field book or completion of the project, the book will be turned over to the file custodian and stored at the BNC offices in Georgetown, Texas.

2.2 Daily Work Log

In addition to the project field log book that serves as the primary project documentation tool, daily activities will be initially documented on daily work logs. One daily work log will be completed for each day of site activities and will document items such as:

- personnel on-site and the company or agency they represent
- start and completion time for site activities
- detailed summary of activities conducted
- problems and resolutions
- deviations from the work plan, and
- weather conditions

On a weekly basis, copies of the previous week's daily work logs will be sent or delivered to the BNC Project Coordinator.

2.3 Site Photographs

To the extent practical, photographic documentation will be maintained of the removal action. This may include digital and conventional film photography. Photographic documentation will provide a historical reference of actual site activities. Documentation of each photograph will include the date taken, time of day, location and direction of the photograph and will be recorded by field personnel in the field log book. Photographic images will be transmitted weekly to the BNC PC.

2.4 Sample Chain of Custody Forms

All collected samples will be documented on sample chain of custody forms. The forms will be provided by the analytical laboratory that will be analyzing the sample. The chain of custody will identify the time and date of sample collection, provide unique sample identification, list the person collecting the sample, type of container, preservative, analysis requested, detailed project data, and any other relevant data. The chain of custody forms will be completed in triplicate with one being retained prior to sample shipment and the other two copies being shipped with the samples to the laboratory. Copies of the chain of custodies will be maintained by the PC.

3.0 REMOVAL ACTION SCOPE OF WORK

This section provides the rationale and sequence of tasks for the RA as designated in the AOC. BNC will direct and oversee activities on behalf of NORCO during the implementation of the RA, including data collection and management and construction oversight. The Project Coordinator designated in the AOC will provide project management and coordination between NORCO and the EPA.

The EPA will be notified of the name and qualifications of proposed contractors at least five business days prior to the contractor beginning activities. Each contractor will be provided copies of the Removal Action Order, HSP and the RA work plan.

Following review of the Work Plan by the EPA the following activities may be performed:

- Locating utilities;
- Providing site security;
- Mobilization of construction facilities, site office and personnel;
- Site preparation including;
    - Emergency first aid facility,
    - Construction of decontamination facilities,
    - Provision of utilities,
    - Clearing and grubbing of existing vegetation,
    - Work zone identification, and
    - Construction of temporary staging areas
- Implementation of the Health and Safety Plan,
- Asbestos assessment,
- Asbestos abatement,
- Fugitive air monitoring,
- Ambient air monitoring,
- Soil excavation, handling and backfilling,
- Above-ground storage tank gauging and sampling,
- Decontamination, demolition and removal of tanks and equipment,
- Restoration of excavation areas,
- Management of waste, and
- Demobilization of construction facilities and equipment from the site.

These tasks will be discussed in detail.

3.1 Locating Utilities

To reduce the likelihood of encountering utility lines during removal actions, especially demolition and excavation activities, a utility locating service will be used to identify, locate and mark utility lines that cross the property.

3.2 Providing Site Security

A perimeter fence is in place around the entire facility to ensure that only appropriate personnel have access to the site. BNC will be responsible for maintaining security at all times during RA construction activities.

Access gates will be closed to prevent uncontrolled access to the site. During soil and liquid waste handling the following actions will be in effect:

- Limited vehicular access;
- Initial screening of all site personnel and visitors;
- A security log including dates, names, addresses, companies, time in and time out for all employees and visitors will be maintained; and
- Warning signs will be posted.

3.3 Construction Support Facilities

The following sections describe the required construction support facilities for the site activities. Anticipated dates for the plan are depicted on Figure 4.

3.3.1 Site Office

A project trailer will be in place at the Falcon Refinery for use as the on site project office by BNC and EPA personnel.

3.3.2 Emergency First-Aid Facility

BNC will supply and maintain a first-aid facility, which complies with the requirements of 29 CFR 1910.151, during the RA.

3.3.3 Fire Suppression Equipment

BNC will provide fire protection that complies with 29 CFR 1910 Subpart L and necessary fire suppression equipment that complies with 1910.157 to ensure the safety of site personnel. Coordination will be established with the local fire department.

3.3.4 Decontamination Facilities

Prior to working in any exclusion zone (EZ), BNC will supply and operate a personnel hygiene/decontamination facility that complies with 29 CFR 1910.141.

Wastewater from the personnel hygiene/decontamination facility will be pumped to the designated storage tank. Prior to any approved discharge of wastewater appropriate sampling will be performed.

3.3.5 Equipment Decontamination Facility

BNC will supply and operate an equipment decontamination facility with sufficient pumping equipment and piping to pump wastewater from the decontamination pad to the wastewater storage tank for treatment and possible disposal.

All equipment leaving the EZ will be decontaminated on the decontamination pad using a high-pressure, low-volume hot water and non-phosphate detergent (or equivalent), if necessary, and will be inspected by BNC prior to entering the support zone (SZ). Sediments collected on the decontamination pad will be characterized for either disposal off-site at an appropriate commercial facility or staged on-site.

In highly contaminated areas a contaminant reduction zone (CRZ) will be established at the interface of the EZ and the SZ and will provide access for the transfer of construction materials and equipment.

3.3.6 Portable Sanitary Facilities

Portable toilet facilities will be provided and maintained by BNC in an area outside the EZ. Sanitary waste will be removed and disposed off-site on a periodic basis in accordance with applicable laws and regulations.

3.3.7 Cleaning and Grubbing

Areas required for construction access will be cleared to the extent required to implement the RA. Cleared vegetation will be removed or chipped on-site and used to support site restoration activities.

Also, vegetation will be cleared near the perimeter of the property to establish a fire break line around the property.

3.4 Health and Safety Plan

A health and safety plan (HSP) that meets the requirements of OSHA Standards and Regulations contained in Title 29, CFR 1910 and 1926 has been developed for the site (Appendix A) The developed HSP includes EPA guidance documents regarding procedures to insure safe operations at sites containing hazardous or toxic materials.

Each contractor involved in RA construction activities at the site will be required to abide by the HSP. The following items are covered in the HSP:

- Medical surveillance;
- Worker training;
- Site Safety Officer designation and responsibility;
- Work area designations;
- Personnel and equipment usage;

- Air monitoring programs;
- Personnel protective equipment to be used;
- Respirator protection program and procedures;
- Emergency first-aid equipment;
- Safety meetings;
- Confined space entry;
- Site communications; and
- Site security.

The HSP will be maintained at the site at all times during the performance of the RA and will be made available to site personnel and visitors that are permitted to enter the site. Also included is the HSP, which includes:

- Injury to on-site personnel;
- Fire procedures;
- Leak or release of toxic materials;
- Severe weather;
- Utility breakage; and
- Detecting vapors.

3.5 Asbestos Assessment

Prior to the initiation of any demolition activities an asbestos assessment will be conducted of possible asbestos containing materials (ACM). The ACM survey will be conducted by a yet to be determined contractor that will conduct the survey in accordance with the National Emissions Standards for Hazardous Air Pollutants (NESHAPS), the EPA's Asbestos Hazard Emergency Response Act (AHERA) and the Occupational Safety and Health Administration (OSHA).

To perform the survey a thorough inspection will be made of all buildings, insulation and other possible ACM. Any homogenous samples containing ACM will be determined and classified. These homogenous samples will be determined by the same color, texture and size. The following guidelines will be used:

- For surface materials the 3-5-7 Rule will be used which requires that a minimum of three samples be collected for materials encompassing less that 1,000 square feet, a minimum of five samples for materials encompassing between 1,000 and 5,000 square feet and a minimum of seven samples for materials encompassing greater than 5,000 square feet.
- For thermal system insulation (TSI) a minimum of three samples per homogenous area will be collected. No samples will be collected if the accredited inspector determines that the TSI is fiberglass, foam, rubber or other non-ACM.
- AHERA and OSHA requirements for miscellaneous materials will be used.

Quantification of ACM's will be used to determine if NESHAPS and OSHA notifications are required. Surface materials will be listed in square feet and TSI will be listed in linear feet. The

location of each sample collected will be done in a statistically reliable manner that is representative of the homogenous area.

The following sampling procedures will be used as needed:

- Unique sample numbers will be used and the containers will be labeled with the location, date, sample number and material sample.
- The location will be marked on a diagram.
- Polyethelene dropcloths will be placed below the areas to be sampled.
- Appropriate PPE will be used.
- The area will be sprayed with water.
- Representative sized samples will be obtained with appropriate tools.
- Tools will be cleaned with wet wipes or a HEPA vacuum.
- The sample hole will be sealed with duct tape or patching compound.
- All PPE will be cleaned.
- The respirator will be decontaminated with soap and water and any wipes used will be placed in a disposal bag.
- All samples will be transported to a laboratory that is accredited by the National Voluntary Lab Accreditation Program (NVLAP). The samples will be analyzed by polarized light microscopy as described in Appendix A, of 40 CFR part 763, Subpart F.

ACM will be classified as either friable asbestos or non-friable asbestos and the following actions will be utilized:

- Friable asbestos or asbestos that will become friable during demolition will be disposed of as asbestos hazardous waste. These wastes are classified by NESHAPS as RACM and Category II non-friable. A waste manifest form will be completed that documents the site, responsible party and the transporter.
- Non-Friable ACM can be disposed of as non-hazardous asbestos waste.

Before asbestos abatement work is initiated, if any, a structure-by-structure evaluation will be completed assessing the structural integrity of the objects that are known to contain ACM prior to abatement. If it is determined that removal of the ACM would be unsafe and endanger workers, a request will be submitted to the TDH to condemn the structures and potentially demolish them as is. Also as part of any necessary asbestos abatement, an on-site air quality monitoring station will be installed to monitor air quality before, during and after abatement activities. A consultant independent of the contractor conducting the asbestos abatement will monitor air quality during the work to obtain baseline information and final clearance for all asbestos related work.

3.6 Assessment and Removal of Hazardous Substances and Other Pollutants

Previous site investigations conducted by US EPA, Texas Commission on Environmental Quality (TCEQ) and contractors have identified above ground storage tanks, containers and

drums that may contain hazardous waste. The quantity of hazardous and non-hazardous material at the site is unknown.

The initial waste characterization will include testing for items such as flammability, pH, reactivity to sulfide and cyanide; as well as visual observations including physical state, color, clarity and density. Testing will be performed to identify the hazard class (if the material is determined to be hazardous) and volume of material. Actual waste management practices for these substances will be determined by additional waste characterization and analytical testing. Based on the results of the sampling and volume determination a disposal option will be selected and provided to the EPA.

During the sampling of the tanks safety precautions described in the HSP will be employed, including the possible use of scaffolding or mechanical devices to lift personnel to the top of the tanks that are in poor condition.

Sampling of the liquids will utilize methods described in the field sampling plan.

In addition to determining the volume of liquid in the tanks and the waste characterization, BNC proposes to perform a Flowers Compatibility Study to determine if a majority of the liquids found in the above-ground storage tanks can be transferred to one above-ground storage tank. In addition to complying with the HSP the following procedures would be followed:

3.6.1 Flowers Compatibility Study Field Sampling

- Collect 3 samples (8 oz/250 ml) from each tank: top/middle/bottom
- The "Top" sample shall be collected from below the surface down to a depth of no more than 2 feet.
- The "Middle" sample shall be collected from the approximate mid-point of the liquid level in the tank.
- The "Bottom" sample will be collected from the bottom 2 feet of the tank.
- The percentages of any material phase in the tank will not be determined.
- Note tank levels whenever possible and estimate liquid volume of each tank.

3.6.2 Lab Evaluation and Sample Consolidation

- Determine, by visual comparison of the three individual tank samples, whether the tank contents are multi-phasic (oil/organics/aqueous)
- Note visual characteristics of each sample.
- Consolidate samples, i.e. prepare individual tank composite samples wherever possible by combining all samples of similar phases and apparent composition.
- Note any reactions or other anomalies when consolidating tank samples.
- Measure pH of each remaining sample
- Optionally, on a case by case basis, check reactivity and ignitability

3.6.3 Mixing Tests

- Equilibrate all samples to room temperature
- Split samples into three equal fractions

3.6.4 Phase 1: Intra-Tank Reactivity

- Systematically combine the Fraction 1 samples collected from the same tank to check for intra-tank component reactivity that might occur during transfer
- Monitor the temperature of the samples before and after mixing and note any significant temperature change.
- Check for the generation of any gas bubbles in the liquid.
- Seal jar and let stand overnight.
- After sample has settled, mark the level of any phase separations and note the sample's physical characteristics (color, odor, etc).
- Check for evidence of gas evolution (jar pressurized?).
- If there are no apparent reactions from the mixing of the intra-tank samples, then proceed to next phase.

3.6.5 Phase 2

- If a reaction is evident after the addition of any tank sample, that tank sample will be identified and the remaining fractions used for additional tests.
- If a reaction is evident only after the samples have set overnight, identify the tank sample for additional evaluation.

3.6.6 Phase 2: Inter-Tank Reactivity

- Systematically mix the combined tank samples together, one by one, noting any measurable temperature changes, or other visible signs of reaction after each addition.
- Seal jar and let stand overnight.
- After sample has settled, mark the level of any phase separations and note the sample's physical characteristics (color, odor, etc).
- Check for evidence of gas evolution (jar pressurized?).
- If a reaction is evident after the addition of any tank sample, that tank sample will be identified and the remaining fractions of that tank used for additional tests.
- If a reaction is evident only after the sample has set overnight, a more comprehensive test matrix may be required to isolate the tank(s) responsible for the reaction.
- If no apparent reaction occurs as a result of the consolidation of all tank samples, then no additional tests will be required.

3.6.7 Phase 3: Identification and Characterization of Reactive Tank Samples (if necessary)

- Assess data for any tank samples that are identified as reactive and either recommend isolation or develop alternative plans.
- Assess data and develop a test matrix to determine tank samples responsible for reacting with one another.
- Using remaining sample fractions, prepare a comprehensive test matrix based on those samples already mixed when reactions were noted.

Results of the initial liquid volume determination and the AST sampling may indicate that further sampling for waste characterization is necessary and an amended work plan will be developed.

3.7 Affected Soil

Areas have been identified as containing visually affected soil resulting from historical spills, past operations, accidents and deteriorating equipment near the main refinery area and near numerous aboveground storage tanks (ASTs). Areas described in section 1.2 of this work plan will be evaluated and a site walk through will be conducted to determine if additional areas of affected soil are present on-site.

Surface soil that appears grossly contaminated will be excavated and any soil that will be disposed of off-site will be appropriately characterized to meet the requirements of the receiving facility. Excavation of affected soil will be conducted with the appropriate type of construction excavation equipment. The depth and extent of any excavation will be directed by observations in the field including the use of a PID or FID. Based on field observations, some samples may be analyzed for appropriate constituents at the selected laboratory.

Any excavated location will be located using a GPS receiver that provides real-time sub-meter accuracy. The unit receiver offers GPS, WAAS, EGNOS, satellite differential, and beacon capabilities and provides two-way data flow between the field and GIS, facilitating the data collection and data maintenance processes.

During this removal action, when grossly contaminated soil is encountered at a depth greater than five feet below ground surface, a determination will be made to either stop the excavation or continue. A depth of five feet is selected based on guidance set forth in the Texas Risk Reduction Program (TRRP), a risk-based corrective action program, which is often used in evaluating affected properties within the State of Texas. For sites classified as commercial/industrial properties, soil from the surface to five feet below ground surface is classified as surface soil and soil below five feet in depth are classified as sub-surface soils.

If excavations are backfilled as part of this action, backfilling will consist of placing material meeting all regulatory requirements in eight to 12-inch lifts or as deemed appropriate at the site. The lifts may be rolled, compacted and moisture added as necessary to ensure 90% compaction as to meet ASTM compaction standards.

Excavations completed during this removal action are not designed to remove all affected soil, only grossly affected surface soil. A detailed site investigation into soil quality will be conducted after the completion of this initial removal phase of grossly affected soil. At that time the vertical and horizontal extent of affected soil will be determined and an evaluation will be conducted to determine if additional response actions are necessary.

3.8 Tank Bottoms and Liquids

Previous EPA site investigation/characterizations identified liquid, sludge and solids within the ASTs. Removal of liquids and tank bottoms will be conducted prior to the demolition of any ASTs and other equipment. Materials will be characterized prior to determining the appropriate method of treatment, disposal or reuse. Some materials may be listed as hazardous wastes and will be handled as hazardous waste; other material may be classified as non-hazardous and may be recycled.

3.9 Decontamination and Demolition of On-site Vessels, Piping and Structures

Above and below ground structures as well as site debris may be removed from the site. Major concern during this removal action will be the protection of site workers, adjoining neighborhood areas and the environment in general. Each structure will be decontaminated prior to demolition and removal. Site equipment, structures and miscellaneous piping will be emptied, cleaned, gas freed and deenergized prior to demolition. Also all ACM and suspect insulation will be removed from the structures before dismantling. The following is an example ordering of removal/demolition activities:

1. removal/demolition of ASTs
2. removal of piping (underground/overhead)
3. slab removal

Actual ordering will be determined with the assistance of the remedial/demolition contractor and detailed in a Demolition Action Plan. The selected demolition contractor will develop a written Demolition Action Plan that outlines specific methodology, procedures, and scheduling for each building, AST, sump and structure. Any demolition plan shall also include:

- Any necessary addendums to the site-specific safety and health plan relating to demolition/decommissioning steps to ensure site worker protection.
- A fire protection and prevention plan that details fire prevention and safety equipment and staff that will be on-site to respond to any emergencies that arise, including the location of dry powder type fire extinguishers, pressurized fire house connection locations and fire hoses.
- The contractor's proposed permit system to ensure safety, confined space entry, fire protection, and regulatory compliance.
- A schedule/time line for conducting site activities.
- A step-by-step methodology of pre-demolition procedures and equipment needed for inspection, gas-freeing, ventilation, combustible and explosive vapor monitoring as

applied to all equipment and structures to be dismantled. Explosive and oxygen deficient atmospheres are likely to be encountered during demolition, especially in piping, sumps and ASTs. Also because of the high likelihood of structural instability during dismantling structures due to deterioration, especially the ASTs, all structures are to be inspected before demolition.

- A step-by-step methodology of demolition procedures and equipment.
- A listing of all subcontractors that will be involved in site work.

All products (liquid and solids) shall be emptied from the items to be demolished. If tanks containing solidified asphalt are scheduled to be dismantled before asphalt removal, the contractor shall perform complete water flooding of the asphalt surface before hot work in connection with dismantling is allowed. Dust generation will be reduced and suppressed as much as practical. Items that can be recycled or salvaged shall be carefully removed, segregated and protected before demolition.

3.10 Restoration of Property

After all tasks associated with this removal action have been completed, site restoration activities will be performed. Included will be backfilling and re-grading the property to optimize drainage and stormwater runoff patterns, a reseeding program may be initiated to control erosion, minimize dust and promote re-vegetation. Seed selection will be based on plant species endemic to the area.

4.0 REPORTING

Weekly construction meetings will be conducted at the site during active removal activities. Participants will include the BNC site health and safety officer, the on site project manager and contractors. Meetings may also include NORCO and EPA personnel.

4.1 Progress Reports

Progress reports will be submitted monthly on the 10th day of the following month to document the progress of the work as required under the AOC. Progress reports, which will be submitted until the termination of field activities will include:

- Descriptions of all significant developments during the previous month;
- Descriptions of work and problems encountered;
- Summaries of daily activities;
- Analytical data; and
- Anticipated activities for the upcoming month.

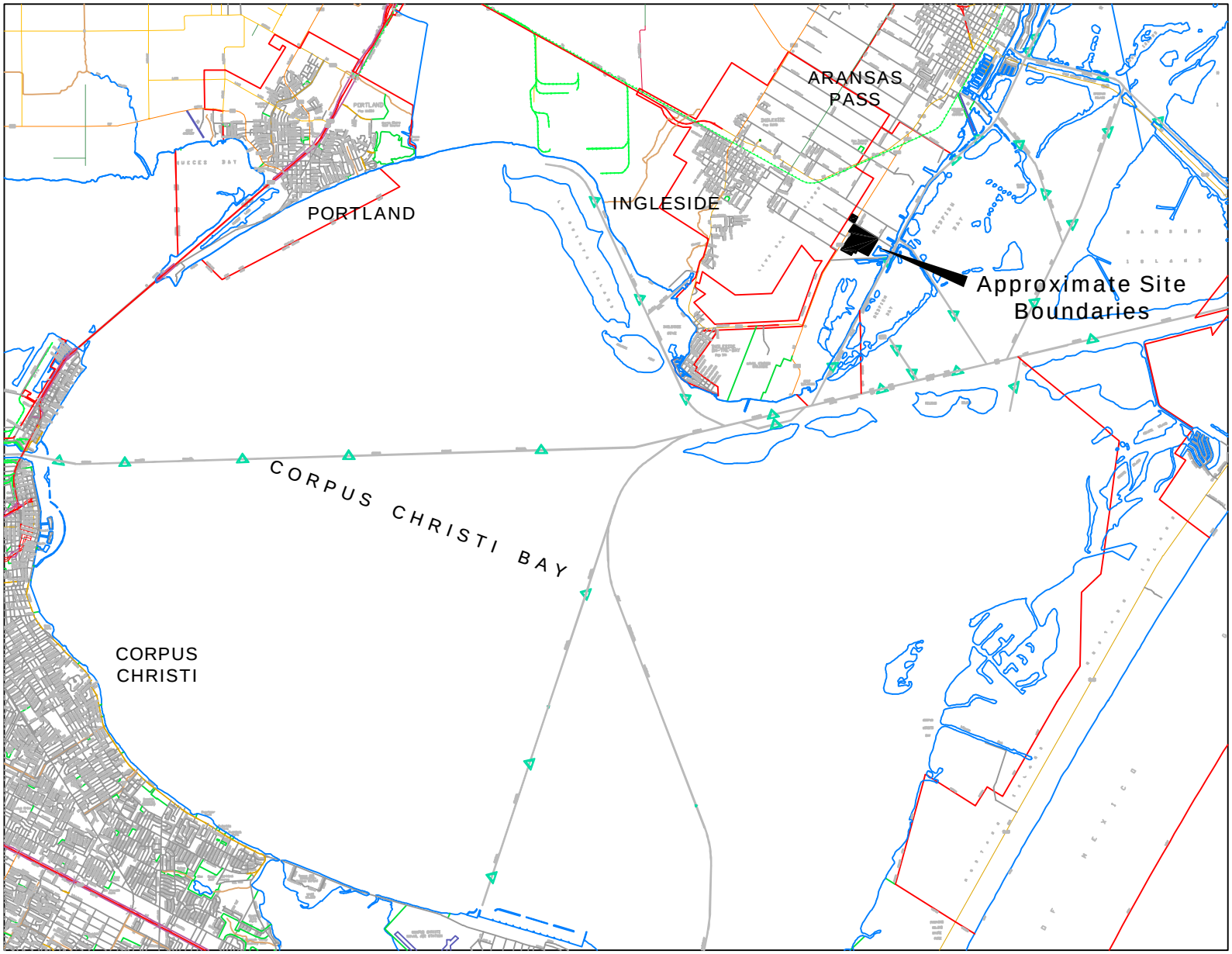
4.2 Final Report

Within 90 days of the completion of removal actions NORCO will provide a draft final report that details the actions taken. The report will comply with the requirements in Section 300.165 of the NCP. Included in the report will be:

- A listing of quantities and types of materials removed off-site or handled on-site;
- A discussion of removal and disposal options considered for the materials;
- A listing of the ultimate destinations of the materials;
- A presentation of the analytical results; and
- Accompanying appendices containing all relevant documentation generated during removal actions.

5.0 PROJECT SCHEDULE

Figure 4 provides an anticipated project schedule showing milestones and deliverables that relate to this removal action. The schedule is based on currently known information and estimates for specific tasks. If known information changes or if review time for submittals is longer than estimated, the dates in the schedule will not be accurate. The project start date will be based on US EPA approval of this work plan. Assuming that approval of the RAW is received on August 13, 2004, the proposed start date for substantial field activities relating to this removal action will be August 27, 2004. Prior to that time activities consisting of securing the site and installing a work trailer may be performed.



