3R - 375

REPORTS

DATE:

APR 2000

WORK PLAN

REMEDIAL ACTION WORK PLAN FOR CRUDE OIL IMPACTED SOIL FORMER ARCO PIPELINE BISTI PUMP STATION, NEW MEXICO

Prepared for
ARCO Pipeline Company
15600 J.F. Kennedy Boulevard, Ste 300
Houston Texas 77032

April 2000

URS Greiner Woodward Clyde

2020 East First Street, Suite 400
Santa Ana, California 92705
984w484

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URS Greiner Woodward Clyde (URS) is submitting this remedial action work plan on behalf of the ARCO Pipeline Company. This work plan was prepared to address crude oil impacted soil resulting from operations from ARCO's Line 90 Bisti Pump Station located near Farmington, New Mexico. The location of the Bisti Pump Station is illustrated on Figures 1 and 2.

This remedial action work plan has been developed to address soil impacted by crude oil hydrocarbons through limited soil excavation and on-site remediation or off-site disposal at a registered facility. As detailed in Section 3, select pump station sites will be retained by the new owner for ongoing gas transmission activities. Soil remediation activities will be conducted in accordance with applicable regulatory requirements outlined in Section 4.0

3.1 OVERVIEW

In October, 1998, URS was retained by APL to conduct a Baseline Environmental Site Assessment (BESA) of 13 pump stations to evaluate potential environmental conditions associated with operational activities on the Line 90 Pipe Line System.

The Line 90 Pipe Line System used to be a part of the West Coast Crude Operations of APL, which maintained over 1,500 miles of pipe lines and associated pump stations. The West Coast Crude Operations were subdivided into three operations: Bakersfield, Los Angeles Basin, and Farmington. The Line 90 system was under the Los Angeles and Farmington operations and had a daily capacity of approximately 140,000 barrels.

The Line 90 Pipe Line System is comprised of Line 90 and Line 92. Line 90 originates at West Hynes Pump Station in Long Beach, California and terminates at Red Mesa Pump Station, Utah. Line 92 originates at Red Mesa Pump Station, Utah and terminates at Bisti Metering Station in Farmington, New Mexico (refer Figure 1). In 1998, the Line 90 Pipe Line system was divested to the Questar Corporation, a natural gas utility. Under the divestment agreement, APL will perform site remediation as needed to obtain site closure from the jurisdictional agencies.

The Line 90 system includes the following pump stations:

Pump Station	Location
Corona	Corona, California
Beaumont	Beaumont, California
Morongo	Morongo, California
Twenty-Nine Palms	Twenty-Nine Palms, California
Danby	Danby, California
Oatman	Oatman, Arizona
New Kingman	Kingman, Arizona
Juniper	Juniper, Arizona
Cameron	Cameron, Arizona
Tonalea	Tonalea, Arizona
Red Mesa	Red Mesa, Arizona
Shiprock	Shiprock, New Mexico
Bisti	Bisti, New Mexico

Questar will convert the Line 90 system from transmission of crude oil to natural gas. As part of the conversion process, pumping equipment will be converted to handle natural gas. Since natural gas requires less pumping capacity than crude oil, some pump stations will be eliminated. Questar's planned activities at the Line 90 pump stations include pump station demolition, pump station equipment removal/salvage, and construction of new facilities at existing pump station locations.

Associated with these redevelopment and demolition activities, remedial excavations will be undertaken.

3.2 SITE DESCRIPTION

The Bisti Pump Station (Site) is located approximately 20 miles south of Farmington, New Mexico within the northwest quadrant of Township 26 North, Range 12 West. Located immediately to the west and east of the Bisti station are Texas New Mexico Pipeline Company and Giant Industries, respectively. The El Paso Chaco Power Plant is located less than one mile west of the Site. The approximate location of the site is shown in Figure 2.

The Site consists of a flat rectangular area covering approximately 0.4 acre. The west fork of Gallegos Canyon is located approximately one quarter mile west of the Site. The Site is covered with gravel and no vegetation. The gravel is underlain by light to medium brown sandy soil. Moncisco Mesa is located approximately 6 miles west of the site.

The Site is designed for automated operations and services Line 92. It consists of an above ground crude oil storage tank (AST), a prover loop, a sump and sump pump, various control valves and meters, a control building, and a small laboratory.

3.3 GEOLOGIC SETTING

The Site is located within the San Juan Basin, in the Colorado Plateau physiographic province. The Colorado Plateau consists of horizontal sedimentary deposits broken into series of plateaus and cliffs that were formed by normal faulting that began in the Eocene (55 million years ago) and continued through the Pliocene (2 million years ago).

The San Juan Basin is a circular structural depression approximately 150 miles across that was created by subsidence during the Tertiary (Cooley, 1969). The San Juan Basin is outlined by Creataceous sedimentary layers with Tertiary sandstones and siltstones in the interior of the basin (Chronic, 1984).