BNC ENGINEERING, LLC
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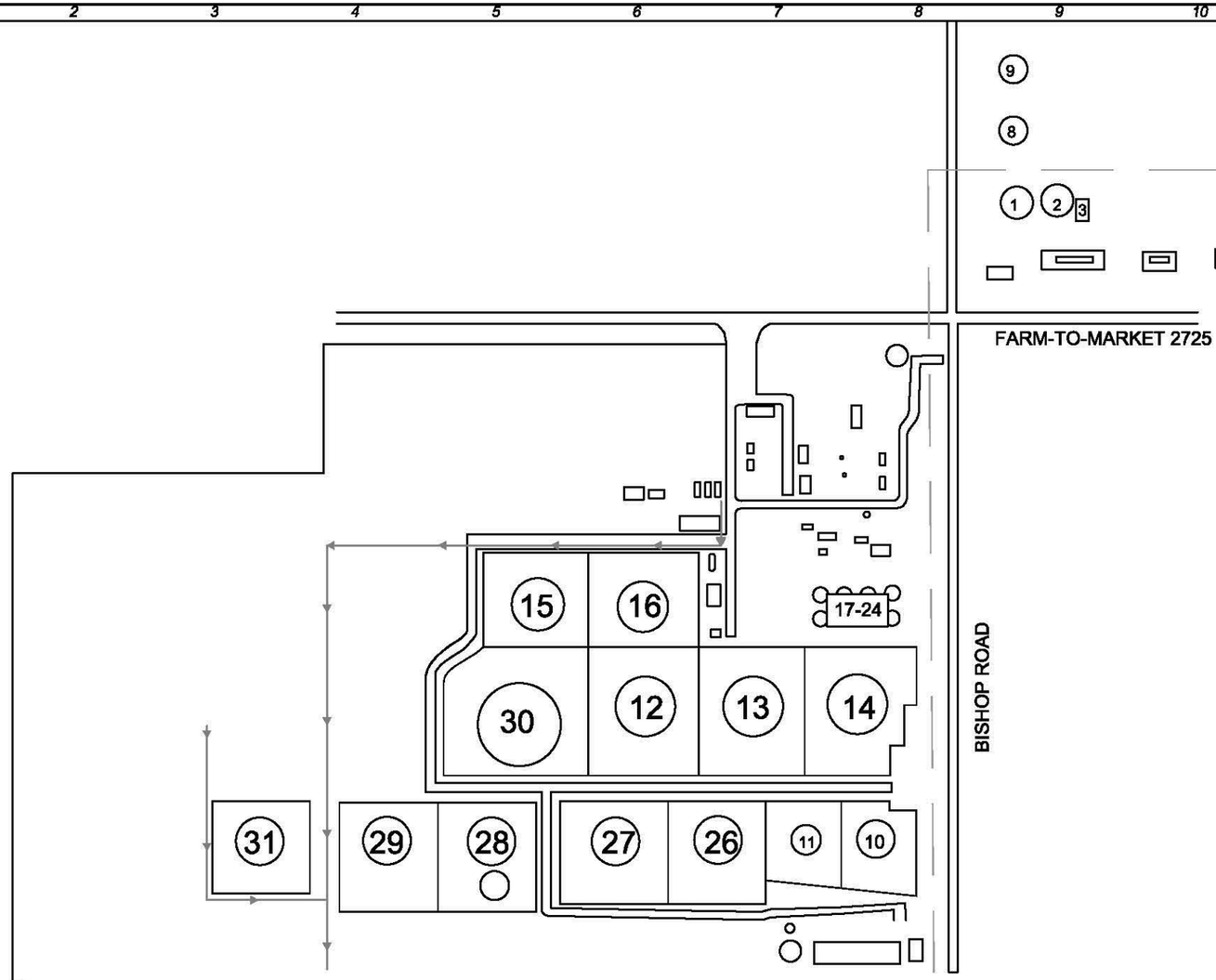
GEORGETOWN, TX 78628
(512) 930-1535 VOICE
(512) 930-7696 FAX

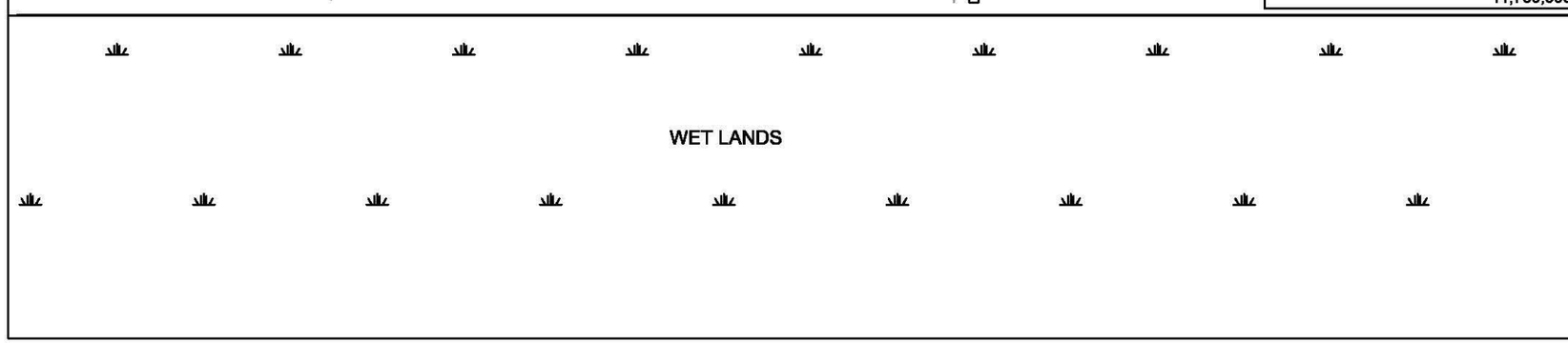
FALCON REFINING

FIGURE 1

DRAWN	CHECKED	APPROVED		JOB NO.	DRAWING NO.
		BNC	OWNER		
DATE 09/16/03	DATE	SCALE N.T.S.			



TANK #	SIZE	TOTAL CAPACITY	NOTES
1	1,000	-	GAS, DIESEL OILS, 69% FUEL
2	1,000	-	PH > 12.5 LIGHT OIL
3	-	-	UNKNOWN
4	-	-	2' PARAFFIN BASED OIL SLUDGE
5	-	-	EMPTY
6	-	-	3' PARAFFIN BASED OIL SLUDGE
7	10,000	10,000	HAZ. LEAD
8	20,000	-	EMPTY - 97% WATER
9	20,000	-	EMPTY
10	50,000	50,000	NO ANALYSES
11	50,000	50,000	NO ANALYSES
12	100,000	-	LEASED FOR CRUDE STORAGE
13	100,000	-	LEASED FOR CRUDE STORAGE
14	100,000	-	LEASED FOR CRUDE STORAGE
15	55,000	-	EMPTY
16	55,000	-	LEASED FOR CRUDE STORAGE
17	5,000	5,000	HAZ. BENZENE
18	5,000	5,000	MOSTLY WATER / MAY NOT BE
19	5,000	5,000	NOT ANALYZED
20	5,000	5,000	PH > 12.5 CAUSTIC AND GASOLINE
21	5,000	5,000	87% WATER
22	5,000	5,000	MAY NOT BE
23	5,000	5,000	97% WATER AND GASOLINE
24	5,000	5,000	MOSTLY WATER
25	-	-	UNKNOWN
26	65,000	65,000	75% - GAS, DIESEL, LEAD AND ZINC
27	65,000	65,000	MOSTLY WATER
28	67,000	-	EMPTY
29	67,000	-	HAS BEEN REMOVED
30	200,000	-	EMPTY
31	67,000	-	HAS BEEN REMOVED
		280,000 BARRELS 11,760,000 GALLONS	



SCALE
N.T.S.

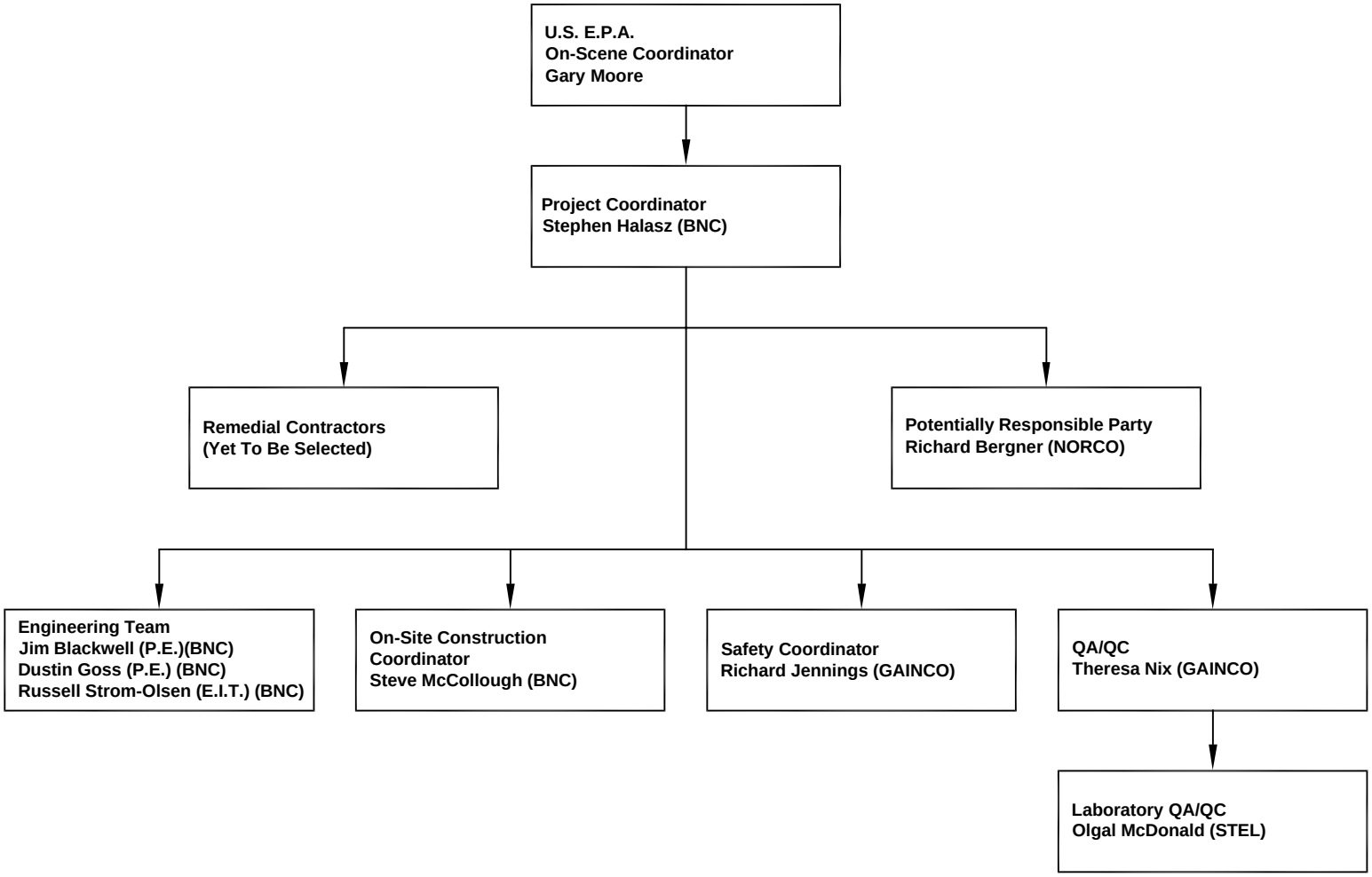
NO.	REVISIONS	DATE

BNC ENGINEERING, LLC
607 RIVER BEND DRIVE
GEORGETOWN, TX 78628

FALCON REFINING

FIGURE 2

JOB NO.	SCALE	DATE	DRAWING NO.
	N.T.S.	09/16/03	



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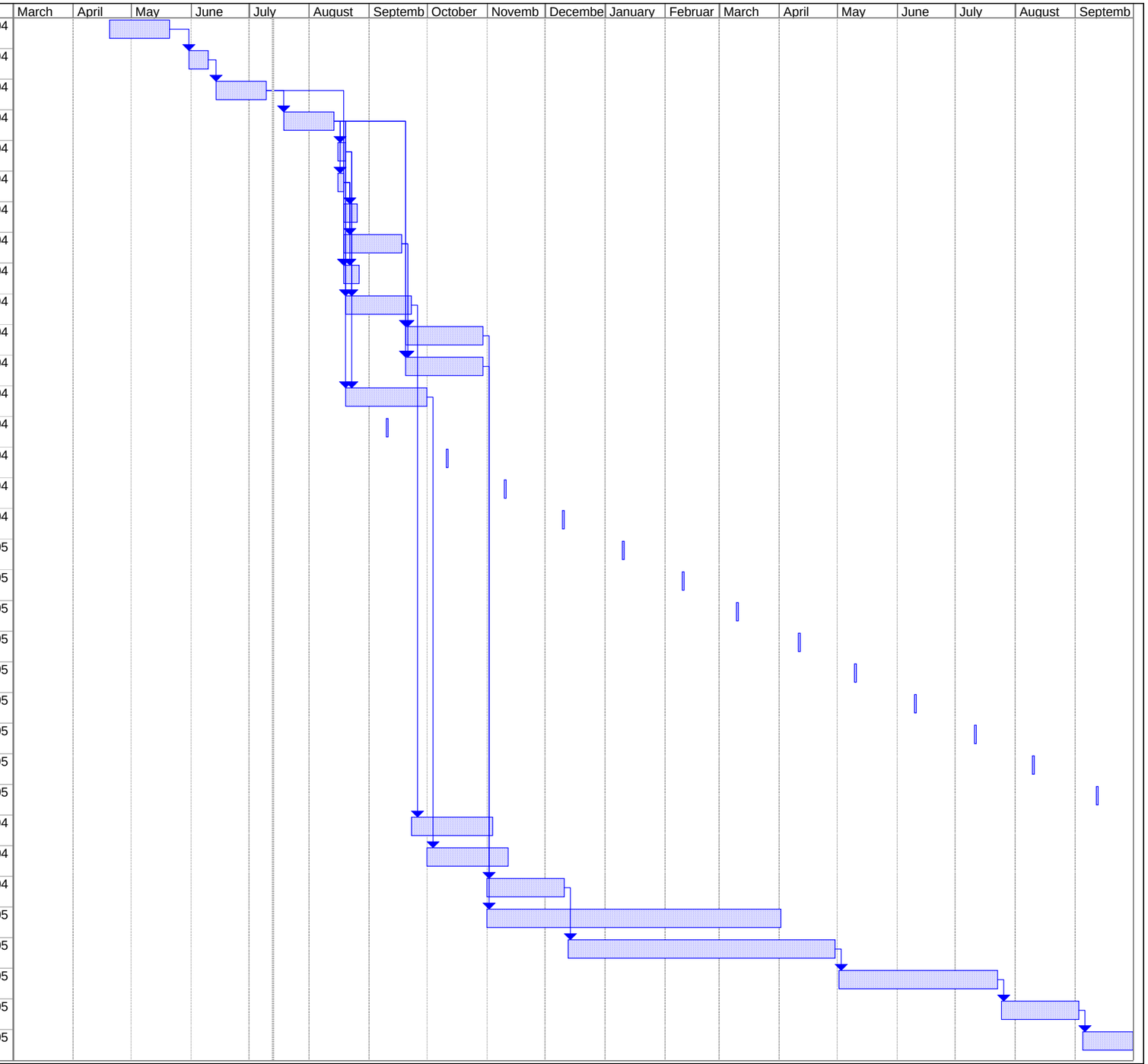
FALCON REFINING
FIGURE 3
Project Team
Removal Action
Work Plan
Falcon Refinery

DRAWN	CHECKED	APPROVED	
		BNC	OWNER
DATE 07/02/04	DATE	SCALE N.T.S.	JOB NO. / DRAWING NO.

ID	Task Name	Duration	Start	Finish
1	Publish notice of Agreed Orders for public comment	23 days	Tue 4/20/04	Thu 5/20/04
2	EPA Officially signs Agreed Orders	8 days	Mon 5/31/04	Wed 6/9/04
3	Submit Removal Action Workplan (RAW)	20 days	Mon 6/14/04	Fri 7/9/04
4	EPA Review and approval of RAW	20 days	Mon 7/19/04	Fri 8/13/04
5	Secure site	4 days	Mon 8/16/04	Thu 8/19/04
6	Locate utilities	3 days	Mon 8/16/04	Wed 8/18/04
7	Install office trailer	5 days	Thu 8/19/04	Wed 8/25/04
8	Construct decon area, staging area and first aid station	22 days	Thu 8/19/04	Fri 9/17/04
9	Remove tall grass and debris	6 days	Thu 8/19/04	Thu 8/26/04
10	Asbestos survey	24 days	Fri 8/20/04	Wed 9/22/04
11	Guage and sample tank contents	30 days	Mon 9/20/04	Fri 10/29/04
12	Perform structural integrity test of tanks	30 days	Mon 9/20/04	Fri 10/29/04
13	Survey areas with stained soil and sample	30 days	Fri 8/20/04	Thu 9/30/04
14	Monthly updates to EPA	1 day	Fri 9/10/04	Fri 9/10/04
15	Monthly updates to EPA	1 day	Mon 10/11/04	Mon 10/11/04
16	Monthly updates to EPA	1 day	Wed 11/10/04	Wed 11/10/04
17	Monthly updates to EPA	1 day	Fri 12/10/04	Fri 12/10/04
18	Monthly updates to EPA	1 day	Mon 1/10/05	Mon 1/10/05
19	Monthly updates to EPA	1 day	Thu 2/10/05	Thu 2/10/05
20	Monthly updates to EPA	1 day	Thu 3/10/05	Thu 3/10/05
21	Monthly updates to EPA	1 day	Mon 4/11/05	Mon 4/11/05
22	Monthly updates to EPA	1 day	Tue 5/10/05	Tue 5/10/05
23	Monthly updates to EPA	1 day	Fri 6/10/05	Fri 6/10/05
24	Monthly updates to EPA	1 day	Mon 7/11/05	Mon 7/11/05
25	Monthly updates to EPA	1 day	Wed 8/10/05	Wed 8/10/05
26	Monthly updates to EPA	1 day	Mon 9/12/05	Mon 9/12/05
27	Initiate asbestos abatement	30 days	Thu 9/23/04	Wed 11/3/04
28	Grossly contaminated soil removal	30 days	Fri 10/1/04	Thu 11/11/04
29	Transfer or dispose of liquids	30 days	Mon 11/1/04	Fri 12/10/04
30	Demolish unacceptable tanks and piping	110 days	Mon 11/1/04	Fri 4/1/05
31	Dispose of hazardous liquids or begin the installlation of a	100 days	Mon 12/13/04	Fri 4/29/05
32	Draft Completion Report	60 days	Mon 5/2/05	Fri 7/22/05
33	EPA Review	30 days	Mon 7/25/05	Fri 9/2/05
34	Final Completion Report	20 days	Mon 9/5/05	Fri 9/30/05



Project: RAW schedule.mpp
Date: Tue 7/13/04

Task | Progress | Summary | External Tasks | Deadline
Split | Milestone | Project Summary | External Milestone

APPENDIX A

SAFETY AND HEALTH PLAN

SAFETY AND HEALTH PLAN

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

Prepared for

National Oil Recovery Corporation
3717 Bowne Street
Flushing, NY 11354

Prepared by

BNC Engineering, LLC.
607 River Bend Drive
Georgetown, Texas 78628

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1.0 PURPOSE

The purpose of this Safety and Health Plan (SHP) is to establish policies and procedures to protect personnel from potential health hazards associated with work activities at the former Falcon Refinery in San Patricio County, Texas (site). The site occupies approximately 104 acres and is located 1.7 miles southeast of State Highway 361 on FM 2725 at the northwest and southeast corners of FM 2725 and Bishop Road. Additionally, this SHP has been prepared to minimize accidents and injuries that may occur during normal daily activities. This SHP was prepared in accordance with the Occupational Safety and Health Administrations (OSHA's) Standards and Regulations contained in Title 29 CFR Parts 1910 and 1926 including amended sections in 29 CFR 1910.120 and current Recommended Exposure Limits (RELs) as provided by the National Institute for Occupational Safety and Health (NIOSH).

This SHP is designed to ensure the following:

- That field personnel are not adversely exposed to the constituents of concern as well as the physical hazards present;

- That the public welfare or the environment are not adversely impacted by migration of contaminated materials due to work activities; and

- That operations, procedures and equipment will meet the requirements of 29 CFR 1910.120, Hazardous Waste Operations and Emergency Response and the applicable subparts of 29 CFR 1926 and 29 CFR 1910.

A complete copy of the BNC Safety and Health Protocol, which provides additional safety and health details, will be maintained at the site by the Safety Coordinator.

2.0 APPLICABILITY

This SHP applies to activities associated with the Falcon Refinery Superfund Site Removal Action (RA) and Remedial Investigation and Feasibility Study (RI/FS).

3.0 RESPONSIBILITY AND AUTHORITY

The Safety Coordinator (SC) has overall responsibility for safe conduct of all field work, including ensuring full implementation of this plan. The SC will attend to the daily safety and health matters in the field. The SC must be on-site, as applicable, when work is conducted at the site. The SC is authorized to stop work when working conditions become unacceptable and is authorized to dismiss from the project site any worker whose conduct endangers the safety and health of others.

Responsibilities of the SC include:

- Controlling and maintaining access to the work area;

- Implementing the SHP at the initiation of field work;

- Conducting the pre-entry safety briefing for all field personnel with regard to the SHP and other safety requirements to be observed during operations, including:

    - ☐ Potential hazards;
    - ☐ Personal protection principles;
    - ☐ PPE;
    - ☐ Respiratory protection equipment usage; and
    - ☐ Emergency response procedures.

- Reviewing and modifying the SHP as additional information becomes available;

- Supervision and enforcement of safety equipment usage;

- Supervision and inspection of equipment cleaning;

- Personnel training in safety equipment and usage;

- Suspending work activities if unsafe working conditions develop;

- Informing employees, nearby workers and visitors of the nature of chemical exposure risk as required by the "Right-to-Know" Law;

- Recommending a medical examination when required for an employee;

- Coordinating the Emergency Response Plan;

- Maintaining a log with a sign in/out sheet for personnel performing activities and visitors entering work areas;

- Investing all accidents, injuries, illness, spills, fires, incidents and near misses; and

- Ensuring that all subcontractors have a SHP.

4.0 PRE-ENTRY BRIEFING

Before activities begin at the site, all field personnel, including subcontractor employees, must be briefed on their work assignments and the provisions of this plan. Each person must acknowledge receipt and willingness to comply by signing the Signature Form. At a minimum, the briefing will:

- Describe the assigned tasks and their potential hazards,

- Coordinate activities,

- Identify methods and precautions to prevent injuries,
- Plan for emergencies,
- Describe any changes in the site specific safety plan,
- Get worker feedback on conditions affecting safety and health,
- Designate emergency evacuation routes prior to beginning of work, and
- Designate on-site and off-site assembly points.

As subsequent phases of a project are undertaken and as new personnel provide services, the plan and Signature Form shall be updated. The Signature Form is presented as APPENDIX A. The Site Standard Operating Procedures are presented as APPENDIX B.

Additionally all subcontractors will be provided with a copy of the approved Removal Action Work Plan as required by the EPA.

5.0 SAFETY AND HEALTH INSPECTIONS

The SC will conduct frequent inspections of site conditions, facilities, equipment, and activities to determine compliance with this SHP. The frequency at which inspections will occur will be at the discretion of the SC and will vary based on the characteristics of the site, the equipment used on-site, and an evaluation of the on-site risk with respect to personnel, equipment, and property.

6.0 EMPLOYEE TRAINING

BNC employees and subcontractors are trained as per the requirements listed in 29 CFR Part 1910.120 (e). The applicable OSHA training requirements are presented below.

- General site workers (such as equipment operators, general laborers and supervisory personnel) engaged in hazardous substance removal or other activities which expose or potentially expose workers to hazardous substances and health hazards shall receive a minimum of 40 hours of instruction off the site, and a minimum of three days actual field experience under the direct supervision of a trained, experienced supervisor.

- Workers on-site only occasionally for a specific limited task (such as but not limited to, ground water monitoring, land surveying, or geo-physical surveying) and who are unlikely to be exposed over the permissible exposure limits (PELs) shall receive a minimum of 24 hours of instruction off the site, and the minimum of one day actual field experience under the direct supervision of a trained, experienced supervisor.

- Workers regularly on-site who work in areas which have been monitored and fully characterized indicating that exposures are under permissible exposure limits and published exposure limits where respirators are not necessary, and the characterization indicates that

there are no health hazards or the possibility of an emergency developing, shall receive a minimum of 24 hours of instruction off the site and the minimum of one day actual field experience under the direct supervision of a trained, experienced supervisor.

- On-site management and supervisors directly responsible for, or who supervise employee engaged in, hazardous waste operations shall receive 40 hours initial training, and three days of supervised field experience (the training may be reduced to 24 hours and one day if this individual only supervise workers requiring 24 hour training) and at least eight additional hours of specialized training at the time of job assignment.

7.0 SAFETY AND HEALTH RISKS

Health studies have shown that Hazardous constituents may pose potential human health risks, which may vary from person to person. As a precaution, exposure to chemicals of concern or gas liquids, vapors, mists or fumes should be minimized. High vapor concentrations are irritating to the eyes and the respiratory tract, may cause headaches and dizziness, are anesthetic, may cause unconsciousness, and may have other central nervous system effects including death. Skin contact with hot product may cause thermal burns. Prolonged or repeated contact with this product at warm or ambient temperatures tends to remove skin oils, possibly leading to irritation and dermatitis. Eye contact with hot product may cause thermal burns. Contact with this product at warm or ambient temperatures may cause eye irritation but will not damage eye tissue.

Refinery sampling and remediation operations may include benzene as a natural constituent. Benzene can cause anemia and other blood diseases, including leukemia (cancer of the blood-forming system), after prolonged or repeated exposure to high concentrations (e.g., 50-500 PPM). OSHA regulation 29 CFR Part 1910 establishes an action level for benzene of 5 PPM and permissible exposure limited of 10 PPM as an 8-hour time weighted average.

A complete list of OSHA PELs is maintained at the site and will be administered by the SC.

Safety and Health Hazards including potential hazards and precautions, and heat and cold stress are further described on APPENDIX C.

8.0 PERSONAL PROTECTIVE EQUIPMENT (PPE)

Personal protective equipment is divided into four categories (Levels A, B, C and D) based on the degree of protection required.

Level A (SCBA, totally-encapsulating chemical-protective suit, coveralls, gloves, steel toed/shank boots, and hard hat) is selected when the greatest level of skin, respiratory, and eye protection is required.

Level B (SCBA, hooded chemical-resistant clothing, coveralls, gloves, steel toed/shank boots, and hard hat) is selected when the highest level of respiratory protection is necessary but a lesser level of skin protection is needed.

Level C (air purifying respirator, hooded chemical-resistant clothing, gloves, steel toed/shank boots, hard hat, and face shield) is selected when the concentrations and types of airborne substances is known and the criteria for using air purifying respirators are met.

Level D (coveralls, gloves, steel toed/shank boots, safety glasses/goggles, hard hat and face shield) is selected when a work uniform is adequate to afford the protection required to protect against nuisance contamination (29 CFR Part 1910.120).

At a minimum, the following PPE should be available on-site in appropriate sizes for use when needed:

- National Institute for Occupational Safety and Health (NIOSH) approved full or half-face respirator with combination high efficiency particulate air and organic vapor/acid gas cartridge. Respirators must be worn when airborne action levels are reached or exceeded.

- Saranex or polyethylene coated Tyvek coveralls must be worn when the services to be provided will require contact to body parts, other than just hands, with any of the contaminants listed in this SHP.

- Safety goggles or glasses must be worn at all times.

- Hard hat, steel toed shoes with a steel shank must be worn at all times.

- Nitrile gloves, neoprene gloves, or a suitable substitute must be worn when handling soil or waste impacted or potentially impacted with any of the constituents listed in this SHP.

- Neoprene or butyl rubber safety boots, calf-length, must be worn when walking on soil or waste impacted or potentially impacted with any of the constituents listed in this SHP.

- Reflective clothing must be worn in areas with heavy traffic.

- Fire extinguishers must be on-site at all times.

- Ear plugs must be used in environments where the noise level exceeds 85 dBA.

8.1 Respiratory Program

Prior to arriving at the facility personnel will have received training in the use of and been fit tested for a full or half face respirator. During intrusive activities a photo-ionization detector (PID) will be used to monitor for organic vapors and some inorganic gases. Background concentrations will be established prior to commencing work activities at each location.

Sustained (greater than five minutes) air monitoring action levels to determine the level of respiratory protection necessary during field activities will be:

Sustained PID Organic Reading Above Background	Protection Level
0 – 10 ppm	Level D, Modified Level D
1 - 125 ppm	Full or half face air purifying respirator (Level C)
> 125 ppm	Shut down activities

Work will be stopped and the work area will be allowed to vent if monitoring indicates that organic vapors are present at concentrations which present Immediate Danger to Life and Health (IDLH) conditions, or in excess of the protection factor afforded by the air purifying respirator.

8.2 Personal Hygiene

All personnel performing or supervising work within the EZ will observe and adhere to the personal hygiene provisions of this section. The following equipment/facilities are available for personnel:

- Suitable disposable outerwear, gloves, respiratory protection and footwear on a daily basis for the use of field personnel;
- Disposable containers for used outerwear; and
- Potable water and a suitable sanitation facility.

The following regulations will be enforced for all personnel actively participating in the field sampling program:

- Personnel will wear appropriate PPE when in the EZ;
- Used disposable outerwear will not be reused if deemed unsuitable and when removed will be placed inside disposal containers;
- Smoking, eating and drinking will be prohibited within the EZ; and
- Personnel will thoroughly clean their hands, face, neck and other exposed areas before smoking, eating, drinking, and before leaving the CRZ.

9.0 MEDICAL SURVEILLANCE

All employees who are or may be exposed to hazardous substance or health hazards at or above the PELs or, if there is no PEL, above the published exposure levels for these substances, without regard to the use of respirators, for 30 days or more a year will be placed on BNC's medical surveillance program.

A licensed physician will determine whether or not personnel can work in a hazardous environment. BNC employees will not wear PPE (such as respirators, encapsulating suits, etc.)

if, in the opinion of a licensed physician, the employee might suffer physical or psychological harm due to wearing the PPE. This program is administrated in accordance with 29 CFR 1910.120 (f).

10.0 MONITORING

10.1 Monitoring Instruments

Four instruments are used to monitor for a safe working environment:

- Combustible Gas/Oxygen indicator with readout in % Lower Explosive Limit (LEL) and % Oxygen (O_2).
- Photoionization detector (PID) field survey instrument (HNU or equivalent).
- Hydrogen Sulfide (H_2S) Monitor
- Detector Tube System

10.2 Monitoring Guidelines

Personnel exposure and area monitoring should be performed as often as necessary and wherever necessary to protect field personnel from potential health hazards associated with organic vapors and hydrogen sulfide. Monitoring must be performed by individuals trained in the calibration, use and care of the required instruments.

10.3 Toxicity Monitoring Action Levels

Initial and periodic monitoring for toxicity action levels should be conducted with a PID when the SC deems necessary. Personnel exposure monitoring should be conducted in the worker's breathing zone, which is a one foot diameter sphere surrounding the worker's head. If vapors are measured continuously and the instrument must be unattended, the detector inlets should be located as close to the worker's breathing zone as possible. Decisions regarding respirator use will be based on breathing zone vapor concentrations of personnel expected to have the greatest exposures. Particular effort should be made to monitor personnel exposures while trenching or boring.

The toxicity action levels will comply with Occupational Safety and Health Administration Permissible Exposure Limits. Respiratory protection must be worn when meter readings, averaged over 10 minutes, equal or exceed the action level for upgrade to Level C personal protective equipment. Workers must be evacuated from the area when organic vapor concentrations exceeding respirator's protection factors are encountered.

10.4 Explosive Action Levels

Explosive monitoring should be conducted when the SC deems necessary, with the detector set at a location near and downwind of the source of emission. Additional monitoring with the LEL monitor should be conducted when organic vapor concentration exceed the ppm range of the PID instrument. If 10% of the LEL is reached, initiate shut-down and evacuation procedures immediately.

The explosive action level below was set to prevent the creation of flammable or explosive atmospheres. Measurements should be taken at all locations where personnel are present or power/hand tools are used.

EXPLOSIVE ACTION LEVELS

Instrument	Action Level to Evacuate Area
Combustible Gas Indicator	10% of LEL

The Combustible Gas Indicator (CGI) alarm (if applicable) should be set to sound at the action level. Hexane, methane, or pentane calibration gas should be used for calibration. When measurements with a CGI indicate the presence of combustible gas levels equal to or exceeding the explosive action level in the work area, the following action must be taken:

- Extinguish all possible ignition sources in the work area and shut down all powered equipment,
- Move personnel at least 100 feet away from work area, and
- Contact the Safety Officer.

After waiting 15 minutes for vapors to dissipate, the SC may use the CGI to cautiously approach the work area to determine the extent and concentration of organic emissions. No personnel may enter any area where CGI readings exceed the explosive action level. Personnel may reenter the work area only by clearance of the SC after the cause of the emission has been determined and the source abated.

11.0 CONFINED SPACE

Confined space is usually defined as a space with limited openings for entry or egress and may require the use of ladders, hoists, or other devices; enclosed such that adequate dilution ventilation is not obtained by natural air movement; not designed for continuous worker occupancy; may be subject to the accumulation of toxic or combustible agents; or may have an oxygen deficiency (less than 19.5% oxygen).

Specific confined space entry procedures are available at the site and will be used and enforced by the SC, if needed.

12.0 SITE CONTROL MEASURES

Access to potentially hazardous areas must be controlled to reduce the probability of occurrence of physical injury and chemical exposure of field personnel, visitors, and the public. The boundaries of a potentially hazardous area shall be identified by barricades or emergency traffic cones or posts, depending on conditions. Trenches and other large holes must be guarded with

wooden or metal barricades spaced no further than 20 feet apart and connected with yellow or yellow and black nylon tape no less than 3/4 inches wide. The barricades must be placed no less than two feet from the edge of the excavation or hole.

Entry to a potentially hazardous area shall be limited to individuals who must work in the area. Unofficial visitors will not be permitted to enter while work is in progress. Official visitors will not be allowed to enter a potentially hazardous area unless they are informed of the potential dangers that could be encountered in the area; sign the Signature Form, agree to abide by the provisions of this document, and follow instructions issued by the SC.

Specific work areas will be delineated by temporary fencing or flagging. The following three zones will be described:

- Exclusion Zone (EZ) – This zone will include all areas where potentially contaminated soil or materials are to be handled and all areas where contaminated equipment or personnel travel.

- Contaminant Reduction Zone (CRZ) – This zone will occur at the interface of the EZ and Support Zone (SZ) and will provide access for the transfer of construction materials and field equipment to the EZ.

- Support Zone (SZ) – This area is the portion of the work area defined as the area outside the zone of significant air, liquid and soil contamination.

13.0 SPILL CONTAINMENT

The purpose of this section is to provide contingencies for spills resulting from crude oil liquids or materials brought to the site or produced at the site by field personnel. Every effort should be made to adhere to the procedures presented below.

- After obtaining the proper spill response tools and PPE, attempt to contain the spill so as to prevent its entry into a storm sewer, a drainage ditch, or any conveyance that eventually discharges to surface waters. Equipment and media that can be used to contain spills include absorbent material and absorbent socks.

- At the same time that containment is being conducted or as soon as possible after containment, the field personnel shall attempt to locate the source of the release and if deemed appropriate by the SC, abate the source.

- Once the spill is contained and the source eliminated, the spilled material shall be collected by the appropriate manner and placed into secured container. The area or surface in contact with the spilled material shall be decontaminated by an appropriate method that is permissible under federal, state, and local environmental rules. The specific method used should depend upon the substance, the availability of permitted sewer discharge to a public

owned treatment work (POTW), regulatory standards applicable to hazardous and toxic wastes, and other factors.

- All spill material and debris will be managed in a manner that fully complies with applicable federal, state, and local environmental rules regarding recycling or disposal of wastes. The preferred method is to recycle or reclaim materials from spills in an effort to minimize waste generation. Where this is not feasible or allowed, then the collected spilled material will be disposed of in accordance with applicable federal, state, and local rules.

14.0 DECONTAMINATION

According to 29 CFR Part 1910.120 (l), procedures must be established for those projects requiring decontamination and communicated to employees and subcontractors that will work at the site. Decontamination effectiveness must be monitored by the SC. Generally, field decontamination of personnel and equipment is required when working with petroleum substances contaminated with petroleum. BNC's decontamination procedures are presented below.

14.1 Personnel Decontamination

Contamination should be removed from skin using a mild detergent and water. Hot water is more effective than cold water. Liquid dishwashing detergent is more effective than hand soap. Decontaminated wastewater or solution will be disposed of according to federal, state and local rules.

14.2 Equipment Decontamination

Gloves, respirators, hard hats, boots and goggles should be cleaned as described above. Sampling equipment, augers, vehicle undercarriages, and tires should be steam or high-pressure washer cleaned. The steam cleaner is a convenient source of hot water for personnel and protective equipment cleaning but extreme caution must be exercised to prevent burns and equipment damage from elevated temperatures. Never use the steam cleaner directly on the skin. Decontaminated wastewater or solution will be disposed of according to federal, state and local rules.

15.0 EMERGENCY RESPONSE

All field employees have received training regarding contingency plans for site emergencies. Training was obtained through the 40-hour course on Hazardous Waste Operations and Emergency Response (OSHA 29 CFR Part 1910.120).

15.1 Emergency Response Activities

The procedures listed below should be followed during a site emergency.

- Survey the situation. Do not endanger your own life. DO NOT ENTER A CONFINED SPACE TO RESCUE SOMEONE WHO HAS BEEN OVERCOME unless you are qualified in rescue procedures.

- Call 911 or the fire department immediately. Explain the physical injury, chemical exposure, fire or release.

- If the victim's condition appears to be non-critical, but seems to be more severe than minor cuts, transport the victim to the nearest hospital or clinic listed. If condition is obviously serious, transportation must be done by EMS. Make certain that injured persons are accompanied to the emergency room.

- Complete the Accident/Incident Investigation Report, which is presented as APPENDIX D, within 24 hours and submit this document to the Safety Officer.

15.2 Emergency Contacts and Notification

A list of emergency contact numbers is presented the Emergency Contacts presented as APPENDIX E.

15.3 Emergency Medical Treatment

The SC will assume charge during a medical emergency until the ambulance arrives, or the injured person is admitted to the emergency room. The SC shall conduct the following:

- Prevent further injury;

- Initiate first aid and CPR (if applicable) carefully to avoid bloodborne pathogens;

- Call the ambulance and hospital;

- Determine if decontamination will make injury worse;

- Make certain that injured person is accompanied to emergency room;

- Notify the Safety Manager; and

- Prepare an incident report and submit to the Safety Officer within 48 hours.

15.4 Evacuation

The following activities will be conducted during evacuation:

- Personnel will exit the work area and assemble at the off-site assembly point upon hearing the emergency signal for evacuation.

- The SC will account for all personnel in the off-site assembly zone.

- The SC and a "buddy" will remain after the site has been evacuated (if possible) to assist local responders and advise them of the nature and location of the incident.

15.5 Site Security and Control during Emergencies

- If public evacuation is necessary, responsibility for implementation lies with government authorities.

- When the Fire Department, federal regulatory agents or state regulatory agents arrive, the command, control and responsibility for the site may be assumed by that entity.

- No one is permitted on-site during the emergency, unless exception is individually granted by the incident commander.

- Physical barriers should be immediately erected to indicate the perimeter of the incident area; nonessential personnel and the public must be kept outside of this border.

- To evacuate the public, inform local police to contact Civil Defense or other agencies.

16.0 DISCIPLINARY ACTION

Failure to adhere to and follow the policies and procedures discussed in this SHP may result in disciplinary action including termination of employment or contract.

17.0 PLAN APPROVAL

The SHP has been prepared for use by BNC personnel. BNC claims no responsibility for its use by others, unless specified and defined in project or contract documents. The plan is written for the specific site conditions, purposes, dates, and personnel specified and must be amended if these conditions change.

Plan approved by:_____ **Date:**_____

APPENDIX A

SIGNATURE FORM

I have read, understand, and agreed to abide by this site-specific safety and health plan.

COMPANY	PERSONNEL	SIGNATURE	DATE

SITE- SPECIFIC INFORMATION

Safety Coordinator:_____

Site Name:_____

Site Address:_____

Date Site Safety Plan Prepared:_____

Date(s) of Site Work:_____

Site Description and Previous Usage:_____

Description and Size of Work Area:_____

Type of Area: ☐ Industrial ☐ Commercial ☐ Residential

HAZARD EVALUATION

Physical Hazards	Chemical Hazards	Biological Hazards
☐ Heat/Cold Stress	☐ Petroleum/Hydrocarbon	☐ Snakes
☐ Noise	☐ Heavy Metals	☐ Scorpions
☐ Traffic	☐ Asbestos	☐ Insects
☐ Crime	☐ PCB	☐ Other (Specify)
☐ Underground Utilities	☐ Flammable	_____
☐ Power Lines	☐ Corrosive	
☐ Heavy Equipment	☐ Toxic	
☐ Drum Handling	☐ Reactive	
☐ Pits, Ponds, or Surface Water	☐ Unknown	
☐ Confined Spaces/Trenches/Excavations	☐ Other (Specify)	
☐ Other (Specify)_____	_____	

Work Description:

APPENDIX B

STANDARD OPERATING PROCEDURES

1. The buddy system will be used. Hand signals will be established.

2. During site operations, each worker should consider himself as a safety backup to their partner. Off-site personnel provide emergency assistance. All personnel should be aware of dangerous situations that may develop.

3. Visual contact must be maintained between buddies on-site.

4. Eating, drinking, chewing gum or tobacco, smoking, or any practice that increases the probability of hand-to-mouth transfer and ingestion of material is prohibited in any area designated as contaminated.

5. Prescription drugs should not be taken by personnel where the potential for contact with toxic substances exists, unless specifically approved by a qualified physician. Alcoholic beverage intake is prohibited during the work day.

6. No excessive facial hair which interferes with the satisfactory fit of respiratory protection is allowed on personnel required to wear such equipment. Each staff member must pass the fit-testing for respirators.

7. Contact lenses will not be permitted at the site.

8. Disposable clothing will be used whenever necessary to minimize the risk of cross-contamination.

9. The number of personnel and amount of equipment in any contaminated area should be minimized, but allow for effective site operations.

10. Work areas for various operational activities (equipment testing, decontamination) will be established.

11. Procedures for leaving any contaminated area will be planned and reviewed prior to going on-site.

12. Work areas and decontamination procedures will be established based on prevailing site conditions and are subject to change.

13. Wind indicators will be strategically located on-site.

14. Contact with contaminated or potentially contaminated surfaces should be avoided. Whenever possible, do not walk through puddles, mud, or any discolored ground surface; do not kneel on the ground, lean, sit or place equipment on drum, container, vehicles, or on the ground.

15. No personnel will be admitted to the site without the proper safety equipment.

16. Proper decontamination procedures must be followed before leaving the site.

17. All Personnel must comply with established safety procedures. Any staff member who does not comply with safety policy, as established by the Safety Officer will be immediately dismissed.

Tailgate Safety Meetings (TGSM)

To make employees and contractors aware of safety on a daily and timely basis, the Tailgate Safety Meeting (TGSM) has been introduced as a standard practice throughout BNC.

A Tailgate Safety Meeting is to be conducted at a minimum of once every day or once every job or procedure change. Following are the objectives of a TGSM:

- Identify hazards that may interfere with safety performance and determine actions required to eliminate those hazards
- Provide a systematic approach to safety
- Work within and complement other BNC safety programs
- Provide a safe work place with zero safety incidents

Methods

Every employee is responsible for being part of a TGSM.

When working alone, individual employees can review the tasks at hand using the TGSM checklist or by conducting a Job Safety Analysis that includes all aspects of the TGSM.

Employees working as a team or working with contractors should hold TGSMs as a group. Leadership and facilitator roles should be rotated so all team members gain leadership experience and gain ownership of the process.

The Tailgate Safety Meeting begins with a review of the TGSM checklist. Meetings are held with everybody on the job every day and whenever the job or job procedures change. Note that the procedures also cover follow-up in case of an unexpected event in the course of a project.

The TGSM checklist contains a review of the Smith System® and Take Two®, both strong programs of proven benefit. Individual aspects of the job and job requirements also appear on the checklist. These are presented in this form so they may be discussed and checked off one by one.

TGSM CHECKLIST

Smith System® ☐

- Aim high in steering
- Get the big picture
- Leave yourself an out
- Make sure they see you

Take Two® ☐

- Talk: Have I talked to all concerned about what I'm going to do and how it might affect others?
  Have I talked to the right people about any way I see to make the job safer?
- Actions: How can my actions affect my own safety?
  How can my actions affect the safety of others?
- Knowledge: Do I know the procedures, the written ones and the unwritten ones?
  Do I know all of the hazards of the surroundings and the environment, and what to do about them?
- Equipment: Do I have the proper protective equipment for this job?
  Do I have the correct tools and equipment for this particular job, and are they in good condition?

Shut Down Authority ☐	Lights On ☐	Chemical Exposure ☐
Noise/Hearing Protection ☐	Backing ☐	MSDS/HAZCOM ☐
Excavation Safety & Daily Inspection ☐	Hazards w/driving ☐	Hoist/Cables/Slings/ Chains, etc. ☐
PPE ☐	Weather (changes) ☐	Proper and Adequate Training ☐
Lock Out/Tag Out ☐	Heat Stress ☐	Emergency Proc. Reviewed ☐
Written Procedures ☐	Hazards Associated w/Work Task ☐	First Aid/CPR ☐
Confined Spaces ☐	Distractions that May Affect Safety ☐	Work Attitude ☐
Respiratory Safety ☐	Safety Awareness ☐	Communications w/ Contractors ☐
Effect on Adjacent Facilities/Personnel ☐	Proper Tools ☐	State & Federal Notification ☐
Walking/Working Surfaces ☐	Work Permits ☐	Safe Electrical Work Practices ☐
JSA ☐	Ladders ☐	☐
☐	☐	☐

BNC SERVICES
JOB SAFETY ANALYSIS WORKSHEET

INSTRUCTIONS FOR COMPLETING JOB SAFETY ANALYSIS WORKSHEET

SEQUENCE OF BASIC JOB STEPS	POTENTIAL HAZARDS	RECOMMENDED ACTION OR PROCEDURE
Break the job down into steps. Each of the steps of a job should accomplish some major task. The task will consist of a set of movements. Look at the first set of movements used to perform a task, and then determine the next logical set of movements. For example, the job might be to move a box from a truck in the receiving area to a shelf in the storage area. How does that break down into job steps? Picking up the box from the truck and putting it on a hand truck is one logical set of movements, so it is one job step. Everything related to that one logical set of movements is part of that job step. The next logical set of movements might be pushing the loaded hand truck to the storeroom. Removing the boxes from the truck and placing them on the shelf is another logical set of movements. And finally, returning the hand truck to the receiving area might be the final step in this type of job. Be sure to list all the steps in a job. Some steps might not be done each time – checking the casters on a hand truck, for example. However, that task is a part of the job as a whole, and should be listed and analyzed. Number the steps. The number will provide a reference point for the hazards and procedures developed.	Identify the hazards associated with each step. Examine each step to find and identify hazards – actions, conditions and possibilities that could lead to an accident. Number the hazard list to correspond with your steps. It is not enough to look at the obvious hazards. It's also important to look at the entire environment and discover every conceivable hazard that might exist. Be sure to list health hazards as well, even though the harmful effect may not be immediate. A good example is the harmful effect of inhaling a solvent or chemical dust over a long period of time. It's important to list all hazards. Hazards contribute to accidents, injuries and occupational illnesses. In order to do part three of a JSA effectively, you must identify potential and existing hazards. That's why it's important to distinguish between a hazard, an accident and an injury. Each of these terms has a specific meaning: HAZARD – A potential danger. Oil on the floor is a hazard. ACCIDENT – An unintended happening that may result in injury, loss or damage. Slipping on the oil is an accident. INJURY – The result of an accident. A sprained wrist from the fall would be an injury. Some people find it easier to identify possible accidents and illnesses and work back from them to the hazards. If you do that, you can list the accident and illness types in parentheses following the hazard. But be sure you focus on the hazard for developing recommended actions and safe work procedures.	Using the first two columns as a guide, decide what actions are necessary to eliminate or minimize the hazards that could lead to an accident, injury or occupational illness. Number the actions to correspond with the steps and identified hazards. Among the actions that can be taken are (1) engineering the hazard out; (2) providing personal protective equipment; (3) job instruction training; (4) good housekeeping; and (5) good ergonomics (positioning the person in relation to the machine or other elements in the environment in such a way as to eliminate stresses and strains). List recommended safe operating procedures on the form, and also list required or recommended personal protective equipment for each step of the job. Be specific. Say exactly what needs to be done to correct the hazard, such as "lift, using your leg muscles." Avoid general statements like, "be careful." Give a recommended action or procedure for every hazard. If the hazard is a serious one, it should be corrected immediately. The JSA should then be changed to reflect the new conditions.

BNC SERVICES
JOB SAFETY ANALYSIS WORKSHEET

Job: Page of

Location Supervisor:

Date: Analysis Made By / Reviewed With:

Personal Protective Equipment required and/or recommended:

Sequence of Basic Job Steps	Potential Accidents or Hazards	Recommended Safe Job Procedure

Identify HAZARDS: Is there a possibility of striking against, being struck by, or making harmful contact with an object; of being caught in, by or between objects; of slipping, tripping or falling; of developing a strain from pushing, pulling, lifting, bending or twisting; of coming in contact with electricity or other power source; of receiving a thermal or chemical burn; of being exposed to a hazardous environment?