The Site is located east of the West Fork Gallegos Canyon on a flat surface. The Site is underlain by Shiprock Fine Sandy Loam (Maker et. al., 1973) in the Cool Desertic Region of northwestern New Mexico (Maker et. al., 1978). The sandy loam are alluvial and eolian deposits that range in color from light brown to reddish-brown (Maker et. al.,1978). Underlying the sandy loam deposits are sedimentary rocks of shale.

Hydrogeology information about the Site was obtained from a Phase I Environmental Site Assessment report (ENSR, 1997). This report indicated that the aquifer beneath the Site is the Ojo Alamo Sandstone aquifer and the depth to groundwater measured at a well located 2 miles from the Site is 156 feet bgs.

3.4 SITE CONDITIONS

Minimal surface stains were observed in areas associated with sump, prover loop, meter, and valves. A crude oil spill occurred in May 1998 at an adjacent site (Giant Industries) east of the pump station and surface stains from this spill were observed extending 2 inches above the gravel surface on the concrete supports of the prover loop (Photographs 4, 5, and 6). Oil stains were also observed along the fence line separating Giant Industries and the pump station.

Detectable concentrations of TRPH were reported in five of the 15 samples analyzed. The TRPH concentrations ranged from 272 mg/kg (BS-01-01-01) to 46,100 mg/kg (BS-06-01-01). The highest TRPH concentration was detected in a sample collected from the valve area (BS-06) at a depth of 1 foot bgs. A the 5 feet bgs, the TRPH concentration was reported as non detect.

Detectable concentrations of TPH-E were reported in all the samples analyzed. The TPH-E concentrations ranged from 101 mg/kg (BS-01-01-01) to 24,476 mg/kg (BM-03-02-01). The total TPH-E concentrations and corresponding hydrocarbon chain breakout are summarized on Table 1 and Figure 3.

3.5 REDEVELOPMENT AND DEMOLITION ACTIVITIES

All facilities at the site, excluding the main pipeline, will be demolished or removed and Questar plan to sell/abandon the site. Demoltion activities will include the removal of both above and underground structures/facilities. It is anticipated that additional areas of contamination may be encountered during demolition/redevelopment activities. These areas may include the following:

- Process pipeline trenches;
- Value boxes;

- Transformers;
- Wastewater separators – sumps and piping;
- Pump compounds; and
- Adjacent and beneath above ground storage tanks.

A summary of facilities to be removed and retained is given on Figure 5.

As detailed above, the sites within the Navajo Indian Reservation will generally be retained by Questar for ongoing gas transmission activities and are not surrounded by residential properties or other intensive land uses. Therefore ARCO proposes to utilize a risk based approach to clean-up of the pump station sites, ensuring that both environmental and human health risks are appropriately mitigated.

All sites have only been utilized for the storage and transmission of crude oil, therefore the range of contaminants and associated potential human health and environmental risks are likely to be limited.

In general, crude oil contamination can be characterized by its limited mobility in the environment. High viscosity, low water solubility, low volatility and tendency to strongly sorb to the soil limit crude oil's mobility in the environment. Given the low solubility of these compounds and the depth to groundwater at these sites (greater than 300 feet bgs) potential impacts on groundwater are considered limited.

To enable development site specific clean-up criteria, which are protective of human health and the environment and recognize the physical and chemical properties of crude oil, a review was undertaken of risk based Federal and State regulatory guidelines. Based on this review, the Arizona Department of Environmental Quality (ADEQ) Soil Remediation Levels (SRL's) were identified as the most appropriate risk based guidelines (Arizona Department of Environmental Quality Soil Remediation Standards Rule 1997) as:

The guidelines considered physical properties of chemicals and mobility in the subsurface;

A guideline value for medium to heavy molecular weight hydrocarbons (representative of crude oil contamination) was specifically provided and has been utilized extensively by the ADEQ for crude oil remediation projects; and

Guidelines were developed for an environment (low rainfall and deep groundwater) similar to those at the subject sites.

URS propose to use the ADEQ guidelines (with approval from the Navajo EPA) as the basis of the clean-up criteria for each site. The ADEQ guidelines provided SRLs for unrestricted (residential) and restricted non-residential land uses. It is proposed that all properties will be remediated to a residential SRL. In this manner, long-term landuse is protected and both ARCO's and Questar's long-term liabilities will be mitigated.

Based on this approach and ADEQ guidance documents, a petroleum hydrocarbon clean-up criteria of 4,100 mg/kg is proposed for each site.

In addition to remediation verification sampling, additional site delineation (in potentially non-impacted areas) will be undertaken. To this end, soil samples will be collected in areas outside of the known areas of impact to verify the absence of TPH impacted soils in other areas of the pump station site. These additional site delineation activities will be conducted in conjunction with remedial excavation work.