APPENDIX C

SAFETY AND HEALTH HAZARDS	
POTENTIAL HAZARD	PRECAUTION
Traffic	Wear fluorescent safety vest. Use cones/barricades to indicate work areas.
Petroleum Products/Methanol Exposure	Stand upwind. Wear PPE as appropriate. Follow decontamination procedure.
Inclement Weather	Stop outdoor work during lightning storms. Take cover indoors or in vehicle.
High Crime Areas	Be aware of surroundings. Request police protection, if appropriate.
Flammability	LEL ≥ 10%, leave area; seek advise on changing atmosphere; DO NOT ENGAGE ANY SPARK PRODUCING SOURCE; prevent electrical engagement; investigate source.
Oxygen Deficiency (O_2 < 19.5%)	Evacuate work area.
Oxygen Enrichment (O_2 > 23.5%)	Evacuate work area.
Flying Debris/Object	Personal protective equipment (PPE). Wear hard hat, safety glasses/goggles, steel toed boots and other PPE as appropriate.
Noise > 85 dBA	Utilize noise protection (ear plugs or ear muffs).
Steep Terrain/Unstable Surface	Brace and shore equipment.
High Pressure Hose Rupture	Check to see that fitting and pressurized lines are in good repair before using.
Electrical Shock	Make certain third wire is properly grounded. Do not tamper with electrical wiring unless qualified to do so.
Suspended Loads	Work is not permitted under suspended loads.
Moving Vehicles	Back-up alarm required for heavy equipment. A spotter should remain in contact with the vehicle operator and signal safe back-up. Personnel to remain outside of turning radius.
Slip, Trip, and Fall Hazards Due to Muddy Work Areas	Use wood pallets or similar devices in muddy work areas. Wear ANSI-approved safety shoes with steel toe and shank (foot bottoms) and non-skid sole.
Falls	All employees on walking/work surfaces with unprotected sides or edges which are 6 feet or more above a lower level will be protected from falling by the use of guard rail systems, safety net systems, or personal fall arrest systems.
Back Injury	Bend knees and use legs muscles or provide mechanical lifting aids.
Overhead Electrical Wires	Heavy equipment (e.g., drill rigs and transport trucks) to remain at least 10 feet from overhead power lines of 50 kV or less. For lines rated over 50 kV, the minimum clearance is 10 feet plus 0.4 inch for each 1 kV over 50 kV.
Trenches/Excavations	Make certain trench meets OSHA standard before entering. All excavations >5 feet deep must be sloped or shored. Excavation >4 feet deep must have a ladder every 25 feet. If not entering trench, remain 2 feet from edge of trench at all times.
Protruding Objects	Flag visible objects.
Buried Utilities, Drums, Tanks, and So Forth	Locate buried utilities, drums, tanks, etc., prior to digging or drilling and mark location.

HEAT STRESS		
ILLNESS	SYMPTOMS	FIRST AID
Heat Cramps	Muscle cramps of arms, legs and/or stomach. Heavy sweating (wet skin) and extreme thirst may occur.	1. Move worker to a shady area and loosen clothing. 2. Slowly give large amounts of cool water. 3. Watch the worker. Continue to give water, if worker accepts it. 4. Get medical help if cramps continue.
Fainting	Feeling weak, dizzy, or exhausted. Temporarily lost of consciousness.	1. Lay the victim down.
Heat Exhaustion	Shallow breathing, pale, cool, moist skin, dizziness, profuse sweating.	1. Move worker to a cool, shady area and loosen/remove clothing. 2. Pour water on worker and fan to permit cooling effect. 3. Have worker slowly drink cool water. 4. Elevate worker's legs. 5. Get medical help if symptoms continue; watch worker until symptoms are gone or medical help arrives.
Heat Stroke - Heat stroke is a medical emergency. Evacuate to a medical facility IMMEDIATELY.	Red, hot, dry skin, no perspiration, nausea, dizziness and confusion, strong - rapid pulse, coma, death.	1. Move worker to a cool, shady area and loosen or remove clothing (remove outer and/or protective clothing if the situation permits. 2. Start cooling the worker immediately. Immerse in water. Fan to cool. Massage extremities and skin. 3. Elevate worker's legs. 4. If conscious, have worker slowly drink cool water.
COLD STRESS		
Cold Stress	Dehydration, frostbite, heavy shivering, excessive fatigue, drowsiness, and irritability.	1. Wear warm clothing. 2. Provide heated shelters (tents, cabins, vehicles, etc.). 3. Provide warm, sweet drinks, and soups.

APPENDIX D

ACCIDENT / INCIDENT INVESTIGATION REPORT

Branch	Department / Department Manager	
Location of Incident	Date of Incident Time ☐ AM ☐ PM	**Date Reported**
Property Owner		

PERSONAL INJURY		**PROPERTY DAMAGE**	
Injured's Name		Property Damaged	
Occupation	Injured Part of Body	Estimated Costs	Actual Costs
Nature of Injury		Nature of Damage	
Object/Equipment/Substance		Object/Equipment/Substance/Inflicting Damage	
Person With Most Control of Object/Equipment/Substance		Person With Most Control of Object/Equipment/Substance	

Post Accident Drug Test Required? Yes _____ No

For Injured? Yes _____ No

For Contributing Parties: List Names

Testing Scheduled By: Date of Test:

DESCRIPTION

Describe Clearly How The Accident Occurred: Attach Accident Diagram For All Motor Vehicle Accidents.

_____

_____

_____

_____

_____

ANALYSIS

What Acts, Failures To Act And/Or Conditions Contributed Most Directly To This Accident?_____

_____

_____

_____

_____

LOSS SEVERITY POTENTIAL	**PROBABLE RECURRENCE RATE**
☐ Major ☐ Serious ☐ Minor	☐ Frequent ☐ Occasional ☐ Rare

PREVENTION
What Action Has Or Will Be Taken To Prevent Recurrence? Place X by Items Completed.
1. ☐ Date: _____
2. ☐ Date: _____
3. ☐ Date: _____
4. ☐ Date: _____
5. ☐ Date: _____
6. ☐ Date: _____

Investigated By: _____ Date: _____

Reviewed By: _____ Date: _____

Insurance Agent Notified By: _____ Date: _____

Client Notified By: _____ Date: _____

BNC ENGINEERING,

NEAR MISS INVESTIGATION REPORT

Job:	Customer:	Event Date:
Investigator(s):		Date of Investigation:

Witnesses or Persons Knowledgeable of the Near Miss Event:	Their Statements:
1.	
2.	
3.	

Investigator's Description of the Near Miss Event:

Describe the contributing factors and the *Root Cause* of the event:

Corrective Actions Needed to Prevent a Recurrence:	Person Responsible	Completion Date:
1.		
2.		
3.		
4.		

APPENDIX E

EMERGENCY CONTACTS		
N O.	CONTACTS	PHONE NUMBERS
1.	BNC Safety Coordinator: Richard Jennings	361-633-9743
2.	Client Contact - Richard Bergner	713-783-4832
3.	Emergency Medical Service	911
4.	Fire Department	911
5.	Police Department	911
6.	**Hospital**: Columbia North Bay Hospital 1717 W. Wheeler Aransas Pass, Texas	361-758-8585
7.	OSHA	800-321-6742
8.	Poison Control	800-764-7661
9.	Chemtrec	800-424-9300
10.	Texas Emergency Response Center	512-463-7727
11.	Railroad Commission (District Office)	512-463-6788
12.	National Response Center (NRC contacts EPA)	800-424-8802
13.	Texas Commission on Environmental Quality (TCEQ)	512-239-2160
14.	EPA (Region 6) 24-Hour Response Number	866-372-7745
15.	DOT Hazardous Materials	202-366-4488

APPENDIX B
QUALITY ASSURANCE / QUALITY CONTROL PROJECT PLAN

QUALITY ASSURANCE / QUALITY CONTROL PROJECT PLAN

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

Prepared for

National Oil Recovery Corporation
3717 Bowne Street
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Prepared by

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APPENDIX A FIELD SAMPLING PLAN

1.0 PROJECT DESCRIPTION

This Quality Assurance/Quality Control Project Plan (QA/QCPP) has been developed by BNC Engineering, LLC (BNC) to ensure quality assurance/quality control (QA/QC) during field sample collection and analytical laboratory activities associated with removal actions at the Falcon Refinery Superfund site in San Patricio County, Texas.

Site activities may include:

- Asbestos assessment and possible abatement activities;
- Potential demolition of on-site buildings;
- Assessment and removal/disposal of oil, hazardous substances and/or pollutants and contaminants;
- Decontamination of containers, equipment, piping and buildings;
- Removal/Disposal or recycling of containers, equipment, piping and other contaminated items; and,
- Consolidation, removal/disposal of visibly contaminated soils.

All sampling and analyses will be performed pursuant to the Administrative Order on Consent for Removal Action and shall conform to EPA direction, approval and guidance regarding sampling, quality assurance/quality control, data validation and chain of custody procedures. Severn Trent Laboratories, the selected analytical laboratory for this project, is accredited under the National Environmental Laboratory Accreditation Program (NELAP) and will comply with appropriate EPA guidance.

This plan is consistent with the "Quality Assurance/Quality Control Guidance for Removal Activities: Sampling QA/QC Plan and Data Validation Procedures" (OSWER Directive No. 9360.4-01, April 1, 1990). Upon request, BNC will analyze samples submitted by the EPA for QA monitoring. Also, upon request BNC will allow EPA or its authorized representative to take split and/or duplicate samples.

EPA will be notified not less than five days in advance of any sample collection activity.

1.1 Site History

A thorough description of the past activities at the site can be found in the Removal Action Work Plan.

1.2 Project Organization

The BNC Project Coordinator (PC) has overall responsibility for all field activities during the implementation of the Removal Action. Severn Trent Laboratories, Inc (STL) in Corpus Christi, Texas has been selected as the primary project laboratory providing all environmental analysis.

1.3 Management Responsibility

Stephen Halasz – Project Coordinator

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 QA/QCPP.

James E. Blackwell – Project Engineer

The Project Engineer will be responsible for all mechanical aspects of the project and will be actively involved in the direction of the project. The Project Engineer will ensure that technical quality and scheduling are maintained.

1.4 Field Responsibility

Theresa Nix – Field QA Officer

The Field QA Officer will be responsible for leading and coordinating day-to-day activities of the field team. The Field QA Officer will report to the Project Coordinator and specific responsibilities will include:

- Providing day-to-day coordination with the Project Coordinator;
- Developing an 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 QA/QCPP; and
- Participating in the final report.

1.5 Laboratory Responsibility

Olga McDonald – STL Project Manager

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

- Manage and provide responses to customer inquiries related 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 STL 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.

Anh Tran – STL QA Officer

The Laboratory QA Officer has the overall responsibility for data after it leaves the laboratory and will communicate issues through the STL 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 QA/QCPP.

Cheyenne Whitmire – STL Sample Custodian

The Sample Custodian will report to the STL 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.

2.0 QUALITY PROGRAM AND DATA QUALITY OBJECTIVES

Data Quality Objectives (DQOs) specify the data type, quality, quantity, and uses needed to make decisions and are the basis for designing data collection activities. DQOs are applicable to collection activities and are based on the end use of the data being collected. DQOs will be described in detail within the individual Sampling and Analysis Plan.

2.1 Data Categories

The two general categories of data are defined as: (1) screening data and (2) definitive data.

Screening data are generated by rapid methods of analysis with less rigorous sample preparation, calibration and/or QC requirements than are necessary to produce definitive data. Sample preparation steps may be restricted to simple procedures such as dilution with a solvent, instead of elaborate extraction/digestion and cleanup. Screening data may provide analyte identification and quantitation, although the quantitation may be relatively imprecise. Physical test methods, e.g., dissolved oxygen measurements, temperature and pH measurements, moisture content, turbidity, conductance, etc., have been designated by definition as screening methods, as are

immunoassay, X-Ray Fluorescence (XRF), and gas chromatography. Gas chromatography can also serve to generate definitive data.

Definitive data are generated using rigorous analytical methods (see Section 5 of this QA/QCPP), such as approved EPA reference methods. The data can be generated in a mobile or off-site laboratory. Data are analyte-specific, and both identification and quantitation are confirmed. These methods have standardized QC and documentation requirements. Definitive data are not restricted in their use unless quality problems require data qualification.

2.2 Data Quality Objectives

Precision, Accuracy, Representativeness, Completeness, and Comparability (PARCC) parameters are indicators of data quality. The end use of the measurement data should define the necessary PARCC parameters. Numerical precision, accuracy, and completeness goals will be established in each SAP and will aid in selecting the measurement methods.

2.2.1 Precision

Precision measures the reproducibility of measurements. It is strictly defined as the degree of mutual agreement among: independent measurements as the result of repeated application of the same process under similar conditions. *Analytical* precision is the measurement of the variability associated with duplicate (two) or replicate (more than two) analyses. *Total* precision is the measurement of the variability associated with the entire sampling and analysis process. It is determined by analysis of duplicate or replicate field samples and measures variability introduced by both the laboratory and field operations. Field duplicate samples and matrix duplicate spiked samples shall be analyzed to assess field and analytical precision, and the precision measurement is determined using the relative percent difference (RPD) between the duplicate sample results. For replicate analyses, the relative standard deviation (RSD) is determined.

2.2.2 Accuracy

Accuracy is a statistical measurement of correctness and includes components of random error (variability due to imprecision) and systematic error. It therefore reflects the total error associated with a measurement. A measurement is accurate when the value reported does not differ from the true value or known concentration of the spike or standard. Analytical accuracy is measured by comparing the percent recovery of analytes spiked into an LCS or matrix spike sample to a control limit. For volatile and semivolatile organic compounds, surrogate compound recoveries are also used to assess accuracy and method performance for each sample analyzed. Analysis of performance evaluation (PE) samples shall also be used to provide additional information for assessing the accuracy of the analytical data being produced.

Both accuracy and precision are calculated for each analytical batch, and the associated sample results are interpreted by considering these specific measurements.

2.2.3 Representativeness

Objectives for representativeness are defined for each sampling and analysis task and are a function of the investigative objectives. Representativeness shall be achieved through use of the standard field, sampling, and analytical procedures. Representativeness is also determined by appropriate program design, with consideration of elements such as proper well locations, drilling and installation procedures, and sampling locations. Decisions regarding sample locations and numbers and the statistical sampling design are documented in the Soil and Waste Sampling and Analysis Plan.

2.2.4 Completeness

Completeness is calculated for the aggregation of data for each analyte measured for any particular sampling event or other defined set of samples. Completeness is calculated and reported for each method, matrix and analyte combination. Completeness shall be calculated in two ways: 1) The number of valid individual analyte results divided by the number of possible individual analyte results, expressed as a percentage, determines the completeness of the data set for risk assessment; and 2) the number of valid sample points divided by the number of planned sample points, expressed as a percentage, determines the completeness of the data set for remedial investigation/feasibility studies. For completeness requirements, valid results are all results not qualified with an "R" flag. The requirement for completeness is 95 percent for aqueous samples and 90 percent for soil samples. For any instances of samples that could not be analyzed for any reason (holding time violations in which resampling and analysis were not possible, samples spilled or broken, etc.), the numerator of this calculation becomes the number of valid results minus the number of possible results not reported. BNC will note in the QA report any significant anomalies in the data set.

The formula for the calculation of completeness for risk assessment is presented below:

$$\%\ \textit{Completeness} = \frac{\text{number of valid results}}{\text{number of possible results}}$$

The formula for the calculation of completeness of a data set is presented below:

$$\%\ \textit{Completeness} = \frac{\text{number of valid sample points}}{\text{number of planned sample points}}$$

2.2.5 Comparability

Comparability is the confidence with which one data set can be compared to another data set. The objective for this QA/QC program is to produce data with the greatest possible degree of comparability. The number of matrices that are sampled and the range of field conditions encountered are considered in determining comparability. Comparability is achieved by using standard methods for sampling and analysis, reporting data in standard units, normalizing results to standard conditions and using standard and comprehensive reporting formats. Complete field

documentation using standardized data collection forms shall support the assessment of comparability. Analysis of performance evaluation (PE) samples and reports from audits shall also be used to provide additional information for assessing the comparability of analytical data produced among subcontracting laboratories. Historical comparability shall be achieved through consistent use of methods and documentation procedures throughout the project.

3.0 SAMPLING LOCATIONS AND PROCEDURES

3.1 Sampling and Analysis Plans

The purpose of a SAP is to provide specific guidance for field and laboratory activities associated with a task. Each SAP will include a description of the objectives of the task and corresponding DQOs. The DQO process will ensure that sampling analytical procedures meet the objectives.

For each proposed test, the SAP will include the appropriate analytes of interest, sample types and frequency, and a sample location map. The SAP will describe sample handling, control, transport, and storage procedures. Some general guidance is provided in the following subsections

3.1.1 Sampling Procedures

Procedures for collecting field samples and/or data are presented in Appendix A – Field Sampling Plan. Sample collection protocols are based on EPA and industry acceptable practices. Detailed procedures will be included or referenced in each SAP, along with a description of the sampling and analysis strategy in the sampling design.

3.1.2 Method of Analysis

Each SAP shall list for each analytical method the (a) method number, (b) compounds and/or elements of interest, (c) number of samples of each matrix to be collected, (d) holding times, and (e) sample locations.

3.1.3 Time Considerations for Transporting Samples

Samples will be taken to the analytical laboratories for analyses on the day of collection, if possible.

3.1.4 Preparations of Sampling Equipment

Pre-cleaned sample containers will be secured from the analytical laboratory. Containers will remain closed until ready for use. Field sampling equipment will be cleaned before being transported to the field. Analysis of equipment rinsates will evaluate the effectiveness of field decontamination.

3.1.5 Quality Control Samples

The SAP will list the number, type and matrix of field QA/QC samples. This includes trip blanks, equipment rinsates, field blanks, and field duplicates as appropriate for the medium being sampled. Definitions and requirements for QA/QC samples are outlined in Section 9.

3.2 Detailed Operating Procedures and Standard Operating Procedures

The SAP will include or reference, all activities that acquire environmental data or affect the quality of environmental data, including sampling, testing, drilling, groundwater monitoring well installation, decontamination, and calibration activities.

3.3 Decontamination Procedures

During a sampling event, all procedures will be followed that will prevent or minimize cross contamination and thereby affect the integrity and quality of the samples. The analysis of equipment rinsates will document the effectiveness of those procedures. Specific decontamination methods will be documented in or referenced in the SAP.

4.0 CONTROL DOCUMENTS

Control Documents are those that describe activities affecting data and data quality that potentially will be used as evidence. All sample identification documents and other controlled documents will be serialized and completed with indelible ink. The following controlled sample identification documents will be used, if appropriate:

- Sample labels
- Chain-of-Custody records
- Sample analysis request sheets
- Electronic data storage devices and/or field logbooks
- Calibration logbooks
- Shipping logbooks
- SAP
- QA/QCPP
- Reports
- Laboratory data package
- Data qualification package

Sample labels and custody seals are examples of uncontrolled documents that will be used on the project

4.1 Sample Identification Numbers

Sample identification (ID) numbers will be assigned to each sample. The requirements of the sample ID number are that the number (a) must distinguish the sample from other similar evidence and (b) is traceable throughout the sampling and analysis process. The SAP will describe, or incorporate by reference, the sample identification scheme in detail.

4.2 Chain of Custody

To maintain and document sample possession, COC procedures will be followed. The purpose of the COC is to document the identity of a sample and its handling from point of collection until receipt by the laboratory. Thereafter, internal analysis is complete and laboratory QA/QC procedures confirm accuracy. The COC record will be a multiple copy form that serves as a written record of the handling of the sample. When a sample changes custody (when it is transferred from one person to another), the person receiving the sample will sign a COC record. Each change of possession will be documented. Thus, a written record tracking the handling of the sample will be established. The COC record may be combined with the sample analysis request sheet and will contain the following minimum information:

- Field sample identification number
- Signature of sample custodian
- Signature of other persons transferring custody
- Date and time of collection
- Sample type
- Signature of persons involved in the chain of possession and dates of transfer
- Inclusive dates of possession
- Suspected hazard
- Special Information (if appropriate)

The following general COC guidelines will be followed:

- A minimal number of persons will handle the samples.
- The COC record will accompany the samples to the laboratory.
- A copy of the COC record will be retained in the field file.
- Upon receipt at the analytical laboratory, all samples will be inspected for damage or tampering.
- After receipt of the sample by the laboratory, the COC record will be returned to the project file.

5.0 ANALYTICAL PROCEDURES

Analytical methods shall be specified in the SAP and justified through the DQO process. Analytical methods recommended 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 Method Quantitation Limits (MQLs), QC procedures and data validation guidelines are provided. Analytical methods, method detection limits (MDL) and method quantitation limits (MQL) are presented in Table 1.

5.1 Preparation Methods

Method SW1311 - Toxicity Characteristic Leaching Procedure

Method SW1311 is used to prepare samples for determining the hazard characteristic due to leachability of organic (semivolatile and volatile) and inorganic constituents in waste or other material, which are being classified for land disposal.

QC is accomplished by preparing a toxicity characteristic leaching procedure (TCLP) blank at a rate of one blank for every 20 extractions conducted in the extraction vessel. Additional extract is prepared so a LCS may also be extracted along with MS/MSDs for each waste type (samples of similar waste types shall be batched together). One MS must be analyzed in each project analytical batch. These QA measures are in accordance with the requirements of EPA method SW1311. The MQLs for TCLP are 10X higher.

Method SW1312 - Synthetic Precipitation Leaching Procedure

Method SW1312 is used to prepare samples for determination of the concentration of organic and inorganic constituents that are leachable from liquids, soils, waste or other various matrices.

Quality Control is accomplished by preparing a blank at a rate of one blank for every 20 extractions conducted in the extraction vessel. Additional extract is prepared so a LCS may also be extracted along with MS/MSDs for each waste type (samples of similar waste types shall be batched together). One MS must be analyzed in each analytical batch of twenty samples. The MQLs for SPLP are the same as water reporting limits for the method analytes.

Method SW3015 - Microwave Assisted Acid Digestion of Aqueous Samples and Extracts for Metals Analysis

This method is used to prepare aqueous or waste samples, that contain suspended solids, for total metals determination by graphite furnace atomic absorption spectroscopy (GFAA), FLAA or ICP. The samples are digested with acid and heated in a microwave.

Method SW3050B - Acid Digestion of Solids, Sediments, and Sludges for Metals Analysis

This method is applicable to the preparation of sediment, sludge, and soil samples for metals analysis by ICP or, for some metals, by GFAA. A sample is digested then refluxed with acid. A separate aliquot of the sample is dried for a total solids and/or percent moisture determination.

Method SW3051 - Microwave Assisted Acid Digestion of Sediments, Sludges, Soils, and Oils

Method SW3051 is applicable to the preparation of sediment, sludge, and soil samples for metals analysis by FLAA or GFAA or ICP. The samples are digested with acid and heated in a microwave. A separate aliquot of the sample is dried for a total solids and/or percent moisture determination.

Method SM 2540G – Solids and Moisture

Percent moisture is determined for solid samples undergoing analysis for inorganic and organic analytes. The sample is weighed, dried and then re-weighed. The moisture content is used to calculate results for soil samples on a dry weight basis. All soil or sediment results and MDLs shall be reported on a dry weight basis.

Method SW3550A - Ultrasonic Extraction

Method SW3550A is a procedure for extracting nonvolatile and semivolatile organic compounds from solids such as soils and sludges. The sonication process ensures intimate contact of the sample matrix and the extraction solvent.

Method SW5030B Modified - Purge and Trap Method

Method SW5030B Modified describes sample preparation and extraction for the analysis of VOCs. The method is applicable to nearly all types of samples, including aqueous sludges, caustic liquors, acid liquors, waste solvents, oily wastes, water, tars, fibrous wastes, polymeric emulsions, filter cakes, spent carbons, spent catalysts, soils, and sediments. The success of this method depends on the level of interferences in the sample. Results may vary due to the large variability and complexity of matrices of solid waste samples.

An inert gas is then bubbled through the sample solution at ambient temperature to transfer the volatile components to the vapor phase. The vapor is swept through a sorbent column where the volatile components are trapped. After purging is completed, the sorbent column is heated and backflushed with inert gas to desorb the components onto a GC column.

Method SW5035 - Closed System Purge and Trap and Extraction for Volatile Organics in Soil and Waste Samples

Method SW5035 is a method for analyzing VOCs in solid matrices. This method is designed for use on samples containing low levels of VOCs. This procedure may be used with any appropriate gas chromatographic analysis, including methods 8015, 8021B and 8260B. This low soil method utilizes a hermetically sealed vial, which is sealed from the time of sampling to the time of analysis. Therefore, the losses of VOCs are negligible. The success of this method depends on the level of interferences in the sample. Results may vary due to the large variability and complexity of matrices of solid waste samples.