This remedial action plan will address the hydrocarbon crude oil soil impacts at the site. To accomplish this objective it is proposed that soils which exceed the regulatory clean-up guidelines be removed and either treated on-site and/or disposed off-site. The following scope of work will be conducted in conjunction with redevelopment and demolition activities:

The proposed remediation program will comprise the following works:

(i) Excavation and removal of identified areas of soil contamination which exceed regulatory guidelines;

(ii) Characterization of remaining areas of the site in conjunction with demolition activities to determine the necessity for additional remedial excavations;

(iii) Additional remedial excavations (as required) in impacted areas identified during demolition/redevelopment works;

(iv) Validation of remedial excavations to ensure compliance with regulatory requirements; and

(v) Backfilling and recompaction of remedial excavations with a combination of clean materials and excavated materials which meet regulatory standards.

A decision flow diagram, demonstrating the proposed remedial approach is given on Figure 4. Soil sampling and health and safety protocols are provided in Appendix A and B, respectively.

Soil sampling (detailed below) will be undertaken in accordance with EPA Publication 9360.4-10 "Removal Program Representative Sampling Guidance, Volume 1 Soil".

5.1 EXCAVATION AND SAMPLING METHODOLOGY

Remedial excavation will be conducted to remove crude oil impacted soils in source areas identified as exceeding regulatory guidelines. Initially, excavation works will be conducted in source areas identified by previous investigation activities. The source areas, currently identified, requiring remediation are shown on Figure 6.

Excavation limits will be determined based on soil organic vapor analyzer (OVA) measurements readings and visual observations of soil samples periodically collected from the base and side walls of the excavated areas. The soil samples will be collected from the shovel of the backhoe and will be placed in a sealed container for a minimum of 15 minutes at ambient conditions. The probe of the OVA will then be inserted into the sealed container and if elevated levels (above 100 parts per million) are recorded, additional excavation will be conducted.

In addition, soil samples from the base of the excavation and each sidewall will be collected on a 30-foot grid and submitted to a Certified laboratory for analysis of TPH by EPA Method 8015 modified. Excavations will remain open until validation sampling analytical results have been received confirming that residual contamination is below regulatory guidelines.

In conjunction with redevelopment activities, soil samples will also be collected from the base and sidewalls of the demolition excavations. Soil samples will be collected on an approximate 30-foot grid in these areas, with select samples submitted to a State Certified laboratory for TPH analysis by EPA Method 8015 modified. Based on these analytical results, the necessity for additional remedial excavations will be evaluated, with all subsequent excavations conducted in accordance with the protocol described above. A limited number of samples will also be tested for BTEX using EPA Method 8021c to verify the absence of these compounds.

Areas of subsurface excavation (associated with demolition activities) which will be validated, and may require remediation, are shown on Figure 6.

All demolition and remedial soil excavations will be photographed by URS to show the location, nature and extent of excavation and soil sampling locations. Details on the soil sampling methodology and QA/QC procedures are presented in Appendix B.

Excavated soil will be temporarily stockpiled on-site in a predetermined location on plastic sheeting until it will be transported to and disposed of at a permitted disposal facility. If required, composite samples will be taken from the stockpile and submitted for TPH analysis (utilizing EPA Method 8015 modified) to ascertain appropriate disposal of the soil. The excavated areas will be backfilled and compacted to a standard suitable for utilization by Questar.

Excavating and shoring (if necessary) will be conducted in compliance with Occupational Safety and Health Administration (OSHA) requirements.

5.2 SITE DELINEATION METHODOLOGY

As discussed in Section 4, further site delineation will be undertaken in areas outside the remedial/demolition excavations, including areas considered unlikely to be impacted to verify the absence of hydrocarbons in the subsurface.

In conjunction with the remediation and demolition excavations and soil sampling (discussed in Section 5.1 above), test pits and soil samples will be collected from the remaining areas of the

site. URS proposes that tests pits be excavated and sampled on a 100-foot grid across these areas of the site. Test pits will be excavated to a minimum depth of 10 feet bgs or to a depth where no visible contamination is encountered (20 feet bgs maximum). Soil samples will be collected at surface (0.5 feet bgs), 5 feet bgs and 10 feet bgs and analyzed by EPA Method 8015 modified for TPH. A limited number of samples will also be analyzed for BTEX using EPA Method 8021c to verify the absence of these compounds.

Analytical results from these areas of the site will be reviewed to ensure residual soil concentrations are below the guideline SRLs. Should contamination exceeding the SRLs be encountered, additional remedial excavation activities (as described in Section 5.1) will be undertaken.

Remediation and demolition verification sampling areas are illustrated on Figure 6.

5.3 EXCAVATION CONTROL AND SAFETY

To ensure that both workers an the general public are protected during the course of the remedial and redevelopment works, the following general work procedures and safety measures shall be adopted. Supplementary information on environmental control and the health and safety plan is presented in Appendix A.

5.3.1 Personnel and Access

(i) An earthworks contractor with experience in the removal and disposal of TPH contaminated soils (40-hour Health and Safety Trained) shall be employed to carry out the excavation, handling and transport off-site of all contaminated soil materials. All subcontractors utilized by the main contractor shall be suitably experienced in the excavation, handling and transport procedures for contaminated soils, sludges and wastewaters;

(ii) All contaminated soil materials will be disposed of at an ARCO Pipeline approved treatment or landfill facility, or retained on-site for land treatment;

(iii)The site shall be fenced with a security fence on all sides with entry to the site via lockable gates;

(iv)All personnel must sign in prior to entry onto the site, with no unregistered personnel allowed on-site. The details included in the site register shall include hours/time spent on-site, work/activities undertaken and details of personal protective equipment utilized;

(v) All vehicles entering the site must be registered and approved for use prior to entry on the site; and

(vi) Outside normal working hours, all gates providing access to the site shall be locked.

5.3.2 Excavation Procedures

The following excavation procedures shall be complied with at all times:

(vii) Areas where materials are to be removed, worked on and/or prepared for removal are to be kept damp to minimize dust generation;

(viii) All deep excavation works shall be strictly controlled in accordance with OSHA confined space guidelines with the following to mitigate associated risks:

(a) Gas/vapor concentrations and oxygen depletion within and surrounding the deep excavation shall be regularly monitored;

(b) Should gas/vapor concentrations or depleted oxygen concentrations exceed safety thresholds set, then all personnel working in the excavation or gasometers shall adopt breathing apparatus and/or face masks/filters, as necessary;

(c) Personnel entering the excavations shall be equipped with personal monitors for hydrogen cyanide and hydrogen sulfide; and

(d) Prior to entering deep structures or an excavation, the integrity and subsequent safety of sidewall structures or soil will need to be assessed by a suitable qualified engineer. Sidewalls may need to be shored or battered back for safe entry, as necessary;

(ix) Excavated fill materials that are suitable as an engineering fill will be replaced and compacted to an engineering standard; and

(x) Perimeters of all excavation areas shall be controlled, through temporary bunding and hay bales, to prevent contaminated stormwater run-off leaving the site or running into excavation areas.

5.3.3 Storage, Transportation and Containment of Contaminated Materials

To minimize potential adverse human health and environmental effects impacts from transportation of contaminated materials off-site, the following general procedures shall be followed.

Stockpiling and Storage of Contaminated Soils

Temporary stockpiling of contaminated soils will be undertaken as part of the remedial excavation activities. All materials will be placed on impermeable plastic sheeting and covered to prevent propagation of dust and vapors. Where possible, the area of stockpile uncovered during stockpiling operations will also be minimized. At the end of each work day, covers will be fully secured and weighted over each stockpile.

Wheel Wash

If necessary, a wheel wash will be provided at the control gate where vehicles enter and exit he dirty site area. The wheel wash shall comprise a high pressure hose which can effectively clean the vehicle wheels, underbody and wheel arches. The wash water shall be collected and channeled/piped to an on-site detention facility for later disposal to sewer. At no time shall wash water be allowed pond on-site within undesignated sumps or ditches.

Sheeting and Dampening Down

All trucks and skips used for the removal of contaminated materials from site shall be drip free and tightly tarpaulin-covered prior to leaving the dirty site area. Personnel involved in the sheeting operation shall, wherever possible, avoid contact with contaminated materials. Before sheeting the trucks, the waste contained within the truck shall be dampened down prior to transport to prevent dust generation.

Trucks must be fitted with a facility to store leachate derived from contaminated waste material during transport and to prevent contaminated water dripping onto the road.

Communication

All trucks transporting waste to the designated disposal facility shall be in direct contact with the Contractor's site office via radio or portable telephone.

Transport Route

All vehicles carrying contaminated soil to a registered treatment/disposal facility shall be restricted to a designated route, agreed upon by the relevant regulatory authorities, with vehicles prevented from making stops while in transit to the facility other than as required on the route itself.

5.4 DOCUMENTATION AND REPORTING

In conjunction with the remedial and demolition excavation works, the following records and documentation will be maintained by URS:

- A Health and Safety plan will be developed and maintained for the duration of remedial excavation works;
- A plan showing the location, depth, and measurements (including volume of excavated materials) of all remedial soil excavations;
- A plan showing the location of all soil sampling locations and a log of all field observations and OVA headspace readings;

- A photograph log and plan detailing the date, location, and direction/angle of all validation photographs;
- Chain of custody (COC) documentation of all soil samples dispatched to an analytical laboratory for chemical testing;
- A register of excavation volumes leaving the site for off-site disposal and treatment. This register will include approximate volume, departure time from site, and truck license number;
- A register of all disposal certificates to certify appropriate disposal of impacted soils. The disposal certificates will be cross-checked against the register of excavated volumes to validate that all materials were received and treated by the disposal facility;
- A database of analytical results received and validated against COC documentation.