The sample is heated to 40ºC and an inert gas is bubbled through the agitated sample to transfer the volatile components to the vapor phase. The vapor is swept through a sorbent column where

the volatile components are trapped. After purging is completed, the sorbent column is heated and backflushed with inert gas to desorb the components onto a GC column.

Method TX1005 - Total Petroleum Hydrocarbons

This method is an n-pentane extraction followed by gas chromatography/flame ionization detection (GC/FID) analysis, which measures the concentration of hydrocarbons between nC6 and nC35. The method uses a 1:1 mixture of commercially available unleaded gasoline and diesel #2 fuel as calibration standards and the n-alkane markers, nC6, nC12, nC28 and nC35, to establish the boiling point range boundaries. However, single hydrocarbon components can be used for calibration standard. The concentration of TPH is reported as the summation of all carbon ranges, i.e., nC6 to nC35.

Method TX1006 - Characterization of nC6 to nC35 Petroleum Hydrocarbons in Environmental Samples

This method uses a silica gel column fractionation of the n-pentane extract (obtained using TNRCC Method TX1005) to separate the TPH into the aliphatic hydrocarbon fraction and the aromatic hydrocarbon fraction and includes the analysis of each of these fractions by GC/FID. Quantitation is done using the TNRCC Method TX1005 calibration extended to nC35. The GC/FID analysis of the fractions separates each fraction into discrete boiling point ranges based on normal alkane markers. The concentration within each boiling point range (e.g., >nC8 - nC10 aliphatic or >nC12 - nC16 aromatic) is reported along with the total TPH concentration between nC6 and nC35.

5.2 Analytical Methods

Each potential method that may be applicable to site sampling will be discussed in theis section. Presented as Table 1 are the Method Detection Limits (MDLs) and the Method Quatitation Limits (MQLs) for the laboratory. Table 2 serves to document a summary of calibration and QC procedures for each of the methods.

EPA Method 170.1 - Temperature

Temperature measurements are made with a mercury-filled or dial type centigrade thermometer, or a thermistor. The calibration, QC, corrective action, and data flagging requirements are on figure 2. This is a field test.

Method SW1010 – Ignitability

Method 1020A makes use of the Setaflash or Pensky Martens Closed Tester to determine the flash point of liquids that have flash points between 0° and 110°C and viscosities lower than 150 stokes at 25°C. The calibration, QC, corrective action, and data flagging requirements are given in Table 2.

EPA Method SW1110 – Corrosivity

This test exposes steel to liquid waste to determine the corrosivity of the waste. The calibration, QC, corrective action, and data flagging requirements are given in Table 2.

EPA Method SW9040 (water)/SW9045 (soil) - pH

pH measurements shall be performed for water samples using method SW9040. pH measurements of soil samples are performed using method SW9045. Measurements are determined electrometrically using either a glass electrode in combination with a reference potential, or a combination electrode. The calibration, QC, corrective action, and data flagging requirements are given in Table 2.

EPA Method SW9050 - Conductance

Standard conductivity meters are used. Temperature is also reported. The calibration, QC, corrective action, and data flagging requirements are given in Table 2.

Method SW6010B - Metals by Inductively Coupled Plasma

Samples are analyzed for trace elements or metals using method SW6020 for water and soils. Analysis for total (i.e., acid leachable) metals requires digestion of the sample. Following digestion, the trace elements are determined simultaneously or sequentially using Inductively Coupled Plasma Mass Spectroscopy (ICP-MS). The elements and MQLs for this method are listed in Table 1. The calibration, QC, corrective action, and data flagging requirements are given in Table 2.

Method SW7000 series - Graphite Furnace Atomic Absorption for the Metals Antimony, Arsenic, Cadmium, Chromium, Lead, Selenium and Thallium

GFAA is used to measure low concentrations of metals in water and soil samples. The samples are extracted then discrete aliquots of sample extract are deposited in a graphite tube furnace in microliter amounts. The graphite tube is heated resistively by an electrical current. The sample solution is dried and charred to remove sample matrix components and then atomized at temperatures sufficient to vaporize the antimony. Matrix modification is used to eliminate interference effects and may also enhance the vaporization efficiency and allow lower detection limits. MQLs for this analysis are listed in Table 1. The calibration, QC, corrective action, and data flagging requirements are given in Table 2.

Method SW8021B - Aromatic Volatile Organics

Aromatic volatile organics in water and soil samples are analyzed using method SW8021B. This method is a purge and trap GC method using preparation method SW5030B Modified. A temperature program is used in the GC to separate the compounds. Detection is achieved by a PID and an electrolytic conductivity detector (HECD) in series. The MQLs for the analytes are

presented in Table 1. The calibration, QC, corrective action, and data flagging requirements are given in Table 2.

Method SW8260B - Volatile Organics

Volatile (or purgeable) organics in water and soil samples are analyzed using method SW8260B. This method uses a capillary column GC/mass spectrometry technique. Volatile compounds are introduced into the GC by purge and trap (SW5030B). An inert gas is bubbled through the water samples (or a soil-water slurry for soil samples) to transfer the purgeable organic compounds from the liquid to vapor phase. Soil samples with higher contaminant levels are extracted using methanol before purging. The vapor is then swept through a sorbent trap where the purgeable organics are trapped. The trap is backflushed and heated to desorb the purgeable organics onto a capillary GC column where they are separated and then detected with a mass spectrometer. The analytes detected and MQLs (using a 25 mL purge) for this method are listed in Table 1.

Calibration - The mass spectrometer is tuned daily to give an acceptable spectrum for BFB. The tuning acceptance criteria are given in the following list as an ion abundance for each specified mass:

- mass 50 15 percent to 40 percent of mass 95
- mass 75 30 percent to 60 percent of mass 95
- mass 95 base peak, 100 percent relative abundance
- mass 96 5 percent to 9 percent of mass 95
- mass 173 less than 2 percent of mass 174
- mass 174 greater than 50 percent of mass 95
- mass 175 5 percent to 9 percent of mass 174
- mass 176 greater than 95 percent, but less than 101 percent of mass 174
- mass 177 5 percent to 9 percent of mass 176

The IS method is used for quantitation of analytes of interest. For quantitation, RFs are calculated from the base ion peak of a specific IS added to each calibration standard, blank, QC sample, and sample. The calibration, QC, corrective action, and data flagging requirements are given in Table 2.

Method SW8270C - Semivolatile Organics and Polynuclear Aromatic Hydrocarbons

Semivolatile organics (also known as base/neutral and acid extractables) in water and soil samples are analyzed using method SW8270C. This technique determines quantitatively the concentration of a number of SVOCs. Samples are extracted and both base/neutral and acid extracts are then concentrated through evaporation. Compounds of interest are separated and quantified using a capillary column GC/mass spectrometer. The MQLs are listed in Table 1.

The mass spectrometer is tuned every 12 hours to give an acceptable spectrum for decafluorotriphenylphosphine (DFTPP). The tuning acceptance criteria are given in the following list as an ion abundance for each specified mass:

- mass 51 30 percent to 60 percent of mass 198
- mass 68 less than 2 percent of mass 69
- mass 70 less than 2 percent of mass 69
- mass 127 40 percent to 60 percent of mass 198
- mass 197 less than 1 percent of mass 198
- mass 198 base peak, 100 percent relative abundance
- mass 199 5 percent to 9 percent of mass 198
- mass 275 10 percent to 30 percent of mass 198
- mass 365 greater than 1 percent of mass 198
- mass 441 present, but less than mass 443
- mass 442 greater than 40 percent of mass 198
- mass 443 17 percent to 23 percent of mass 442

The IS method is used for quantitation of analytes of interest. For quantitation, RFs are calculated from the base ion peak of a specific IS that is added to each calibration standard, blank, QC sample, and sample. The calibration, QC, corrective action, and data flagging requirements are given in Table 2.

Method SW8270C and SW8270 SIM - Polynuclear Aromatic Hydrocarbons

Methods SW8270C and SW8270 SIM are_used to determine the concentration of ppb levels of selected polynuclear aromatic hydrocarbons (PAHs) in groundwater and soils by HPLC. Samples are extracted then analyzed by direct injection. Detection is by ultraviolet and fluorescent detectors. MQLs are listed in Table 1. The calibration, QC, corrective action, and data flagging requirements are given in Table 2.

Method TX1005 - Total Petroleum Hydrocarbons

Method TX1005 is designed to determine total concentrations of petroleum hydrocarbons (TPH) in solid and water samples using gas chromatography, with flame ionization detection (FID). The GC method is used to separate the TPH into two ranges (nC6 to nC12 and >nC12 to nC28), and a third range (>nC28 to nC35) when applicable, based on boiling points of the hydrocarbons. MQLs are listed in Table 1. The calibration, QC, corrective action, and data flagging requirements are given in Table 2.

Method TX1006 - Characterization of Nc6 to Nc35 Petroleum Hydrocarbons in Environmental Samples

Method TX1006 is designed to separate and quantify the aliphatic and aromatic fractions in petroleum hydrocarbons extracted soil and water samples. The separation is based on approximate carbon number/boiling ranges with respect to n-alkane markers from n-hexane (nC6) to n-pentatriacontane (nC35). This method is to be used in conjunction with TNRCC Method 1005, which is used for the determination of total petroleum hydrocarbons. Gas chromatography (GC) is used for separation with flame ionization (FID) as the mode of

detection. MQLs are listed in Table 1. The calibration, QC, corrective action, and data flagging requirements are given in Table 2.

EPA Method 600-R-93/116 – Asbestos

Method 600-R-93/116 identifies asbestos minerals by Polarized Light Microscopy and has a lower quantification limit of one (1) percent by weight. The samples may be further subjected to the point counting method following the procedures described in the EPA Method for the Determination of Asbestos in Bulk Building Materials, July 1999, Section 2.2.5.27.

5.3 Method Detection Limits

The method detection limit (MDL) is the minimum concentration of a substance that can be measured and reported with 99 percent confidence that the analyte concentration is greater than zero. The laboratory shall establish MDLs for each method, matrix, and analyte for each instrument the laboratory plans to use for the project. The laboratory shall revalidate these MDLs at least once per twelve month period.

Laboratories participating in this work effort shall demonstrate the MDLs for each instrument, including confirmatory columns, method of analysis, analyte, and matrix (i.e., water and soil) using the requirements in 40 CFR 136, Appendix B, or by the following instructions:

(1) Estimate the MDL using one of the following:

a) the concentration value that corresponds to an instrument signal/noise ratio in the range of 2.5 to 5, or
b) the concentration equivalent of 3 times the standard deviation of replicate measurement of the analyte in reagent water, or
c) the region of the standard curve where there is a significant change in sensitivity (i.e., a break in the slope of the standard curve).

(2) Analyze seven replicates of a matrix spike (ASTM Type II water for aqueous methods, Ottawa sand for soil methods) containing the analyte of interest at a concentration three to five times the estimated MDL.

(3) Determine the variance (S^2) for each

(4) Determine the standard deviation (s) for each analyte as follows:

$$s = (S^2)^{1/2}$$

(5) Determine the MDL for each analyte as follows:

$$MDL = 3.14(s)$$

(Note: 3.14 *is the one-sided t-statistic at the* 99 *percent confidence level appropriate for determining the MDL using* 7 *samples)*

5.4 Reporting Limits and Sample Quantitation Limits

The laboratories participating in this work effort shall compare the results of the MDL demonstrations to the reporting limits (RLs) for each method. The MQLs cannot be less than 2.3 times the corresponding MDL. The laboratories shall also verify RLs by including a standard at or below the MQL'S as the lowest point on the calibration curve. For those results falling between the MDL and the MQL'S, an "J" flag shall be applied to the results indicating the variability associated with the result. Reporting limits shall be met in the laboratory method blanks.

The Sample Quantitation Limit (SQL) shall take into account all sample manipulations (e.g., initial volumes and/or weights, dilutions, concentrations, etc.). Sample non-detects which cannot be reported at the reporting limit due to manipulations on the sample shall be reported at the SQL. The SQL can be reported at or less than the corresponding MQL'S.

6.0 CALIBRATION PROCEDURES AND FREQUENCIES

Analytical instruments shall be calibrated in accordance with the analytical methods. All analytes reported shall be present in the initial and continuing calibrations, and these calibrations shall meet the acceptance criteria specified in Section 5 and associated tables. All results reported shall be within the calibration range. Records of standard preparation and instrument calibration shall be maintained. Records shall unambiguously trace the preparation of standards and their use in calibration and quantitation of sample results. Calibration standards shall be traceable to standard materials.

Instrument calibration shall be checked using all of the analytes listed in the QC acceptance criteria table referenced in Section 5 for the method. This applies equally to multi response analytes. All calibration criteria shall satisfy SW-846 requirements at a minimum. The initial calibration shall be verified prior to the analysis of any environmental samples. The initial calibration verification solution shall be prepared using materials prepared independently of the calibration standards and at a different concentration than that of any of the initial calibration standards but still within the bounds of the calibration curve. Acceptance criteria for the calibration verification are presented in Section 5 and associated tables. Analyte concentrations are determined with either calibration curves or response factors (RFs). For gas chromatography (GC) and gas chromatography/mass spectroscopy (GC/MS) methods, when using RFs to determine analyte concentrations, the average RF from the initial five-point calibration shall be used. The continuing calibration shall not be used to update the RFs from the initial five-point calibration. The continuing calibration verification cannot be used as the laboratory control sample (LCS).

7.0 DATA REDUCTION, REVIEW, VERIFICATION, REPORTING, VALIDATION, AND RECORDKEEPING

The data reduction, review, reporting, and validation procedures described in this section will ensure; (1) complete documentation is maintained, (2) transcription and data reduction errors are minimized, (3) the data are reviewed and documented, and (4) the reported results are qualified, if necessary. Laboratory data reduction and verification procedures are required to ensure the overall objectives of analysis and reporting meet method and project specifications.

In each Laboratory analytical section, the analyst performing the tests shall review 100 percent of the definitive data. After the analyst's review has been completed, the following data shall be reviewed independently by a senior analyst or by the supervisor of the respective analytical section using the same criteria:

- Calibrations
- Blanks
- LCS recoveries
- Identification criteria
- Surrogate recoveries
- Internal standard areas (if applicable)
- MS/MSD %R & RPD
- Dilutions

The definitive data methods are identified in Section 5. The calibration, QC requirements, corrective action requirements, and flagging criteria required for definitive data are shown in the tables referenced in Section 5. The flagging criteria are applied by the Laboratory when acceptance criteria are not met and corrective action is not successful or corrective action is not performed. The Laboratory shall apply the appropriate data qualifying flags to each environmental field QC sample, e.g., field blanks, equipment blanks, trip blanks, field duplicates, matrix spike (MS) samples, and matrix spike duplicate (MSD) samples.

Data qualifiers shall be added by the Laboratory supervisor of the respective analytical section, after the first and second level of Laboratory data reviews have been performed. Analytical batch comments shall be added to the first page of the definitive data report packages to explain any non-conformance or other issues. When data are qualified, the Laboratory supervisor shall apply a final qualifier to any data that have been affected by multiple qualifiers. This final qualifier shall reflect the most severe qualifier that was applied to the data, i.e., all data will have only one data qualifying flag associate with it. The allowable final data qualifiers for definitive data and the hierarchy of data qualifiers, listed in order of the most severe through the least severe, are *R*, *M*, *F*, J; *B*, and U*:* The definitions of the data qualifiers are shown in Table 30.

The one exception to these data flagging criteria rules applies to the tentatively identified compounds (TICs) that are identified only in the GC/MS methods. The numerical results of these TICs will always be qualified with one and only one flag for any reason, and that is the *"T"* flag.

The Laboratory QA section shall review 10 percent of the completed data packages, and the Laboratory project manager shall perform a sanity check review on all the completed data packages and shall ensure that all deliverables are present, qualifiers have been applied to the data, the chain-of-custody has been maintained and is documented, and that all non-conformance and other issues have been addressed in the comments to be included in the data report package. BNC's project manager shall review the entire definitive data report package with the field records and with the data objectives of the project when applying the final data qualifiers to define the usability of the definitive data. BNC shall review the field QC samples and field logs, and shall then appropriately flag any of the associated samples identified with the field QC sample. For example, each matrix spike sample would only be qualified by the Laboratory, while BNC would apply the final qualifying flag for a matrix effect to all samples collected from the same site as the parent sample. The final qualifying flag shall be made manually in green ink by a dated initialed single line strikeout of the Laboratory flag and entry of the final flag. BNC will provide written justification for using any data flagged *R* by the Laboratory.

8.0 ELEMENTS OF QUALITY CONTROL

This section presents QC requirements relevant to analysis of environmental samples that shall be followed during all analytical activities for fixed-base, mobile, and field laboratories producing definitive data. The purpose of this QC program is to produce data of known quality that satisfy the project objectives and that meet or exceed the requirements of the standard methods of analysis. This program provides a mechanism for ongoing control and evaluation of data quality measurements through the use of QC materials.

Laboratory QC samples (e.g., blanks and laboratory control samples) shall be included in the preparation batch with the field samples. An analytical batch is a number of samples (not to exceed 20 environmental samples) that are similar in composition (matrix) and that are extracted or digested at the same time and with the same lot of reagents. The term "analytical batch" also extends to cover samples that do not need separate extraction or digestion (e.g., volatile analyses by purge and trap) and is the number of samples (not to exceed 20 environmental samples) that are similar in composition (matrix) and analyzed sequentially. The identity of each analytical batch shall be unambiguously cross-referenced and reported with the associated sample analyses so that a reviewer can identify the QC samples and the associated environmental samples. All references to the analytical batch in the following sections and tables in this QA/QCPP refer to the analytical batch as defined here.

The type of QC samples and the frequency or use or these samples are discussed below.

8.1 Laboratory Control Sample

The laboratory control sample (LCS) is analyte-free water (for aqueous analyses) or Ottawa sand (for soil analyses) spiked with all analytes listed in the QC acceptance criteria table in Section 6 and associated tables for the method. The LCS shall be spiked at a level less than or equal to the

midpoint of the calibration curve for each analyte. The LCS shall be carried through the complete sample preparation and analysis procedure.

The LCS is used to evaluate each analytical batch and to determine if the method is in control. The LCS cannot be used as the continuing calibration verification. One LCS shall be included in every analytical batch, or analyzed every 30 days, whichever is more frequent. The performance of the LCS is evaluated against the QC acceptance limits given in the tables in Section 5.

Whenever an analyte in an LCS is outside the acceptance limit, corrective action shall be performed. After the system problems have been resolved and system control has been re-established, all samples in the analytical batch shall be reanalyzed for the out-of-control analyte(s). When an analyte in an LCS exceeds the upper or lower control limit and no corrective action is performed or the corrective action was not effective, the appropriate flag shall be applied to all affected results. For organic analysis, surrogate and internal standards shall be evaluated to determine whether the data for individual samples is within acceptance limits and whether corrective action is required.

8.2 Matrix Spike / Matrix Spike Duplicate

A matrix spike (MS) and matrix spike duplicate (MSD) is an aliquot of sample spiked with known concentrations of all analytes listed in the QC acceptance criteria table in Section 6 for the method. The spiking occurs prior to sample preparation and analysis. The MS and MSD shall be spiked at a level less than or equal to the midpoint of the calibration curve for each analyte. The MS/MSD shall be designated on the chain of custody. The MS/MSD is used to document the bias of a method due to sample matrix. A minimum of one project sample shall be designated as an MS and MSD and shall be spiked and analyzed as part of every 20 project samples.

The performance of the MS and MSD is evaluated against the QC acceptance limits given in the tables. If either the MS or the MSD is outside the QC acceptance limits, the analytes in all related project samples shall be qualified according to the data flagging criteria.

8.3 Surrogates

Surrogates are organic compounds that are similar to the target analyte(s) in chemical composition and behavior in the analytical process, but that are not normally found in environmental samples.

Surrogates are used to evaluate accuracy, method performance, and extraction efficiency. Surrogates shall be added to environmental samples, controls, and blanks, in accordance with the method requirements.

Whenever a surrogate recovery for compounds with similar retention times is outside the acceptance limit, corrective action must be performed. After the system problems have been resolved and system control has been re-established, the sample shall be re-extracted / re-

digested and reanalyzed. If corrective actions are not performed or are not effective, the appropriate validation flag shall be applied to the sample results.

8.4 Internal Standards

Internal standards (ISs) are measured amounts of certain compounds added after preparation or extraction of a sample. They are used in an IS calibration method to correct sample results affected by column injection losses, purging losses, or viscosity effects. ISs shall be added to environmental samples, controls, and blanks, in accordance with the method requirements. When the IS results are outside of the acceptance limits, corrective actions shall be performed. After the system problems have been resolved and system control has been re-established, all samples analyzed while the system was malfunctioning shall be reanalyzed. If corrective actions are not performed or are ineffective, the appropriate validation flag shall be applied to the sample results.

8.5 Retention Time Windows

Retention time windows are used in GC and high performance liquid chromatography (HPLC) analysis for qualitative identification of analytes. They are calculated from replicate analyses of a standard on multiple days. The procedure and calculation method are given in SW-846 Method 8000A.

When the retention time is outside of the acceptance limits, corrective action shall be performed. After the system problems have been resolved and system control has been re-established, all samples analyzed since the last acceptable retention time check shall be reanalyzed. If corrective actions are not performed, the appropriate validation flag shall be applied to the sample results.

8.6 Interference Check Sample

The interference check sample (ICS), used in inductively coupled plasma (ICP) analyses only, contains both interfering and analyte elements of known concentrations. The ICS is used to verify background and interelement correction factors. If the instrument is capable of showing over correction, as a negative, then ISC will not be required. Also, if analyses of ICS on 5 consecutive days are within acceptance criteria, then analysis of ICS can be performed on a weekly basis. After any system problems have been resolved and system control has been re-established, the ICS shall be reanalyzed. If the ICS results are acceptable, all affected samples shall be reanalyzed. If corrective action is not performed or the corrective action was ineffective, the appropriate validation flag shall be applied to all affected results.

8.7 Method Blank

A method blank is an analyte-free matrix to which all reagents are added in the same volumes or proportions as used in sample processing. The method blank shall be carried through the complete sample preparation and analytical procedure. The method blank is used to document

contamination resulting from the analytical process. A method blank shall be included in every SSF analytical batch.

The presence of analytes in a method blank at concentrations equal to or greater than the MQL'S indicates a need for corrective action. Corrective action shall be performed to eliminate the source of contamination prior to proceeding with analysis. After the source of contamination has been eliminated, all samples in the analytical batch shall be re-extracted / re-digested and reanalyzed. No analytical data shall be corrected for the presence of analytes in blanks. When an analyte is detected in the method blank and in the associated samples and corrective actions are not performed or are ineffective, the appropriate validation flag shall be applied to the sample results.

8.8 Field Blank

The field blank consists of ASTM Type II reagent grade water poured into a volatile organic compound (VOC) sample vial at the sampling site (in the same vicinity as the associated samples). It is handled like an environmental sample and transported to the laboratory for analysis. Field blanks are prepared only when VOC samples are taken and are analyzed for all VOC analytes.

Field blanks are used to assess the potential introduction of contaminants from field sources (e.g., gasoline motors in operation, etc.) to the samples during sample collection. Field blanks will not be used on this project.

8.9 Equipment Blank

An equipment blank is a sample of ASTM Type II reagent grade water poured into or over or pumped through the sampling device, collected in a sample container, and transported to the laboratory for analysis. If equipment is dedicated, no equipment blank is required.

Equipment blanks are used to assess the effectiveness of equipment decontamination procedures. Collection of equipment blanks shall be at a frequency of one equipment blank per equipment type per medium per day. Equipment blanks shall be collected immediately after the equipment has been decontaminated. The equipment blank should be analyzed for all laboratory analyses requested for the environmental samples collected at the site.

When an analyte is detected in the equipment blank the appropriate validation flag shall be applied to all sample results from samples collected.

8.10 Trip Blank

Trip blanks are used to assess the potential introduction of contaminants from sample containers. The trip blank consists of a VOC sample vial filled in the laboratory with ASTM Type II reagent grade water, transported to the sampling site, handled like an environmental sample and returned to the laboratory for analysis. Trip blanks are not opened in the field. Trip blanks are prepared

only when VOC samples are taken and are analyzed only for VOC analytes or during the transportation and storage procedures

When an analyte is detected in the trip blank the appropriate validation flag shall be applied to all sample results from samples in the cooler with the affected trip blank. One trip blank shall accompany each cooler of samples sent to the laboratory for analysis of VOCs.