On completion of the field activities, all documentation will be compiled in a Soil Remediation Verification Report. This report will subsequently be submitted to the appropriate regulatory agency for review and issuance of a closure letter.

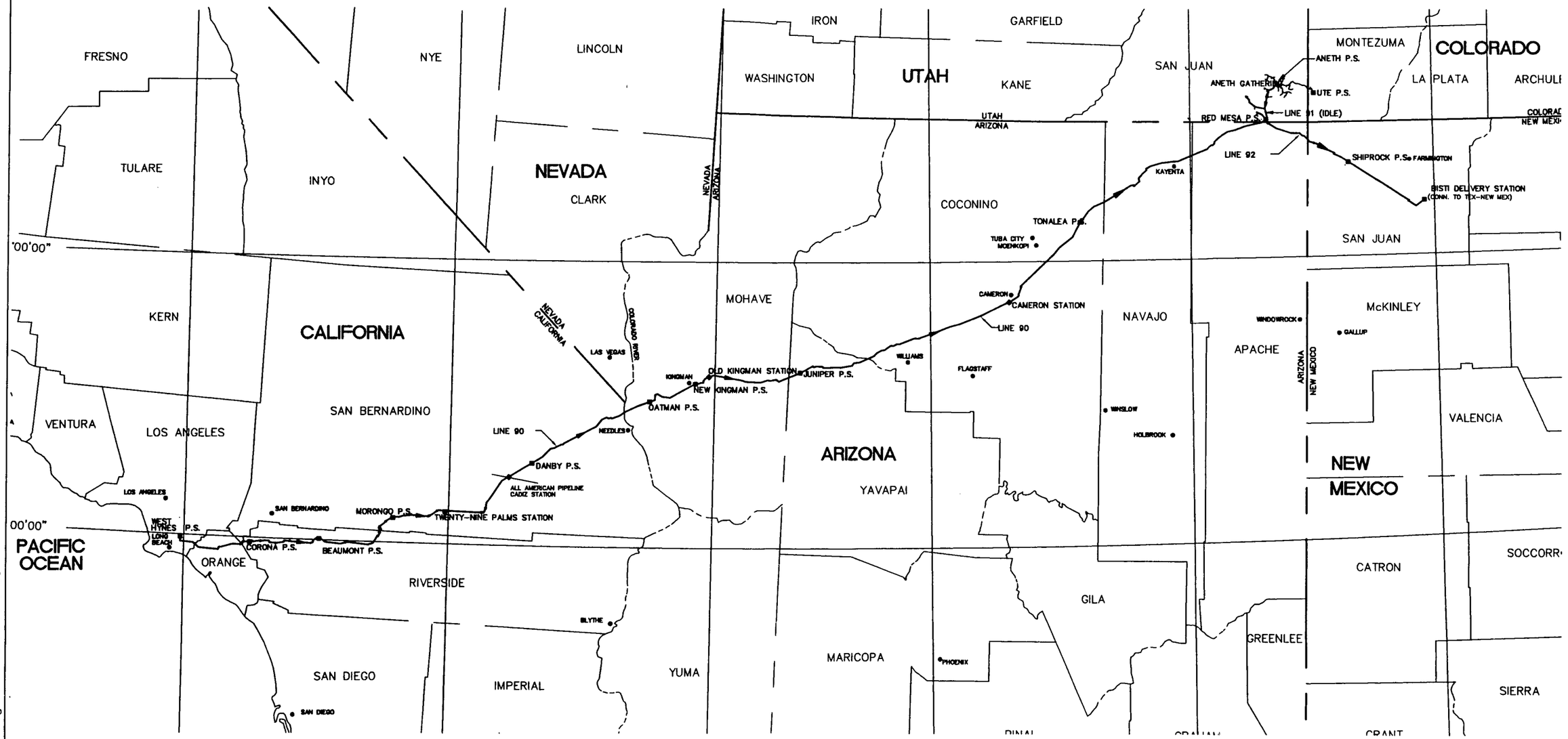
Table 1
Soil Sampling Analytical Results
Bisti Pump Station

Sample Number	Sampling Location	Depth (feet)	Sampling Date	Concentrations (mg/kg)					
				TRPH	TPH-E (Hydrocarbon Chain Range Breakdown)				Total
					C8-C10	C10-C20	C20-C30	C30-C34	(C8-C34)
BS-01-01-01	Sump	1	10/12/98	272	ND [2]	46	45	10	101
BS-01-05-01	Sump	5	10/12/98	ND					
BS-02-05-01	AST	5	10/12/98	ND					
BS-02-09-01	AST	9	10/12/98	ND					
BS-02-09-02 [1]	AST	9	10/12/98	ND					
BS-03-02-01	AST	2	10/12/98	5,010	ND	16,300	5,500	2,676	24,476
BS-03-05-01	AST	5	10/12/98	2,740	ND	5	60	55	120
BS-03-08-01	AST	8	10/12/98	ND					
BS-04-01-01	Spill	1	10/12/98	2,120	ND	518	321	73	912
BS-04-05-01	Spill	5	10/12/98	ND					
BS-05-02-01	Prover Loop	2	10/12/98	ND					
BS-05-05-01	Prover Loop	5	10/12/98	ND					
BS-05-06-01	Prover Loop	6	10/12/98	ND					
BS-06-01-01	Valve	1	10/12/98	46,100	ND	1,460	3,650	1,480	6,590
BS-06-05-01	Valve	5	10/12/98	ND					

Notes:

(1) Indicates a duplicate for the preceeding sample.