8.11 Field Duplicates

A field duplicate sample is a second sample collected at the same location as the original sample. Duplicate samples are collected simultaneously or in immediate succession, using identical recovery techniques, and treated in an identical manner during storage, transportation, and analysis. The sample containers are assigned an identification number in the field such that they cannot be identified (blind duplicate) as duplicate samples by laboratory personnel performing the analysis. Specific locations are designated for collection of field duplicate samples prior to the beginning of sample collection.

Duplicate sample results are used to assess precision of the sample collection process. Precision of soil samples to be analyzed for VOCs is assessed from collocated samples because the compositing process required to obtain uniform samples could result in loss of the compounds of interest

For samples collected for laboratory analysis, field duplicates will be collected at a rate of 10 percent of the total number of samples collected during each day of sampling for each sample matrix type. The number of samples will be rounded up to the next increment of 10, such that 21 samples would require three duplicates if collected within three days. At least one field duplicate will be collected per day of sampling and will be packaged and sent to the laboratory for analysis with the other samples of the same sample matrix type.

8.12 Field Replicates

A field replicate sample, also called a split, is a single sample divided into two equal parts for analysis. The sample containers are assigned an identification number in the field such that they cannot be identified as replicate samples by laboratory personnel performing the analysis. Specific locations are designated for collection of field replicate samples prior to the beginning of sample collection.

Replicate sample results are used to assess precision for evaluating the homogeneity of composite samples, the laboratory precision, and/or the performance between two or more laboratories. Precision of soil samples to be analyzed for VOCs is assessed from collocated samples because the composting process required to obtain uniform samples could result in loss of the compounds of interest.

Field replicates are not planned for this project.

8.13 Holding Time Compliance

All sample preparation and analysis shall be completed within the method-required holding times. The holding time begins at the time of sample collection. Some methods have more than one holding time requirement (e.g., methods for pesticides, semi-volatiles, etc.). The preparation holding time is calculated from the time of sample collection to the time of completion of the sample preparation process as described in the applicable method, prior to any necessary extract cleanup and/or volume reduction procedures. If no preparation (e.g., extraction) is required, the analysis holding time is calculated from the time of sample collection to the time of completion of all analytical runs, including dilutions, second column confirmations, and any required reanalyses. In methods requiring sample preparation prior to analysis, the analysis holding time is calculated from the time of preparation completion to the time of completion of all analytical runs, including dilutions, second column confirmations, and any required reanalyses.

Holding times given in hours (i.e. 24 hours, 48 hours) are calculated to the hour. Holding times given in days (i.e. 7 days, 28 days) are calculated to the end of the appropriate calendar day.

8.14 Confirmation

Quantitative confirmation of results at or above the MQL'S for samples analyzed by GC or HPLC shall be required and shall be completed within the method-required holding times. For GC methods, a second column is used for confirmation. For HPLC methods, a second column or a different detector is used. The result of the first column/detector shall be the result reported. If holding times are exceeded and the analyses are performed, the results shall be flagged according to the procedures as described in Section 7

Quantitative confirmation of results is not performed for the following GC methods:
Method 8021B – BTEX; limited compound list
Method 8082 – PCB; pattern matching done, therefore no confirmation performed.

8.15 Standard Materials

Standard materials, including second source materials, used in calibration and to prepare samples shall be traceable to National Institute Standards and Technology (NIST), EPA, American Association of Laboratory Accreditation (A2LA) or other equivalent SSP approved source, if available. If an NIST, EPA or A2LA standard material is not available, the standard material proposed for use shall be included in an addendum to the SAP and approved before use. The standard materials shall be current, and the following expiration policy shall be followed: The expiration dates for ampulated solutions shall not exceed the manufacturer's expiration date or one year from the date of receipt, whichever comes first. Expiration dates for laboratory prepared stock and diluted standards shall be no later than the expiration date of the stock solution or material or the date calculated from the holding time allowed by the applicable analytical method, whichever comes first. Expiration dates for pure chemicals shall be established by the laboratory and be based on chemical stability, possibility of contamination, and environmental and storage conditions. Expired standard materials shall be either revalidated prior to use or discarded. Revalidation may be performed through assignment of a true value and error window

statistically derived from replicate analyses of the material as compared to an un-expired standard. The laboratory shall label standard and QC materials with expiration dates.

A second source standard is used to independently confirm initial calibration. A second source standard is a standard purchased from a vendor different than the vendor supplying the material used in the initial calibration standards. The second source material can be used for the continuing calibration standards or for the LCS (but shall be used for one of the two). Two different lot numbers from the same vendor do not constitute a second source.

8.16 Supplies and Consumables

The laboratory shall inspect supplies and consumables prior to their use in analysis. The materials description in the methods of analysis shall be used as a guideline for establishing the acceptance criteria for these materials. Purity of reagents shall be monitored by analysis of LCSs. An inventory and storage system for these materials shall assure use before manufacturers' expiration dates and storage under safe and chemically compatible conditions.

9.0 PERFORMANCE / SYSTEM AUDITS

Technical systems and performance audits shall be performed as independent assessments of sample collection and analysis procedures. Audit results will be used to evaluate the ability of Severn Trent to (1) produce data that fulfill the objectives established for the program, (2) comply with the QC criteria, and (3) identify any areas requiring corrective action. The systems audit is a qualitative review of the overall sampling or measurement system, while the performance audit is a quantitative assessment of a measurement system. Full data validation is also a quantitative check of the analytical process, where all documentation and calculations are evaluated and verified.

9.1 Project Audits

9.1.1 State/Federal Project Audits

Audits and inspections are commonly conducted for the laboratories that will analyze project samples. Reports from these audits shall be reviewed by BNC to determine whether data produced by Severn Trent will fulfill the objectives of the program.

9.1.2 Technical Systems Audits

A technical systems audit is an on-site, qualitative review of the sampling or analytical system to ensure that the activity is being performed in compliance with the Sampling and Analysis Plan (SAP) specifications. Sampling and field procedures and the analytical laboratories may be audited by BNC at the beginning of the field work. The laboratory systems audit results will be used to review laboratory operation and ensure the technical procedures and documentation are

in place and operating to provide data that fulfill the project objectives and to ensure that outstanding corrective actions have been addressed.

Critical items for a laboratory or field systems audit include: (1) sample custody procedures, (2) calibration procedures and documentation, (3) completeness of data forms, notebooks, and other reporting requirements, (4) data review and validation procedures, (5) data storage, filing, and record keeping procedures, (6) QC procedures, tolerances, and documentation including traceability of standards, (7) operating conditions of facilities and equipment, (8) documentation of training and maintenance activities, (9) systems and operations overview, and (10) security of laboratory automated systems.

Critical items for a sampling systems audit include: (1) calibration procedures and documentation for field equipment, (2) documentation in field logbooks and sampling data sheets, (3) organization and minimization of potential contamination sources while in the field, (4) proper sample collection, storage, and transportation procedures, and (5) compliance with established COC and transfer procedures.

After each on-site audit, a debriefing session will be held for all participants to discuss the preliminary audit results. The auditor will then complete the audit evaluation and submit an audit report including observations of the deficiencies and the necessary recommendations for corrective actions. Compliance with the specifications presented in the SAP will be noted and noncompliance or deviations shall be addressed in writing by BNC with corrective actions and a time frame for implementation of the corrective actions. Follow-up audits will be performed prior to completion of the project to ensure corrective actions have been taken.

9.1.3 Project-Specific Performance Evaluation Audits

Performance audits quantitatively assess the data produced by a measurement system. A performance audit involves submitting project-specific performance evaluation (PE) samples for analysis for each analytical method used in the project. BNC shall submit project-specific PE samples, if required. The project-specific PE samples are selected to reflect the expected range of concentrations for the sampling program. The performance audit answers questions about whether the measurement system is operating within control limits and whether the data produced meet the analytical QA specifications.

The project-specific PE samples are made to look as similar to field samples as possible and are submitted as part of a field sample shipment so that the laboratory is unable to distinguish between them and project samples analysis and reporting by the laboratory. This approach ensures unbiased sample analysis and reporting by the laboratory.

The critical elements for review of PE results include: (1) correct identification and quantitation of the PE sample analytes, within project specifications, (2) accurate and complete reporting of the results, and (3) measurement system operation within established control limits for precision and accuracy.

The concentrations reported for the PE samples shall be compared to the known or expected concentrations spiked in the samples. The percent recovery shall be calculated and the results assessed according to the accuracy criteria for the LCS. If the accuracy criteria are not met, the cause of the discrepancy shall be investigated and a second PE sample shall be submitted. BNC will notify the project staff of the situation at the earliest possible time.

10.0 PREVENTIVE MAINTENANCE

A preventive maintenance program shall be in place to promote the timely and effective completion of a measurement effort. The preventive maintenance program is designed to minimize the downtime of crucial sampling and/or analytical equipment due to unexpected component failure. In implementing this program, efforts are focused in three primary areas: (1) establishment of maintenance responsibilities, (2) establishment of maintenance schedules for major and/or critical instrumentation and apparatus, and (3) establishment of an adequate inventory of critical spare parts and equipment.

10.1 Maintenance Responsibilities

Maintenance responsibilities for equipment and instruments are assumed by the respective facility managers. The managers then establish maintenance procedures and schedules for each major equipment item. This responsibility may be delegated to laboratory personnel, although the managers retain responsibility for ensuring adherence to the prescribed protocols.

10.2 Maintenance Schedule

The effectiveness of any maintenance program depends to a large extent on adherence to specific maintenance schedules for each major equipment item. Other maintenance activities are conducted as needed. Manufacturers' recommendations provide the primary basis for the established maintenance schedules, and manufacturers' service contracts provide primary maintenance for many major instruments (e.g., GC/mass spectrometry instruments, AA spectrometers, and analytical balances).

10.3 Spare Parts

Along with a schedule for maintenance activities, an adequate inventory of spare parts is required to minimize equipment downtime. The inventory includes those parts (and supplies) that are subject to frequent failure, have limited useful lifetimes, or cannot be obtained in a timely manner should failure occur.

Field sampling task leaders and the respective laboratory managers are responsible for maintaining an adequate inventory of spare parts. In addition to spare parts and supply inventories, BNC will maintain an in-house source of backup equipment and instrumentation.

10.4 Maintenance Records

Maintenance and repair of major field and laboratory equipment shall be recorded in field or laboratory logbooks. These records shall document the serial numbers of the equipment, the person performing the maintenance or repairs, the date of the repair, the procedures used during the repair, and proof of successful repair prior to the use of the equipment.

11.0 CORRECTIVE ACTIONS

Corrective actions, if necessary, are to be completed once. If acceptance criteria were not met and a corrective action for sample analyses was not successful or corrective action was not performed, apply the appropriate flagging criteria. Requirements and procedures for documenting the need for corrective actions are described in this section.

11.1 Corrective Action Report

Problems requiring corrective action in the laboratory are documented by the use of a corrective action report. The QA coordinator or any other laboratory member can initiate the corrective action report in the event QC results exceed acceptability limits, or upon identification of some other laboratory problem. Corrective actions can include reanalysis of the sample or samples affected, re-sampling and analysis, or a change in procedures, depending upon the severity of the problem.

11.2 Corrective Action System

A system for issuing, tracking, and documenting completion of formal Recommendations for Corrective Action (RCA) exists for addressing significant and systematic problems. Recommendations for corrective actions are issued only by a member of the QA group, or a designee in a specific QA role. Each RCA addresses a specific problem or deficiency, usually identified during QA audits of laboratory or project operations. A RCA requires a written response from the party to whom the RCA was issued. A summary of unresolved RCAs is included in the monthly QA report to management. The report lists all RCAs that have been issued, the manager responsible for the work area, and the current status of each RCA. A RCA requires verification by the QA group that the corrective action has been implemented before the RCA is considered to be resolved. In the event there is no response to an RCA within 30 days, or if the proposed corrective action is disputed, the recommendation and/or conflict is pursued to successively higher management levels until the issue is resolved.

12.0 QC REPORTS TO MANAGEMENT

At a minimum during the life of the project, the QA coordinator for BNC will prepare a summary report quarterly of the status of the project, of QA/QC problems, corrective actions taken, and unresolved RCAs with recommended solutions for management. The report shall also

include results from all PE samples, audit findings, and periodic data quality assessments. This report shall be submitted to BNC upon request.

Table 1

Analytes and Associated MDLs and MQLs

QAPP - Falcon Refinery Superfund Site

Ingleside, San Patricio County, Texas

Analytical Method	Analyte	Soil MDL (mg/kg)	Soil MQL (mg/kg)	Water MDL (mg/L)	Water MQL (mg/L)
TX1005	C6 to C12	8.39	50	0.91	5
	>C12 to C28	8.39	50	0.91	5
	>C28 to C35	8.39	50	0.91	5
	TPH C6 to C35	8.39	50	0.91	5
TX1006	nC6 Alipahtics	8.39	50	0.91	5
	>7-8 Aliphatics	8.39	50	0.91	5
	>8-10 Aliphatics	8.39	50	0.91	5
	>10-12 Aliphatics	8.39	50	0.91	5
	>12-16 Aliphatics	8.39	50	0.91	5
	>16-21 Aliphatics	8.39	50	0.91	5
	>21-35 Aliphatics	8.39	50	0.91	5
	>7-8 Aromatics	8.39	50	0.91	5
	>8-10 Aromatics	8.39	50	0.91	5
	>10-12 Aromatics	8.39	50	0.91	5
	>12-16 Aromatics	8.39	50	0.91	5
	>16-21 Aromatics	8.39	50	0.91	5
	>21-35 Aromatics	8.39	50	0.91	5
SW-846 8021B	Benzene	0.000271	0.005	0.000032	0.0005
	Ethylbenzene	0.000292	0.005	0.000043	0.0005
	Toluene	0.000959	0.005	0.00009	0.0005
	Xylenes, Total	0.000659	0.015	0.000076	0.0015
	MTBE	0.00143	0.025	0.000121	0.0025

Table 1 (Continued)

Analytical Method	Analyte	Soil MDL (mg/kg)	Soil MQL (mg/kg)	Water MDL (mg/L)	Water MQL (mg/L)
SW-846 8270C (PAH) Waters are run by 8270C SIM	1,3-Dimethylnaphthalene	0.0165	0.33	0.00005	0.00005
	2-Methylnapthalene	0.0165	0.33	0.00005	0.00005
	Acenaphthene	0.0165	0.33	0.00005	0.00005
	Acenaphthylene	0.0165	0.33	0.00005	0.00005
	Anthracene	0.0165	0.33	0.00005	0.00005
	Benzo(a)anthracene	0.0165	0.33	0.00005	0.00005
	Benzo(a)pyrene	0.0165	0.33	0.00005	0.00005
	Benzo(b)fluoranthene	0.0165	0.33	0.00005	0.00005
	Benzo(ghi)perylene	0.0165	0.33	0.00005	0.00005
	Benzo(k)fluoranthene	0.0165	0.33	0.00005	0.00005
	Chrysene	0.0165	0.33	0.00005	0.00005
	Dibenz(ah)anthracene	0.0165	0.33	0.00005	0.00005
	Dibenzofuran	0.0165	0.33	0.00005	0.00005
	Fluoranthene	0.0165	0.33	0.00005	0.00005
	Fluorene	0.0165	0.33	0.00005	0.00005
	Indeno(123cd)pyrene	0.0165	0.33	0.00005	0.00005
	Naphthalene	0.0165	0.33	0.00005	0.00005
	Phenanthrene	0.0165	0.33	0.00005	0.00005
	Pyrene	0.0165	0.33	0.00005	0.00005
SW-846 8270C (Routine List)	Acenaphthene	0.0165	0.33	0.0005	0.01
	Acenaphthylene	0.0165	0.33	0.0005	0.01
	Aniline	0.0165	0.33	0.00054	0.01
	Anthracene	0.0165	0.33	0.002	0.01
	Benzo(a)anthracene	0.0165	0.33	0.00056	0.01
	Benzo(b)fluoranthene	0.0165	0.33	0.00057	0.01
	Benzo(k)fluoranthene	0.0165	0.33	0.00093	0.01
	Benzo(ghi)perylene	0.0165	0.33	0.0005	0.01
	Benzo(a)pyrene	0.0165	0.33	0.00053	0.01
	Benzyl Alcohol	0.0165	0.33	0.0005	0.01
	Bis(2-chloroethoxy)methane	0.0165	0.33	0.0005	0.01
	Bis(2-chloroethyl)ether	0.0165	0.33	0.00051	0.01
	Bis(2-chloroisopropyl)ether	0.0165	0.33	0.0005	0.01
	Bis(2-ethylhexyl)phthalate)	0.0165	0.33	0.0005	0.01
	4-Bromophenyl ether	0.0165	0.33	0.0005	0.01
	Butyl benzyl phthalate	0.0165	0.33	0.00066	0.01
	4-Chloroaniline	0.0167	0.33	0.0005	0.01

Table 1 (Continued)

Analytical Method	Analyte	Soil MDL (mg/kg)	Soil MQL (mg/kg)	Water MDL (mg/L)	Water MQL (mg/L)
	4-Chloro-3-methylphenol	0.0165	0.33	0.0005	0.01
	2-Chloronaphthalene	0.0165	0.33	0.0005	0.01
	2-Chlorophenol	0.0333	0.33	0.00097	0.01
	4-Chlorophenyl phenyl ether	0.0165	0.33	0.0005	0.01
	Chrysene	0.0165	0.33	0.0005	0.01
	Dibenz(ah)anthracene	0.0165	0.33	0.0005	0.01
	Dibenzofuran	0.0165	0.33	0.002	0.01
	1,2-Dichlorobenzene	0.0165	0.33	0.0005	0.01
	1,3-Dichlorobenzene	0.0165	0.33	0.0005	0.01
	1,4-Dichlorobenzene	0.0165	0.33	0.0005	0.01
	3,3-Dichlorobenzidine	0.0667	0.33	0.004	0.01
	2,4-Dichlorophenol	0.0165	0.33	0.00083	0.01
	Diethyl phthalate	0.0165	0.33	0.0005	0.01
	Dimethyl phthalate	0.0165	0.33	0.0005	0.01
	1,3-Dimethylnaphthalene	0.0165	0.33	0.0005	0.01
	2,4-Dimethylphenol	0.0339	0.33	0.0005	0.01
	Di-n-butyl phthalate	0.0165	0.33	0.00104	0.01
	Di-n-octyl phthalate	0.02	0.33	0.004	0.01
	2,4-Dinitrophenol	0.0165	1.65	0.01	0.05
	2,4-Dinitrotoluene	0.0165	0.017	0.00055	0.01
	2,6-Dinitrotoluene	0.0165	0.017	0.0005	0.01
	Fluoranthene	0.0165	0.33	0.00053	0.01
	Fluorene	0.0165	0.33	0.0005	0.01
	Hexachlorobenzene	0.0165	0.33	0.0005	0.01
	Hexachlorobutadiene	0.0165	0.33	0.0005	0.01
	Hexachlorocyclopentadiene	0.0165	0.33	0.004	0.01
	Hexachloroethane	0.0165	0.33	0.002	0.01
	Indeno(123cd)pyrene	0.0165	0.33	0.0005	0.01
	Isophorone	0.0167	0.33	0.0005	0.01
	2-Methyl-4,6-dinitrophenol	0.0667	0.33	0.004	0.01
	2-Methylnapthalene	0.0165	0.33	0.005	0.01
	2-Methylphenol	0.0165	0.33	0.00052	0.01
	3,4-Methylphenol	0.0227	0.33	0.00121	0.01
	Napthalene	0.0165	0.33	0.0005	0.01
	o-Nitroaniline	0.0165	0.33	0.00074	0.01
	m-Nitroaniline	0.0165	0.33	0.0005	0.01

Table 1 (Continued)

Analytical Method	Analyte	Soil MDL (mg/kg)	Soil MQL (mg/kg)	Water MDL (mg/L)	Water MQL (mg/L)
	p-Nitroaniline	0.0667	0.33	0.004	0.01
	Nitrobenzene	0.0165	0.33	0.0005	0.01
	2-Nitrophenol	0.0165	0.33	0.00106	0.01
	4-Nitrophenol	0.0667	0.33	0.004	0.01
	n-Nitrosodi-n-propylamine	0.0165	0.017	0.0005	0.01
	n-Nitrosodiphenylamine	0.0333	0.33	0.00075	0.01
	Pentachlorophenol	0.0667	1.65	0.00147	0.05
	Phenanthrene	0.0165	0.33	0.0005	0.01
	Phenol	0.0165	0.33	0.00075	0.01
	Pyrene	0.0165	0.33	0.0005	0.01
	Pyridine	0.0165	0.33	0.004	0.01
	1,2,4-Trichlorobenzene	0.0165	0.33	0.0005	0.01
	2,4,5-Trichlorophenol	0.0165	0.33	0.00094	0.01
	2,4,6-Trichlorophenol	0.0165	0.33	0.00087	0.01
SW-846 8260B	Acrolein	0.00814	0.05	0.00186	0.05
	Acrylonitrile	0.00998	0.05	0.0005	0.05
	Acetone	0.00297	0.01	0.00032	0.005
	Acetonitrile	0.00519	0.05	0.00845	0.05
	Benzene	0.00061	0.05	0.0001	0.005
	Bromodichloromethane	0.00043	0.005	0.00009	0.005
	Bromoform	0.00064	0.005	0.0001	0.005
	Bromomethane	0.00061	0.005	0.00047	0.005
	Tert-Butyl methyl Ether	0.00061	0.005	0.00013	0.005
	Methyl Ethyl Ketone	0.00078	0.005	0.00182	0.005
	Carbon Disulfide	0.00122	0.005	0.00012	0.005
	Carbon Tetrachloride	0.00037	0.005	0.0001	0.005
	Chlorobenzene	0.00044	0.005	0.00008	0.005
	Chloroethane	0.00068	0.005	0.00018	0.005
	Chloroform	0.00058	0.005	0.0001	0.005
	Chloromethane	0.00094	0.005	0.00018	0.005
	Dibromochloromethane	0.00028	0.005	0.00012	0.005
	1,2-Dibromoethane	0.00022	0.005	0.00012	0.005
	Dibromomethane	0.00056	0.005	0.00013	0.005
	Dichlorodifluoromethane	0.00084	0.005	0.00013	0.005
	1,1-Dichloroethane	0.00079	0.005	0.00012	0.005
	1,2-Dichloroethane	0.00067	0.005	0.00007	0.005

Table 1 (Continued)

Analytical Method	Analyte	Soil MDL (mg/kg)	Soil MQL (mg/kg)	Water MDL (mg/L)	Water MQL (mg/L)
	1,1-Dichloroethene	0.00094	0.005	0.00009	0.005
	cis-1,2-Dichloroethylene	0.00084	0.005	0.00011	0.005
	trans-1,2-Dichloroethylene	0.00093	0.005	0.00008	0.005
	1,2-Dichloropropane	0.00108	0.005	0.00009	0.005
	cis-1,3-Dichloropropene	0.0006	0.005	0.00009	0.005
	trans-1,3-Dichloropropene	0.00047	0.005	0.00009	0.005
	1,3-Dichloropropane	0.00057	0.005	0.00012	0.005
	2,2-Dichloropropane	0.00065	0.005	0.00009	0.005
	1,1-Dichloropropene	0.00083	0.005	0.00016	0.005
	1,4-Dioxane	0.04	0.1	0.02841	0.1
	Ethyl Acetate	0.00202	0.005	0.00022	0.005
	Ethylbenzene	0.00032	0.005	0.00007	0.005
	Ethyl Ether	0.001	0.005	0.00011	0.005
	Ethyl Methacrylate	0.00035	0.005	0.00013	0.005
	2-Hexanone	0.00108	0.005	0.00021	0.005
	Iodomethane	0.00138	0.005	0.00026	0.005
	Methylene Chloride	0.00751	0.02	0.0003	0.005
	4-Methyl-2-pentanone	0.00053	0.005	0.00013	0.005
	Methyl methacrylate	0.00031	0.005	0.00012	0.005
	2-Nitropropane	0.00139	0.005	0.00161	0.005
	Styrene	0.00029	0.005	0.00006	0.005
	1,1,2,2-Tetrachloroethane	0.00074	0.005	0.00014	0.005
	Tetrachlorethylene	0.00049	0.005	0.00008	0.005
	Toluene	0.00048	0.005	0.00005	0.005
	1,2,3-Trichlorobenzene	0.00047	0.005	0.00015	0.005
	1,1,1-Trichloroethane	0.00041	0.005	0.00009	0.005
	1,1,2-Trichloroethane	0.0007	0.005	0.00009	0.005
	Trichloroethylene	0.00027	0.005	0.00009	0.005
	Trichlorofluoromethane	0.00063	0.005	0.00008	0.005
	1,1,2-Trichloro-1,2,2-trifluoroethane	0.00046	0.005	0.00019	0.005
	1,2,3-Trichloropropane	0.00077	0.005	0.00031	0.005
	1,2,4-Trimethylbenzene	0.00028	0.005	0.00005	0.005
	1,3,5-Trimethylbenzene	0.00044	0.005	0.00004	0.005
	Vinyl Acetate	0.00074	0.005	0.00013	0.005
	Vinyl Chloride	0.00082	0.005	0.00012	0.005

Table 1 (Continued)

Analytical Method	Analyte	Soil MDL (mg/kg)	Soil MQL (mg/kg)	Water MDL (mg/L)	Water MQL (mg/L)
	Xylenes, Total	0.00011	0.015	0.00014	15
SW-846	Arsenic	0.37	1	0.0037	0.01
6010B/7470/7471	Barium	0.06	1	0.0006	0.01
	Cadmium	0.011	1	0.00011	0.01
	Chromium	0.11	1	0.0011	0.01
	Lead	0.31	1	0.0031	0.01
	Mercury	0.03	0.5	0.00012	0.002
	Selenium	0.45	1	0.0045	0.01
	Silver	0.086	0.5	0.00086	0.005
SW-846 7.3/9010	Reactive Cyanide	N/A	5	N/A	N/A
SW-846 7.3/9034	Reactive Sulfide	N/A	50	N/A	N/A
SW-846 9040B/9045C	Corrosivity	N/A	0.1 pH Units	N/A	0.1 pH units
SW-846 1010	Ignitability	N/A	N/A	N/A	1 deg F

Table 2
Summary of Calibration and QC Procedures

Method	Applicable Parameter	QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action[a]	Flagging Criteria[b]
SW-846 (3550)	Moisture	Duplicate Sample	One per 20 samples	% solid – RPD 15% RPD 30%	Correct problem, repeat measurement. If still out, flag data	Apply S to all results
E170.1	Temperature	Field Duplicate	10% of field samples	± 1 degree C	Correct problem, repeat measurement. If still out, flag data	Apply S to all results
SW9030 B	Reactive Sulfides	Field Duplicate	10% of field samples	RPD < 25%	Correct problem, repeat measurement. If still out, flag data	Apply S to all results
SW9010 B	Reactive Cyanides	Field Duplicate	10% of field samples	RPD < 25%	Correct problem, repeat measurement. If still out, flag data	Apply S to all results
SW1020 A	Ignitability	Field Duplicate	10% of field samples	RPD < 25%	Correct problem, repeat measurement. If still out, flag data	Apply S to all results
SW1110	Corrosivity	Duplicate	10% of field samples	RPD < 20%0	Correct problem, repeat measurement. If still out, flag data	Apply S to all results
SW9040	PH (water)	2- point calibration with buffers	Once per day	± 0.05 pH units for every day	If calibration is not achieved, check meter, buffer solutions and probe; replace if necessary; repeat calibration	None
		PH 7 buffer	At each sample location	± 0.1 pH units	Correct problem, recalibrate	None
		Field duplicate	10% of field samples	± 0.1 pH units	Correct problem, repeat measurement	None
	PH (soil)	2- point calibration with buffers	1 per 20 samples	± 0.05 pH	Check with new buffers; if still out, repair meter; repeat calibration check	None
		PH 7 buffer	At each sample location	± 0.1 pH units	Recalibrate	None

Table 2 (Continued)
Summary of Calibration and QC Procedures

Method	Applicable Parameter	QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action[a]	Flagging Criteria[b]
SW9040		Field duplicate	10% of field samples	± 0.1 pH units	Correct problem, repeat measurement. If still out, repeat calibration and reanalyze samples	None
SW9050	Conductance	Calibration with KCL standard	Once per analyst	± 5%	If calibration is not achieved, check meter, standards and probe; recalibrate	Apply S to all results
SW6020	ICP/MS Metals	MS tuning sample	Prior to initial calibration and calibration verification	RSD ≤5% for all analytes	Retune instrument then reanalyze tuning solution	Apply R to all results for all analytes for all samples associated with the MS tuning
		Initial multipoint calibration (minimum 3 standards and a blank)	Daily initial calibration prior to sample analysis	Correlation coefficient ≥0.995 for linear regression	Correct problem then repeat initial calibration	Apply R to all results for specific analyte(s) for all samples associated with the calibration
		Calibration blank	Before beginning a sample run, after every 10 samples and at end of the analysis sequence	No analytes detected ≥ RL	Correct problem then analyze calibration blank and previous 10 samples	Apply B to all results for specific analyte(s) in all samples associated with the blank
		Continuing calibration verification (Instrument Check Standard)	Before beginning a sample run, after every 10 samples and at the end of the analysis sequence	All analyte(s) within ±10% of expected value	Correct problem then repeat calibration and reanalyze all samples since last successful calibration	Apply R to all results for the specific analyte(s) in all samples since the last acceptable calibration

Table 2 (Continued)
Summary of Calibration and QC Procedures

Method	Applicable Parameter	QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action[a]	Flagging Criteria[b]
SW6020		Demonstrate ability to generate acceptable accuracy and precision using four replicate analyzes of a QC check sample	Once per analyst	QC acceptance criteria, Table 6.2.2-2	Recalculate results; locate and fix problem with system and then rerun demonstration for those analytes that did not meet criteria	Apply R to all results for all samples analyzed by the analyst
	ICP/MS Metals	Method blank	One per analytical batch	No analytes detected ≥ RL	Correct problem reprep and analyze method blank and all samples processed with the contaminated blank	Apply B to all results for the specific analyte(s) in all samples in the associated analytical batch
		Interference check solution (ICS)	At the beginning and end of an analytical run or twice during an 12 hour period, whichever is more frequent	Within ±20% of expected value	Terminate analysis; locate and correct problem; reanalyze ICS; reanalyze all affected samples	Apply R to all results for specific analyte(s) in all samples associated with the ICS
		LCS for the analyte	One LCS per analytical batch	QC acceptance criteria, Table 6.2.3-2	Correct problem reprep and analyze the LCS and all samples in the affected USACE analytical batch	For specific analyte(s) in all samples in the associated analytical batch; if the LCS %R > UCL, apply J to all positive results if the LCS %R < LCL, apply J to all positive results, apply R to all non-detects
	ICP/MS Metals	Dilution test	Each new sample matrix	1:4 dilution must agree within ±10% of the original determination	Perform post digestion spike addition	Apply J to all sample results if either of following exist: (1) new matrix check not run (2) RPD ≥10%

Table 2 (Continued)
Summary of Calibration and QC Procedures

Method	Applicable Parameter	QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action[a]	Flagging Criteria[b]
SW6020		Post digestion spike addition	When dilution test fails	Recovery within 75-125% of expected results	Dilute the sample; reanalyze post digestion spike addition	Apply J to all sample results (for same matrix) for specific analyte(s) for all samples associated with the post digestion spike addition
		MS/MSD	One MS/MSD per every 20 project samples per matrix	QC acceptance criteria, Table 6.2.2-2	none	For the specific analyte(s) in all samples collected from the same site matrix as the parent, apply M if; (1)%R for MS or MSD > UCL or (2)%R for MS or MSD < LCL or (3)MS/MSD RPD > CL
		Internal Standards (ISs)	Every sample	IS intensity within 30-120% of intensity of the IS in the initial calibration	Perform corrective action as described in method SW6020, section 8.3	Apply R to all results for specific analyte(s) in all samples associated with the IS.
		MDL study	Every three months	Detection limits established shall be < the RLs in Table 6.2.2-1	none	Apply R to all results for the specific analyte(s) in all samples analyzed
		Results reported between MDL and RL	None	none	none	Apply F to all results between MDL and RL
SW7421	Lead	Initial multipoint calibration (minimum 3 standards and a blank)	Daily initial calibration prior to sample analysis	Correlation coefficient ≥0.995 for linear regression	Correct problem then repeat initial calibration	Apply R to all results for specific analyte for all samples associated with the calibration

Table 2 (Continued)
Summary of Calibration and QC Procedures

Method	Applicable Parameter	QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action[a]	Flagging Criteria[b]
SW7421		Second-source calibration check standard	Once per initial daily multipoint calibration	Analyte within ±10% of expected value	Correct problem then repeat initial calibration	Apply R to all results for specific analyte for all samples associated with the calibration
		Calibration blank	Once per initial daily multipoint calibration	No analyte detected ≥ RL	Correct problem then reanalyze calibration blank and all samples associated with blank	Apply B to all results for the specific analyte in all samples associated with the blank
		Continuing calibration verification	After every 10 samples and at the end of the analysis sequence	The analyte within ±20% of expected value	Correct problem then repeat calibration and reanalyze all samples since last successful calibration	Apply R to all results for the specific analyte in all samples since the last acceptable calibration
		Demonstrate ability to generate acceptable accuracy and precision using four replicate analyzes of a QC check sample	Once per analyst	QC acceptance criteria, Table 6.2.3-2	Recalculate results; locate and fix problem with system and then rerun demonstration for those analytes that did not meet criteria	Apply R to all results for all samples analyzed by the analyst
		Method blank	One per analytical batch	No analytes detected ≥ RL	Correct problem then reprep and analyze method blank and all samples processed with the contaminated blank	Apply B to all results for the specific analyte in all samples in the associated analytical batch

Table 2 (Continued)
Summary of Calibration and QC Procedures

Method	Applicable Parameter	QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action[a]	Flagging Criteria[b]
SW7421	Lead	LCS for the analyte	One LCS per analytical batch	QC acceptance criteria, Table 6.2.3-2	Correct problem then reprep and analyze the LCS and all samples in the affected USACE analytical batch	For specific analyte in all samples in the associated analytical batch; if the LCS %R > UCL, apply J to all positive results if the LCS %R < LCL, apply J to all positive results, apply R to all non-detects
		New matrix check; five-fold dilution test	Each new sample matrix	Five times dilution sample result must be ±10% of the undiluted sample result	Perform recovery test	Apply J to all sample results if either of following exist: (1) new matrix check not run (2) RPD ≥10%
	Lead	Recovery test	When new matrix check fails	Recovery within 85-115% of expected results	Run all samples by the method of standard addition	Apply J to all sample results (for same matrix) in which method of standard addition was not run when recovery outside of 85-115% range
		MS/MSD	One MS/MSD per every 20 project samples per matrix	QC acceptance criteria, Table 6.2.3-2	none	For the specific analyte in all samples collected from the same site matrix as the parent, apply M if; (1)%R for MS or MSD > UCL or (2)%R for MS or MSD < LCL or (3)MS/MSD RPD > CL

Table 2 (Continued)
Summary of Calibration and QC Procedures

Method	Applicable Parameter	QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action[a]	Flagging Criteria[b]
SW7421		MDL study	Once per 12 month period	Detection limits established shall be < the RLs in Table 6.2.3-1	none	Apply R to all results for the specific analyte in all samples analyzed
		Results reported between MDL and RL	None	None	none	Apply F to all results between MDL and RL
SW8021 B	Halogenated volatile organics	Five-point initial calibration for all analytes	Initial calibration prior to sample analysis	%RSD < 20% for CFs or RFs	Correct problem then repeat initial calibration	Apply R to all results for specific analyte(s) for all samples associated with the calibration
		Second-source calibration verification	Once per five-point initial calibration	All analytes within ±15% of expected value	Correct problem then repeat initial calibration	Apply R to all results for specific analyte(s) for all samples associated with the calibration
		Retention time window calculated for each analyte	Each initial calibration and calibration verifications	± 3 times standard deviation for each analyte retention time from 72-hour study	Correct problem then reanalyze all samples analyzed since the last retention time check	Apply R to all results for the specific analyte(s) in the sample
		Initial calibration verification	Daily, before sample analysis	All analytes within ±15% of expected value	Correct problem then repeat initial calibration	Apply R to all results for specific analyte(s) for all samples associated with the calibration
		Continuing calibration verification	After every 10 samples and at the end of the analysis sequence	All analytes within ±15% of expected value	Correct problem then repeat initial calibration verification and reanalyze all samples since last successful calibration verification	Apply R to all results for the specific analyte(s) in all samples since the last acceptable calibration verification

Table 2 (Continued)
Summary of Calibration and QC Procedures

Method	Applicable Parameter	QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action[a]	Flagging Criteria[b]
SW8021 B		Demonstrate ability to generate acceptable accuracy and precision using four replicate analyzes of a QC check sample	Once per analyst	QC acceptance criteria, Table 6.2.4-2	Recalculate results; locate and fix problem with system and then rerun demonstration for those analytes that did not meet criteria	Apply R to all results for all samples analyzed by the analyst
	Halogenated volatile organics	Method blank	One per analytical batch	No analytes detected ≥ RL	Correct problem then reprep and analyze method blank and all samples processed with the contaminated blank	Apply B to all results for the specific analyte(s) in all samples in the associated analytical batch
		LCS for all analytes	One LCS per analytical batch	QC acceptance criteria, Table 6.2.4-2	Reprep and analyze the LCS and all samples in the affected USACE analytical batch	For specific analyte(s) in all samples in the associated analytical batch; if the LCS %R > UCL, apply J to all positive results if the LCS %R < LCL, apply J to all positive results, apply R to all non-detects

Table 2 (Continued)
Summary of Calibration and QC Procedures

Method	Applicable Parameter	QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action[a]	Flagging Criteria[b]
SW8021 B		Surrogate spike	Every sample, spiked sample, standard, and method blank	QC acceptance criteria, Table 6.2.4 -2	Correct problem then reextract and analyze sample	For the samples; if the %R > UCL for any surrogate, apply J to all positive results if the %R < LCL for any surrogate, apply J to all positive results, apply R to all non-detects If any surrogate recovery is < 10%, apply R to all results
SW8021 B	Halogenated volatile organics	MS/MSD	One MS/MSD per every 20 project samples per matrix	QC acceptance criteria, Table 6.2.4-2	none	For the specific analyte(s) in all samples collected from the same site matrix as the parent, apply M if; (1)%R for MS or MSD > UCL or (2)%R for MS or MSD < LCL or (3)MS/MSD RPD > CL
		Second-column confirmation	100% for all positive results	Same as for initial or primary column analysis	Same as for initial or primary column analysis	Apply R to the result for the specific analyte(s) in the sample
		MDL study	Once per 12 month period	Detection limits established shall be < the RLs in Table 6.2.4-1	none	Apply R to all results for the specific analyte(s) in all samples analyzed
		Results reported between MDL and RL	None	none	none	Apply F to all results between MDL and RL

Table 2 (Continued)
Summary of Calibration and QC Procedures

Method	Applicable Parameter	QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action[a]	Flagging Criteria[b]
SW8260 B	Volatile Organics	Five-point initial calibration for all analytes	Initial calibration prior to sample analysis	SPCCs average RF ≥ 0.30[c] and %RSD for RFs for CCCs ≤ 30% and one option below	Correct problem then repeat initial calibration	Apply R to all results for all samples associated with the calibration
				option 1 linear- mean RSD for all analytes ≤15% with no individual analyte RSD >30%		Apply R to all results for specific analyte(s) for all samples associated with the calibration
				option 2 linear – least squares regression r > 0.995		
				option 3 non-linear – COD ≥ 0.990 (6 points shall be used for second order, 7 points shall be used for third order)		
		Second-source calibration verification	Once per five-point initial calibration	All analytes within ±25% of expected value	Correct problem then repeat initial calibration	Apply R to all results for specific analyte(s) for all samples associated with the calibration
		Retention time window calculated for each analyte	Each sample	Relative retention time (RRT) of the analyte within ± 0.06 RRT units of the RRT	Correct problem then reanalyze all samples analyzed since the last retention time check	Apply R to all results for the specific analyte(s) in the sample

Table 2 (Continued)
Summary of Calibration and QC Procedures

Method	Applicable Parameter	QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action[a]	Flagging Criteria[b]
SW8260 B		Calibration verification	Daily, before sample analysis and every 12 hours of analysis time	SPCCs average RF ≥ 0.30[c]; and CCCs ≤ 20% difference (when using RFs)or drift (when using least squares regression or non-linear calibration)	Correct problem then repeat initial calibration	Apply R to all results for all samples associated with the calibration verification
				All calibration analytes within ±20% of expected value		Apply R to all results for specific analyte(s) for all samples associated with the calibration verification
		Demonstrate ability to generate acceptable accuracy and precision using four replicate analyzes of a QC check sample	Once per analyst	QC acceptance criteria, Table 6.2.5-2	Recalculate results; locate and fix problem with system and then rerun demonstration for those analytes that did not meet criteria	Apply R to all results for all samples analyzed by the analyst
	Volatile Organics	ISs	Immediately after or during data acquisition for each sample	Retention time ±30 seconds from retention time of the mid-point std. in the ICAL. EICP area within -50% to +100% of ICAL mid-point std.	Inspect mass spectrometer and GC for malfunctions; mandatory reanalysis of samples analyzed while system was malfunctioning	Apply R to all results for analytes associated with the IS

Table 2 (Continued)
Summary of Calibration and QC Procedures

Method	Applicable Parameter	QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action[a]	Flagging Criteria[b]
SW8260 B		Method blank	One per analytical batch	No analytes detected ≥ RL	Correct problem then reprep and analyze method blank and all samples processed with the contaminated blank	Apply B to all results for the specific analyte(s) in all samples in the associated analytical batch
		LCS for all analytes	One LCS per analytical batch	QC acceptance criteria, Table 6.2.5-2	Correct problem then reprep and analyze the LCS and all samples in the affected AFCEE analytical batch	For specific analyte(s) in all samples in the associated analytical batch; if the LCS %R > UCL, apply J to all positive results if the LCS %R < LCL, apply J to all positive results, apply R to all non-detects
		MS/MSD	One MS/MSD per every 20 project samples per matrix	QC acceptance criteria, Table 6.2.5-2	none	For the specific analyte(s) in all samples collected from the same site matrix as the parent, apply M if; (1)%R for MS or MSD > UCL or(2)%R for MS or MSD < LCL or (3) MS/MSD RPD > CL
		Check of mass spectral ion intensities using BFB	Prior to initial calibration and calibration verification	Refer to criteria listed in the method description (section 6.0)	Retune instrument and verify	Apply R to all results for all samples associated with the tune

Table 2 (Continued)
Summary of Calibration and QC Procedures

Method	Applicable Parameter	QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action[a]	Flagging Criteria[b]
SW8260 B		Surrogate spike	Every sample, spiked sample, standard, and method blank	QC acceptance criteria, Table 6.2.5-2	Correct problem then reextract and analyze sample	For the samples; if the %R > UCL for a surrogate, apply J to all positive results if the %R < LCL for a surrogate, apply J to all positive results; apply R to all non-detect results If any surrogate recovery is <10%, apply R to all results
		MDL study	Once per 12 month period	Detection limits established shall be ≤ ½ the RLs in Table 6.2.5-1	none	Apply R to all results for the specific analyte(s) in all samples analyzed
		Results reported between MDL and RL	None	none	none	Apply F to all results between MDL and RL
SW8270 C	Semi-volatile Organics	Five-point initial calibration for all analytes	Initial calibration prior to sample analysis	SPCCs average RF ≥ 0.30[c]; and %RSD for CCCs < 30%; and %RSD for all other calibration analytes ≤ 15%*	Correct problem then repeat initial calibration	Apply R to all results for specific analyte(s) for all samples associated with the calibration
		Second-source calibration verification	Once per five-point initial calibration	All analytes within ±25% of expected value	Correct problem then repeat initial calibration	Apply R to all results for specific analyte(s) for all samples associated with the calibration

Table 2 (Continued)
Summary of Calibration and QC Procedures

Method	Applicable Parameter	QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action[a]	Flagging Criteria[b]
SW8270 C		Retention time window calculated for each analyte	Each initial calibration and calibration verifications	± 3 times standard deviation for each analyte retention time from 72-hour study	Correct problem then reanalyze all samples analyzed since the last retention time check	Apply R to all results for the specific analyte(s) in the sample
		Calibration verification	Daily, before sample analysis and every 12 hours of analysis time	SPCCs average RF ≥ 0.05; and CCCs < 20% drift; and all calibration analytes within ±20% of expected value	Correct problem then repeat initial calibration	Apply R to all results for specific analyte(s) for all samples associated with the calibration
		Demonstrate ability to generate acceptable accuracy and precision using four replicate analyzes of a QC check sample	Once per analyst	QC acceptance criteria, Table 6.2.6-2	Recalculate results; locate and fix problem with system and then rerun demonstration for those analytes that did not meet criteria	Apply R to all results for all samples analyzed by the analyst
		Check of mass spectral ion intensities using DFTPP	Prior to initial calibration and calibration verification	Refer to criteria listed in the method description (section 6.0)	Retune instrument and verify	Apply R to all results for all samples associated with the tune
SW8270 C	Semi-volatile Organics	Iss	Immediately after or during data acquisition of calibration check standard	Retention time ±30 seconds: EICP area within -50% to +100% of last calibration verification (12 hours) for each	Inspect mass spectrometer and GC for malfunctions; mandatory reanalysis of samples analyzed while system was malfunctioning	Apply R to all results for specific analytes for all samples associated with the IS

Table 2 (Continued)
Summary of Calibration and QC Procedures

Method	Applicable Parameter	QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action[a]	Flagging Criteria[b]
		Method blank	One per analytical batch	No analytes detected ≥ RL	Correct problem then reprep and analyze method blank and all samples processed with the contaminated blank	Apply B to all results for the specific analyte(s) in all samples in the associated analytical batch
		LCS for all analytes	One LCS per analytical batch	QC acceptance criteria, Table 6.2.6-2	Correct problem then reprep and analyze the LCS and all samples in the affected USACE analytical batch	For specific analyte(s) in all samples in the associated analytical batch; if the LCS %R > UCL, apply J to all positive results if the LCS %R < LCL, apply J to all positive results, apply R to all non-detects
	Semi-volatile Organics	Surrogate spike	Every sample, spiked sample, standard, and method blank	QC acceptance criteria, Table 6.2.6-2	Correct problem then reextract and analyze sample	For the samples; if the %R > UCL for any surrogate, apply J to all positive results if the %R < LCL for any surrogate, apply J to all positive results, apply R to all non-detects If any surrogate recovery is < 10%, apply R to all results

Table 2 (Continued)
Summary of Calibration and QC Procedures

Method	Applicable Parameter	QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action[a]	Flagging Criteria[b]
SW8270 C		MS/MSD	One MS/MSD per every 20 project samples per matrix	QC acceptance criteria, Table 6.2.6-2	none	For the specific analyte(s) in all samples collected from the same site matrix as the parent, apply M if;(1)%R for MS or MSD > UCL or (2)%R for MS or MSD < LCL or (3) MS/MSD RPD > CL
		MDL study	Once per 12 month period	Detection limits established shall be < the RLs in Table 6.2.6-1	none	Apply R to all results for the specific analyte(s) in all samples analyzed
		Results reported between MDL and RL	None	none	none	Apply F to all results between MDL and RL
SW8310	PAHs	Five-point initial calibration for all analytes	Initial calibration prior to sample analysis	RSD < 20% for CFs or RFs	Correct problem then repeat initial calibration	Apply R to all results for specific analyte(s) for all samples associated with the calibration
		Second-source calibration verification	Once per five-point initial calibration	All analytes within ±15% of expected value	Correct problem then repeat initial calibration	Apply R to all results for specific analyte(s) for all samples associated with the calibration
		Retention time window calculated for each analyte	Each initial calibration and calibration verifications	± 3 times standard deviation for each analyte retention time from 72-hour study	Correct problem then reanalyze all samples analyzed since the last retention time check	Apply R to all results for the specific analyte(s) in the sample

Table 2 (Continued)
Summary of Calibration and QC Procedures

Method	Applicable Parameter	QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action[a]	Flagging Criteria[b]
SW8310		Initial calibration verification	Daily, before sample analysis	All analytes within ±15% of expected value	Correct problem then repeat initial calibration	Apply R to all results for specific analyte(s) for all samples associated with the calibration
		Continuing calibration verification	After every 10 samples and at the end of the analysis sequence	All analytes within ±15% of expected value	Correct problem then repeat initial calibration verification and reanalyze all samples since last successful calibration verification	Apply R to all results for the specific analyte(s) in all samples since the last acceptable calibration verification
		Demonstrate ability to generate acceptable accuracy and precision using four replicate analyzes of a QC check sample	Once per analyst	QC acceptance criteria, Table 6.2.7-2	Recalculate results; locate and fix problem with system and then rerun demonstration for those analytes that did not meet criteria	Apply R to all results for all samples analyzed by the analyst
	PAHs	Method blank	One per analytical batch	No analytes detected ≥ RL	Correct problem then reprep and analyze method blank and all samples processed with the contaminated blank	Apply B to all results for the specific analyte(s) in all samples in the associated analytical batch
		LCS for all analytes	One LCS per analytical batch	QC acceptance criteria, Table 6.2.7-2	Correct problem then reprep and analyze the LCS and all samples in the affected USACE analytical batch	For specific analyte(s) in all samples in the associated analytical batch; if the LCS %R > UCL, apply J to all positive results if the LCS %R < LCL, apply J to all positive results, apply R to all non-detects