(2) ND = Indicates non detect at or above the laboratory reporting limits. Please see the laboratory analytical reports for reporting limits.



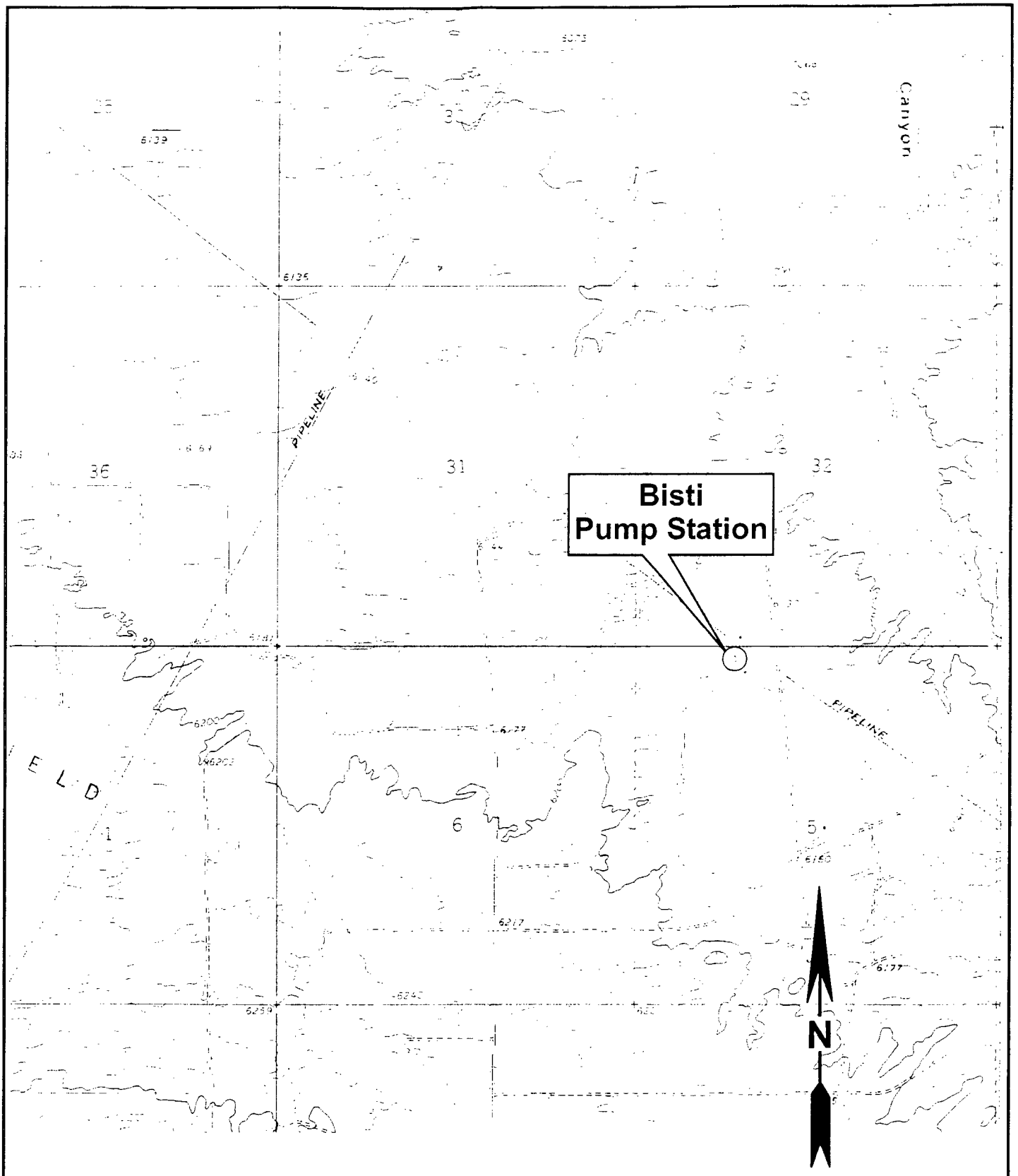
PS I:\98\984W484\LINE90\LINE90.dwg R14.01 02/14/99 04:56

NOT TO SCALE

URS Greiner Woodward Clyde

LINE 90 PIPE LINE SYSTEM MAP

Proj. No.:	984W484	Date:	APRIL 2000
Project:	ARCO PIPE LINE LINE 90	CAD ID.:	LINE90
		Figure:	1



Note:
Base map taken from U.S.G.S. Topgraphic Quadrangle,
7.5' Minute Series, Moncisco Wash, N. Mex,1966.
Photoinspected 1978.