Table 2 (Continued)
Summary of Calibration and QC Procedures

Method	Applicable Parameter	QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action[a]	Flagging Criteria[b]
SW8310		Surrogate spike	Every sample, spiked sample, standard, and method blank	QC acceptance criteria, Table 6.2.7-2	Correct problem then reextract and analyze sample	For the samples; if the %R > UCL for any surrogate, apply J to all positive results if the %R < LCL for any surrogate, apply J to all positive results, apply R to all non-detects If any surrogate recovery is < 10%, apply R to all results
	PAHs	MS/MSD	One MS/MSD per every 20 project samples per matrix	QC acceptance criteria, Table 6.2.7-2	none	For the specific analyte(s) in all samples collected from the same site matrix as the parent, apply M if; (1)%R for MS or MSD > UCL or (2)%R for MS or MSD < LCL or (3)MS/MSD RPD > CL
		Confirmation[c]	100% for all positive results	Same as for initial or primary analysis	Same as for initial or primary analysis	Apply R to the result for the specific analyte(s) in the sample
		MDL study	Once per 12 month period	Detection limits established shall be < the RLs in Table 6.2.7-1	none	Apply R to all results for the specific analyte(s) in all samples analyzed
		Results reported between MDL and RL	none	none	none	Apply F to all results between MDL and RL

Table 2 (Continued)
Summary of Calibration and QC Procedures

Method	Applicable Parameter	QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action[a]	Flagging Criteria[b]
TX1005	Total Petroleum Hydrocarbon	Five-point initial calibration for all analytes	Initial calibration prior to sample analysis	Mean RSD for TPH 25% or correlation coefficient for linear regression of 0.995.	Correct problem then repeat initial calibration	Apply R to all results for specific analyte(s) for all samples associated with the calibration
		Calibration verification	At the beginning of each working day in which TPH analysis will occur and at the end of each batch of 20 samples, each shift, or each work day, whichever is more frequent.	RPD – 25% of expected value	Correct problem then repeat initial calibration	Apply R to all results for specific analyte(s) for all samples associated with the calibration
		Demonstrate ability to generate acceptable accuracy and precision using four replicate analyzes of a QC check sample	Initially prior to analysis of any samples and in response to changes in staff, instrumentation or operations	Average %R within 75 – 125% and RSD – 20% or within laboratory limits	Recalculate results; locate and correct problem with system and then rerun demonstration for those analytes that did not meet criteria	Apply R to all results for all samples analyzed by the analyst
		Method blank	One per analytical batch of 20 samples or less	No analytes detected - MQL	Correct problem then reprep and analyze method blank and all samples processed with the contaminated blank	Apply B to all results for the specific analyte(s) in all samples in the associated analytical batch

Table 2 (Continued)
Summary of Calibration and QC Procedures

Method	Applicable Parameter	QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action[a]	Flagging Criteria[b]
TX1005		LCS and LCSD	One LCS/LCSD per analytical batch of 20 samples or less	%R within 75 – 125% and RPD ± 20% or within the laboratory limits	Correct problem then reprep and analyze the LCS/LCSD and all samples in affected analytical batch	For analyte(s) in all samples in the associated analytical batch; if the LCS/LCSD %R > UCL, apply J to all positive results. If the LCS/LCSD %R < LCL, apply J to all positive results, apply R to all non-detects
		MS and MSD	One MS/MSD per every 20 project samples per matrix	%R within 75 – 125% and RPD ± 20% or within laboratory limits	None	For the specific analyte(s) in all samples collected from the same site matrix as the parent, apply M if; (1) %R for MS or MSD > UCL or (2) %R for MS or MSD < LCL or (3) MS/MSD RPD> CL

Table 2 (Continued)
Summary of Calibration and QC Procedures

Method	Applicable Parameter	QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action[a]	Flagging Criteria[b]
TX1005	Total Petroleum Hydrocarbons	Surrogate Recoveries	Spiked into every sample including all QC	% R within 70 – 130% or laboratory established limits	Reanalyze, or reextract and reanalyze, or flag the data	For the samples; if the %R > UCL for any surrogate, apply J to all positive results if the %R < LCL for any surrogate, apply J to all positive results, apply R to all non-detects If any surrogate recovery is < 10%, apply R to all results
		Retention Time window check	Once per analytical batch of 20 samples or less	± 3 times standard deviation for each analyte retention time from 72-hour study	Correct problem then reanalyze all samples analyzed since the last retention time check	Apply R to all results for the specific analyte(s) in the sample
		MDL study	Once per 12 month period	Within manufacturer's statistical guidelines	none	none
		Performance Evaluation samples	Once per 12 month period	Detection limits established shall be ½ the MQLs	None	Reextract/reanalyzed. If still out, correct problem and reanalyze
TX1006	Characterization of Nc6 to Nc35 Petroleum Hydrocarbons	Five-point initial calibration for all analytes	Initial calibration prior to sample analysis	Mean RSD for TPH 25% or correlation coefficient for linear regression of 0.995	Correct problem then repeat initial calibration	Apply R to all results for specific analyte(s) for all samples associated with the calibration

Table 2 (Continued)
Summary of Calibration and QC Procedures

Method	Applicable Parameter	QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action[a]	Flagging Criteria[b]
TX1006		Calibration verification	At the beginning of each working day in which TPH analysis will occur and at the end of each batch of 20 samples, each shift, or each work day, whichever is more frequent.	RPD – 25% of expected value	Correct problem then repeat initial calibration	Apply R to all results for specific analyte(s) for all samples associated with the calibration
		Demonstrate ability to generate acceptable accuracy and precision using four replicate analyzes of a QC check sample	Initially prior to analysis of any samples and in response to changes in staff, instrumentation or operations	Average %R within 75 – 125% and RSD – 20% or within laboratory limits	Recalculate results; locate and correct problem with system and then rerun demonstration for those analytes that did not meet criteria	Apply R to all results for all samples analyzed by the analyst
		Method blank	One per analytical batch of 20 samples or less	No analytes detected < MQL	Correct problem then reprep and analyze method blank and all samples processed with the contaminated blank	Apply B to all results for the specific analyte(s) in all samples in the associated analytical batch
		Aliphatic and Aromatic Fractionation Check Standards	One per each batch of silica gel	%R within 60 – 140% and < 10 – 20 % crossovers		

Table 2 (Continued)
Summary of Calibration and QC Procedures

Method	Applicable Parameter	QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action[a]	Flagging Criteria[b]
TX1006		LCS	One LCS per analytical batch of 20 samples or less	%R within 60 – 140% and RPD ± 20% or within the laboratory limits	Correct problem then reprep and analyze the LCS and all samples in affected analytical batch	For analyte(s) in all samples in the associated analytical batch; if the LCS %R > UCL, apply J to all positive results. If the LCS %R < LCL, apply J to all positive results, apply R to all non-detects
		MS and MSD	One MS/MSD per every 20 project samples per matrix	%R within 60 – 140% and RPD ± 20% or within laboratory limits	None	For the specific analyte(s) in all samples collected from the same site matrix as the parent, apply M if; (1) %R for MS or MSD > UCL or (2) %R for MS or MSD < LCL or (3) MS/MSD RPD > CL

Table 2 (Continued)
Summary of Calibration and QC Procedures

Method	Applicable Parameter	QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action[a]	Flagging Criteria[b]
TX1006	Characterization of Nc6 to Nc35 Petroleum Hydrocarbons	Surrogate Recoveries	Spiked into every sample including all QC	% R within 70 – 130% or laboratory established limits	Reanalyze, or reextract and reanalyze, or flag the data	For the samples; if the %R > UCL for any surrogate, apply J to all positive results if the %R < LCL for any surrogate, apply J to all positive results, apply R to all non-detects If any surrogate recovery is < 10%, apply R to all results
		Retention Time window check	Once per analytical batch of 20 samples or less	± 3 times standard deviation for each analyte retention time from 72-hour study	Correct problem then reanalyze all samples analyzed since the last retention time check	Apply R to all results for the specific analyte(s) in the sample
		MDL study	Once per 12 month period	Within manufacturer's statistical guidelines	none	none
		Performance Evaluation samples	Once per 12 month period	Detection limits established shall be ½ the MQLs	None	Reextract/reanalyzed. If still out, correct problem and reanalyze

Data Qualifiers

Qualifier	Description
J	The analyte was positively identified, the quantitation is an estimation.
U	The analyte was analyzed for, but not detected. The associated numerical value is at or below the MDL.
F	The analyte was positively identified but the associated numerical value is below the RL.
R	The data are unusable due to deficiencies in the ability to analyze the sample and meet QC criteria.
B	The analyte was found in an associated blank, as well as in the sample.
M	A matrix effect was present.
S	To be applied to all field screening data.
T	Tentatively identified compound (using GC/MS)

APPENDIX A

FIELD SAMPLING PLAN

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

Prepared for

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1.0 INTRODUCTION

The following Field Sampling Plan, prepared by BNC Engineering, LLC (BNC), on behalf of National Oil Recovery Corporation (NORCO) covers the procedures for collecting representative samples from 1) surface and sub-surface soil, 2) drums and aboveground storage tank contents and 3) potential asbestos containing material (PACM). All field sampling activities related to the removal action at the former Falcon Refinery site in San Patricio County, Texas will be performed in accordance with this plan.

2.0 SCOPE AND OBJECTIVES

The Field Sampling Plan provides sampling and characterization procedures for activities that may be performed during the execution of the work listed in the EPA Administrative Order on Consent for Removal Action. Including:

- Removal of above ground tanks, equipment and piping;
- Asbestos Inspection and possible abatement;
- Assessment of surface soil; and
- Removal of grossly contaminated soil.

3.0 FIELD PROCEDURES

This section describes the procedures that may be required as part of the field work to be performed at the site.

3.1. Surface Soil

3.1.1. Sample Event Preparation

General Event Preparation

The laboratory performing the sample analysis will supply all necessary coolers, pre-cleaned containers, trip blanks, chemical preservatives, labels, custody seals, chain-of-custody and shipping forms.

Sample Container Selection

Sample containers will be of a material compatible and non-reactive with the material it is to contain. Consult Table 1 to determine the number, type and volume of appropriate containers.

Sample Container Preparation

Sample containers will be purchased as a pre-cleaned product or cleaned in the laboratory in a manner consistent with EPA protocol.

Equipment Preparation Prior to Site Arrival

This section outlines the equipment preparation prior to site arrival for a specific sample collection event. This equipment preparation includes minimum decontamination procedures for sampling devices.

- Hand Sampling Tools – Hand sampling tools will be cleaned with an Alconox® (or Liquinox®) low phosphate detergent solution and triple rinsed with distilled water prior to collecting each sample.

3.1.2. Soil Sample Collection

General Sample Collection Information

Representative soil samples will be collected for analysis. Evaluation of the sample may be based on visual observation, field screening or laboratory screening.

Equipment Decontamination Procedures

Soil sampling equipment will be cleaned with an Alconox® (or Liquinox®) low phosphate detergent solution and triple rinsed with distilled water prior to collecting each sample.

Sampling Equipment/Procedures

Surface soil samples will be retrieved using a spoon or trowel sampler to allow visual classification. Representative soil samples will be collected using clean sampling tools and placed in a sterile glass container equipped with a Teflon-lined lid furnished by the analytical laboratory. The container will be filled to capacity with soil to limit the amount of headspace present.

Sample Preservation

Each container will be labeled, placed on ice in an insulated cooler, and chilled to a temperature of approximately 40°F (4°C). Upon selection of samples for analysis, the cooler will be sealed for shipment to the laboratory.

3.2. Subsurface Soil

These procedures will be used for sampling of potentially affected subsurface soil and waste materials.

3.2.1. Sample Event Preparation

General Event Preparation

The laboratory performing the sample analysis will supply all necessary coolers, pre-cleaned containers, trip blanks, chemical preservatives, labels, custody seals, chain-of-custody and shipping forms.

Sample Container Selection

Sample containers will be constructed of a material compatible and non-reactive with the material it is to contain.

Sample Container Preparation

Sample containers will be purchased as a pre-cleaned product or cleaned in the laboratory in a manner consistent with EPA protocol.

Equipment Preparation Prior to Site Arrival

This section outlines the equipment preparation prior to site arrival for a specific sample collection event. This equipment preparation includes minimum decontamination procedures for sampling devices.

- Hand Sampling Tools - Hand sampling tools will be cleaned with an Alconox® (or Liquinox®) low phosphate detergent solution and triple rinsed with distilled water prior to collecting each sample.

- Drilling/Push Probe Equipment - Drilling/Push Probe Equipment will be cleaned with an Alconox® (or Liquinox®) low phosphate detergent solution and rinsed with distilled water prior to initiating each boring.

- Drilling/Push Probe Sampling Equipment - Sampling tools will be cleaned with an Alconox® (or Liquinox®) low phosphate detergent solution and triple rinsed with distilled water prior to initiating each boring.

3.2.2. Soil Sample Collection

General Sample Collection Information

Representative soil samples will be collected for analysis. Evaluation of the sample may be based on visual observation, field screening or laboratory screening.

Equipment Decontamination Procedures

The soil sampling equipment will be cleaned with an Alconox® (or Liquinox®) detergent solution and triple rinsed with distilled water prior to initiating each boring or sample collection event.

Sampling Equipment/Procedures

Subsurface soil samples will be retrieved in a split spoon sampler or sample tube to allow visual classification. Representative soil samples will be divided into two separate portions using clean disposable gloves and clean sampling tools. One portion of the soil sample will be placed in a disposable sample bag. The other portion of the soil sample will be placed in a sterile glass container equipped with a Teflon-lined lid furnished by the analytical laboratory. The container will be filled to capacity with soil to limit the amount of headspace present.

Sample Preservation

Each container will be labeled, placed on ice in an insulated cooler, and chilled to a temperature of approximately 40°F (4°C). Upon selection of samples for analysis, the cooler will be sealed for shipment to the laboratory.

3.3. Aboveground Storage Tank (AST) Contents

Aboveground Storage Tanks located on-site will be gauged and sampled to characterize the material contained within them for disposal/recycle evaluation purposes. If confined space entry is required the protocol described in the BNC Health and Safety Plan (HSP) will be followed.

3.3.1. Sample Event Preparation

General Event Preparation

The laboratory performing the sample analysis will supply all necessary coolers, pre-cleaned containers, trip blanks, chemical preservatives, labels, custody seals, chain-of-custody and shipping forms.

Sample Container Selection

Sample containers need to be constructed of a material compatible and non-reactive with the material it is to contain.

Sample Container Preparation

Sample containers will be purchased as a pre-cleaned product or cleaned in the laboratory in a manner consistent with EPA protocol.

Equipment Preparation Prior to Site Arrival

This section outlines the equipment preparation prior to site arrival for a specific sample collection event. This equipment preparation includes minimum decontamination procedures for sampling devices.

- Hand Sampling Tools – Liquid samples taken from the ASTs will be collected using a COLIWASA or other sampling devise that may be necessary if minimal liquid is detected in a tank. Sediment or sludge samples will be obtained using the same procedures described in the soil sampling portion of this plan.

3.3.2. AST Sample Collection

General Sample Collection Information

Representative composite samples will be collected for analysis.

Equipment Decontamination Procedures

The sampling apparatus will be cleaned with an Alconox® (or Liquinox®) low phosphate detergent solution and triple rinsed with distilled water prior to collecting each sample. Or a dedicated sampler will be used.

Sampling Equipment/Procedures

1.0 Caution will be exercised by BNC field investigators when sampling drums and ASTs due to the potential presence of explosive/flammable gases and/or toxic vapors. The following procedures will be used when collecting samples from drums and ASTs of unknown material.

Prior to sampling, all drums and ASTs will be visually inspected for the following:

- Pressurization (bulging/dimples);
- Presence of crystals around the opening;
- Leaks, holes and stains;
- Labels, markings;
- Composition and type;
- Condition, age, rust; and
- Sampling accessibility.

Level B protection will be employed during the following procedures.

2.0 Before sampling, each drum or AST will be grounded to the earth using grounding wires, alligator clips and a grounding rod.

3.0 The drum or AST opening equipment will contact the lid or bung to allow an electrical ground to form. The lid or bung will then carefully be removed.

4.0 Drums and ASTs will be screened for explosive gases or toxic vapors with an air monitoring instrument as the lid or bung is removed. Depending on the conditions, monitoring will be for one or more of the following:

4.1. Combustible gas;
4.2. Halogen vapors; and
4.3. Hydrogen sulfide gas

All relevant results, observations and information will be recorded in a logbook.

5.0 The appropriate sampling data will be selected based on the state of the material and the type of container. Selected equipment will be non-reactive and will meet the objectives of the sampling.

6.0 Sorbent Pads will be placed by the AST lids that will be sampled to contain any spill that may occur during sampling.

Liquids—A COLIWASA will be lowered to the bottom of the drum or AST. The inner rod of the COLIWASA will be closed to create a vacuum and the device will be slowly removed from the drum or AST. The sample will be released to the appropriate sample container. The procedure will be repeated until a sufficient volume is obtained.

Solids/Semi-Solids—A push tube or auger will be used to obtain the sample. In all cases clean equipment will be used to obtain the sample and to place the sample into the appropriate container.

7.0 After sampling the drum or AST will be sealed, if possible.

Sample Preservation

Each sample container will be labeled, placed on ice in an insulated cooler, and chilled to a temperature of approximately 40°F (4°C) and sealed for shipment to the laboratory.

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3.4. Potential Asbestos Containing Materials (PACM)

3.4.1. Sample Event Preparation

General Event Preparation

The laboratory performing the sample analysis shall supply labels, custody seals, chain-of-custody forms and shipping forms.

3.4.2. Asbestos Sample Collection

General Sample Collection Information

Representative asbestos samples will be collected for analysis. Evaluation of the sample may be based on visual observation. Before obtaining a bulk sample of Potentially Asbestos Containing Materials (PACM), the area will be restricted to prevent exposure to other personnel.

Sampling Equipment/Procedures

- Prior to collecting a sample, a spray bottle of water will be used to wet the surface of material to be sampled.

- Samples will be collected and placed in clean plastic bags or other clean containers. Three samples for each homogeneous area will be used to confirm the presence of ACM prior to abatement.

Sample Preservation

Each container will be labeled and secured for shipment. Upon selection of samples for analysis, the cooler will be sealed for shipment to the laboratory.

4.0 DOCUMENTATION

4.1. Field Logs

All field notes must be completely and accurately documented to become part of the final report for the project. All field information will be entered on a standard Daily Work Log or Field Screening Log. Example data sheets are provided at the end of this appendix.

4.2. Photographs

Color photographs documenting the sampling locations and visual classification of the sampled media will be maintained as a part of the sampling record. This will include a minimum of four views of the site showing the location of the area of contamination, entrance and exit road and other notable site conditions. Progress photographs will be taken to document:

- Soil/waste removal, handling and sampling,
- unanticipated events,
- contaminated material storage,
- other notable activities, and

- post-construction conditions.

4.3. Sample Numbering System

The sample numbering system will provide a unique identification for each sample collected for screening or analysis. The numbering system will provide a system for numbering replicate samples for laboratory quality assurance purposes and replicate samples will be clearly documented in the Field Screening record. Prominent identification of waste classification samples will be provided for each container from which a sample is collected.

4.4. Sample Documentation

All sample containers will be labeled to prevent misidentification. The following will be indicated on an adhesive label with a waterproof pen:

- Collector's name, date and time of sampling.
- Sample location.
- Depth of Sample (for soil samples).
- Sample Identification number: Including date, sampler's initials and sample number (e.g. 10/6/03-sjh-24).

Field data sheets will be completed daily to document site activities and the results of field screening and sampling.

Chain-of-Custody forms will be used to document samples collected at the site. Proper chain of custody records will be maintained to insure the integrity of the samples and the conditions of the samples upon receipt at the laboratory, including the temperature of the samples at the time of log in.

4.5. Documentation Procedures

Field data, including site conditions, sampling activities, field screening data, waste shipments, etc., will be documented in the Daily Work Log. Daily Work Log sheets will be turned in to the Project Coordinator for review on a weekly basis.

When samples are collected for laboratory analysis the sample collector shall fill in all applicable sections and forward the original chain of custody, with the respective sample(s), to the laboratory performing the analysis. Upon receipt of the samples at the laboratory, the sample coordinator is to complete the chain of custody, make a copy for his/her files, and make the original documents part of the final analytical report.

If corrections to the documentation are required, they will be initialed by the individual making the correction. The date of the revision will also be recorded on the documentation. If appropriate, the reason for the correction will be documented in writing.

5.0 SAMPLE SHIPPING

Samples will be shipped from the field back to the analytical laboratory either by hand delivery or utilizing an overnight courier service. Appropriate samples are to be shipped in sealed insulated shipping containers which maintain the samples at approximately 4°C.

6.0 INVESTIGATION DERIVED WASTE

Investigation Derived Waste (IDW) generated at this project site will be limited to samples collected for field screening or observation of potentially impacted soils. The IDW will be returned to the soil/waste containers at the end of each day of field activity. The containers (with the IDW) will be characterized and shipped off-site for disposal.

7.0 SAMPLING APPARATUS AND FIELD INSTRUMENTATION

Sampling apparatus used may include stainless steel trowels, knives, disposable bailers, and spoons. If necessary, BNC will utilize the following instruments to screen samples of excavated material or monitor employee work areas for hazards.

- Organic Vapor Meter (OVM) equipped with a Photo-ionization Detector and calibration kit.
- Lower Explosive Limit (LEL) Meter equipped with a Dihydrogen Sulfide (H2S) channel and calibration kit.
- Drager tubes.

8.0 FIELD SAMPLING

As indicated on the RAW project schedule, field sampling activities will begin after:

- The site has been secured;
- A decontamination area has been constructed;
- A first aid station has been installed;
- A project trailer is in place;
- Utilities have been located;
- A source of potable water has been provided; and

- Tall grass and debris have been removed.

Initially asbestos sampling will be performed of all Potentially Asbestos Containing Materials (PACM) using the methods described 3.4 of this plan.

Concurrent to the asbestos sampling, the structural integrity of the above-ground storage tanks will be determined. This analysis will define which tanks, if any, will be removed from the site. Additionally the structural integrity survey will be used to determine if a majority of the liquid waste at the site can be consolidated into one tank or possibly two tanks.

Determination of liquid consolidation will be dependent upon the compatibility analysis that will be performed of the liquids and also the volume of liquid and characteristics of the liquid waste. Several disposal/recycle options will be evaluated and prior to any waste leaving the site the EPA will be notified.

During the structural integrity survey the locations of grossly contaminated soil will be noted and mapped. Prior to any soil removal the EPA OSC will be notified. Since the action is to remove grossly contaminated soil only, no soil sampling will be performed during the RAW. Impacts to the soil not addresses in the RAW will be assessed during the RI/FS portion of the project. Soil will either be properly manifested from the site or placed in properly constructed remediation cells, on-site.

After the structural integrity survey the liquid volumes will be gauged using the methods described in this report and in strict adherence with the Health and Safety Plan. Analytical sampling will include the Flowers Compatibility Test which is described in the RAW.

Depending on the results of the sampling, tank integrity analysis and volume determination, a plan may be provided in the future to transfer liquid from the existing tanks. Also, some tanks may be removed in accordance with the HSP. Prior to removal a demolition plan will be developed with the selected subcontractor.

FIELD DATA SHEETS

BNC
Engineering, LLC.

FIELD SCREENING

PROJECT NO: _____ PROJECT NAME: _____

SITE LOCATION: _____

DATE: _____ TIME: _____ TO _____

SAMPLE DEPTH	LOCATION	HEADSPACE READING

NOTES: _____

_____

_____

_____

_____

FIELD GEOLOGIST/MGR: _____

BNC DAILY WORK LOG

DAY | DATE

CONTRACTOR | JOB NAME | JOB NO.

Work Performed Today

Weather

Temp. AM PM

Safety Meeting

Work Force	No.	Hrs.
Constr. Mgr.		
Superintendent		
Geologist		
Tech.		
Equip. Operator		
Drillers		
Laborers		
Welders		
Pipe Fitters		
Truck Drivers		
Total		

Problems-Delays

Sub-Contractor Progress

Heavy Equipment On-Site

Extra Work	Authorized By

Material Purchased

Small Equipment Rented Today	Rented From	Rate

Supervisor's Signature

The Chain of Custody provided by Severn Trent Laboratories is not available in electronic format, but is included in the hard copy version of the Field Sampling Plan