SITE LOCATION MAP

Project No.: 570007002402	Date: MARCH 2000	Project: Arco Pipeline 90	Fig. 2

I:\Arco Pipeline 90\Bisti.cdr

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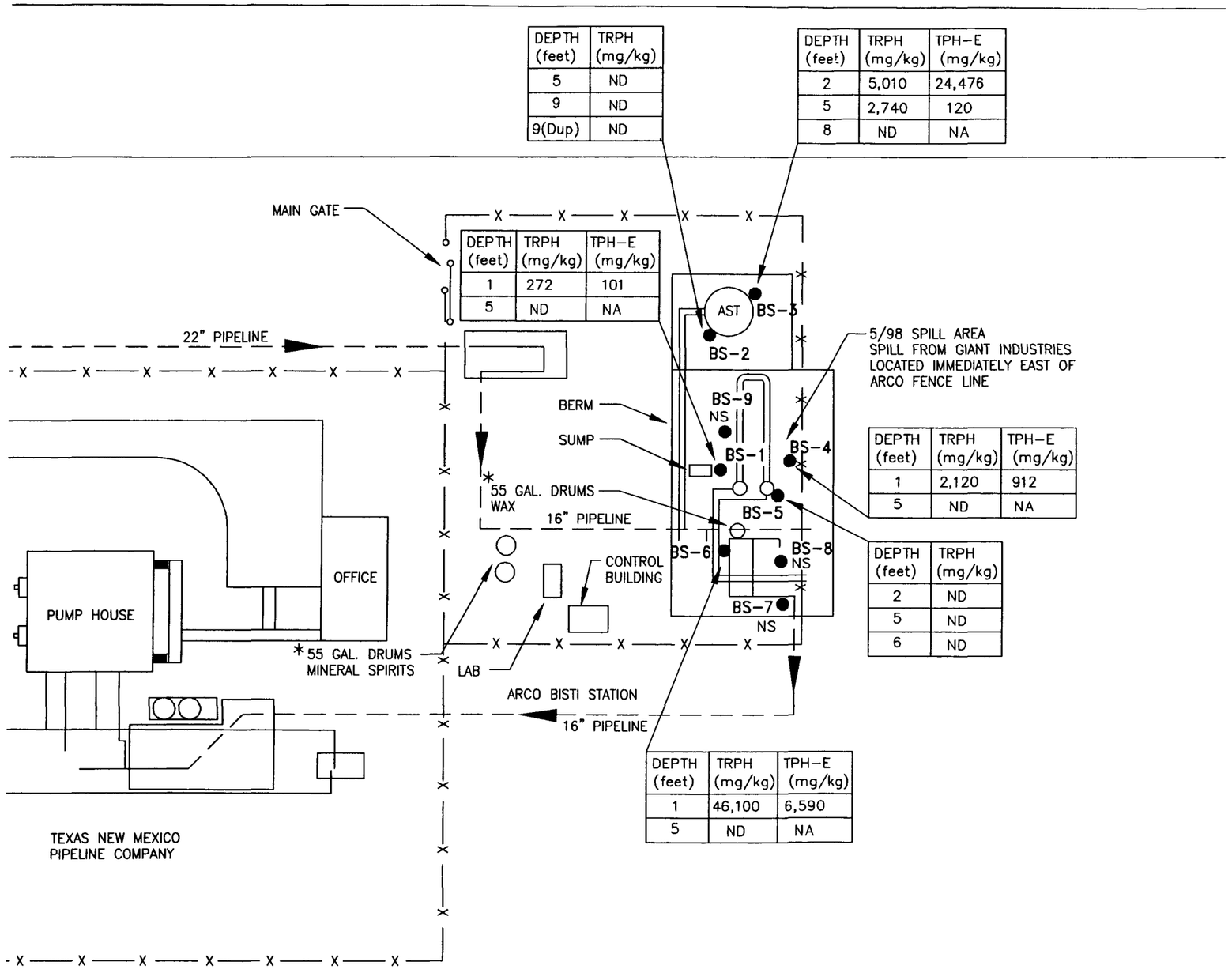


LEGEND

BS-3 ● Boring location and designation

NA Not analyzed

NS Not sampled (visual evidence of soil staining not observed at approximate 6 inches below ground surface)

ND Non-detect at or below the laboratory reporting limit

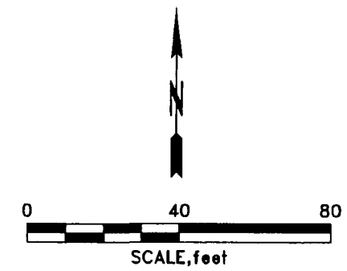
TRPH – Total Recoverable Petroleum Hydrocarbons by EPA method 418.1

TPH-E – Total Petroleum Hydrocarbons by EPA method 8015 modified (Extractable Hydrocarbon Chain Range Breakout See Table M-1 for Hydrocarbon Chain Range Breakout)

NOTES:

Soil samples collected on 10/12/1998

* ARCO Pipe Line Company reports material removed as of January 1999.



URS Greiner Woodward Clyde

SITE PLAN AND SOIL ANALYTICAL RESULTS BISTI PUMP STATION

Proj. No.:	57-09970002.01	Date:	Mar. 2000
Project:	ARCO PIPE LINE LINE 90	CAD ID.:	SMPLOC02
		Figure:	3

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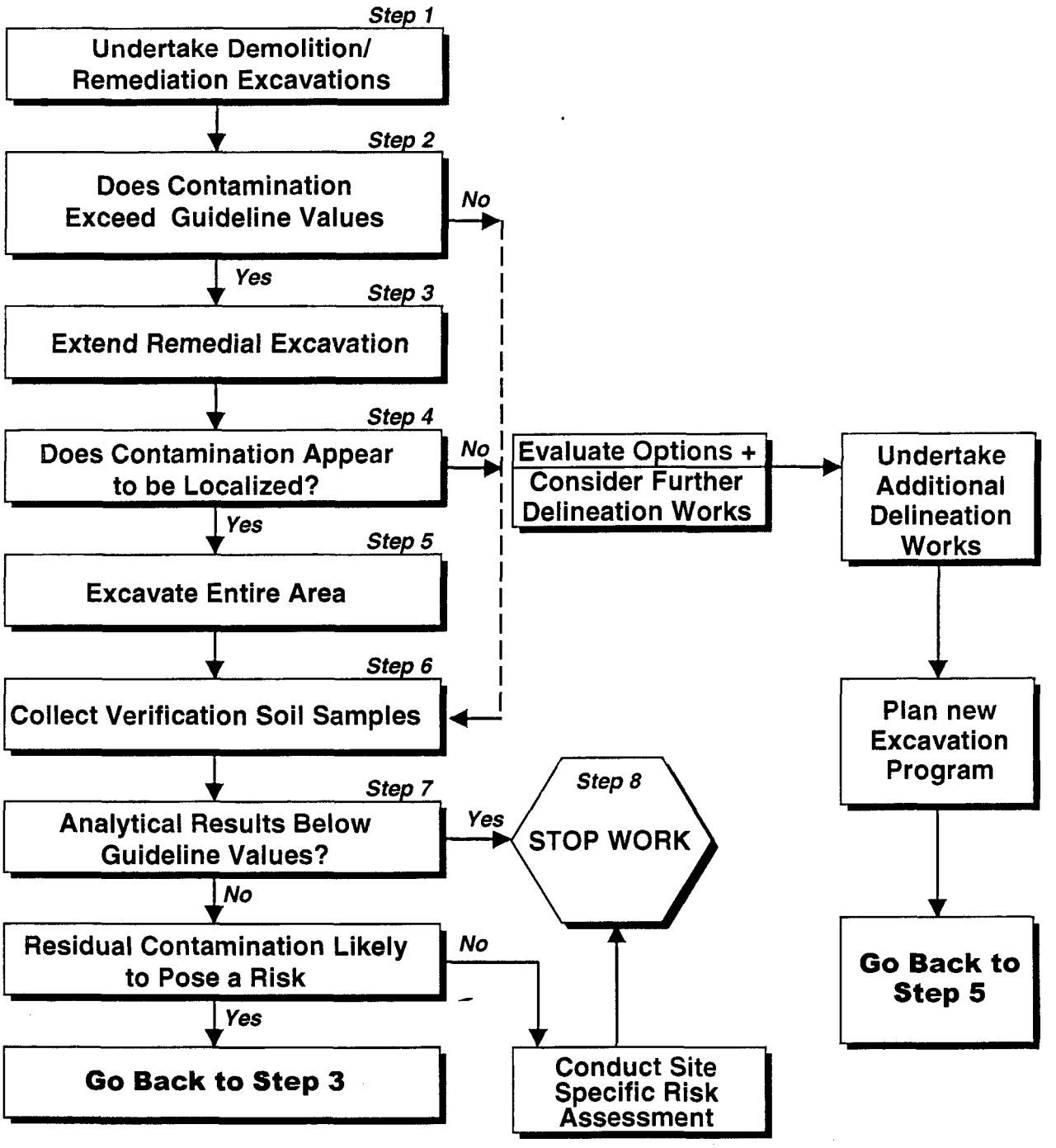

Soil Remediation Decision Flow Diagram

Project No.: 5700070024.02	Date: February 2000	Project: ARCO Pipeline 90	Fig 4

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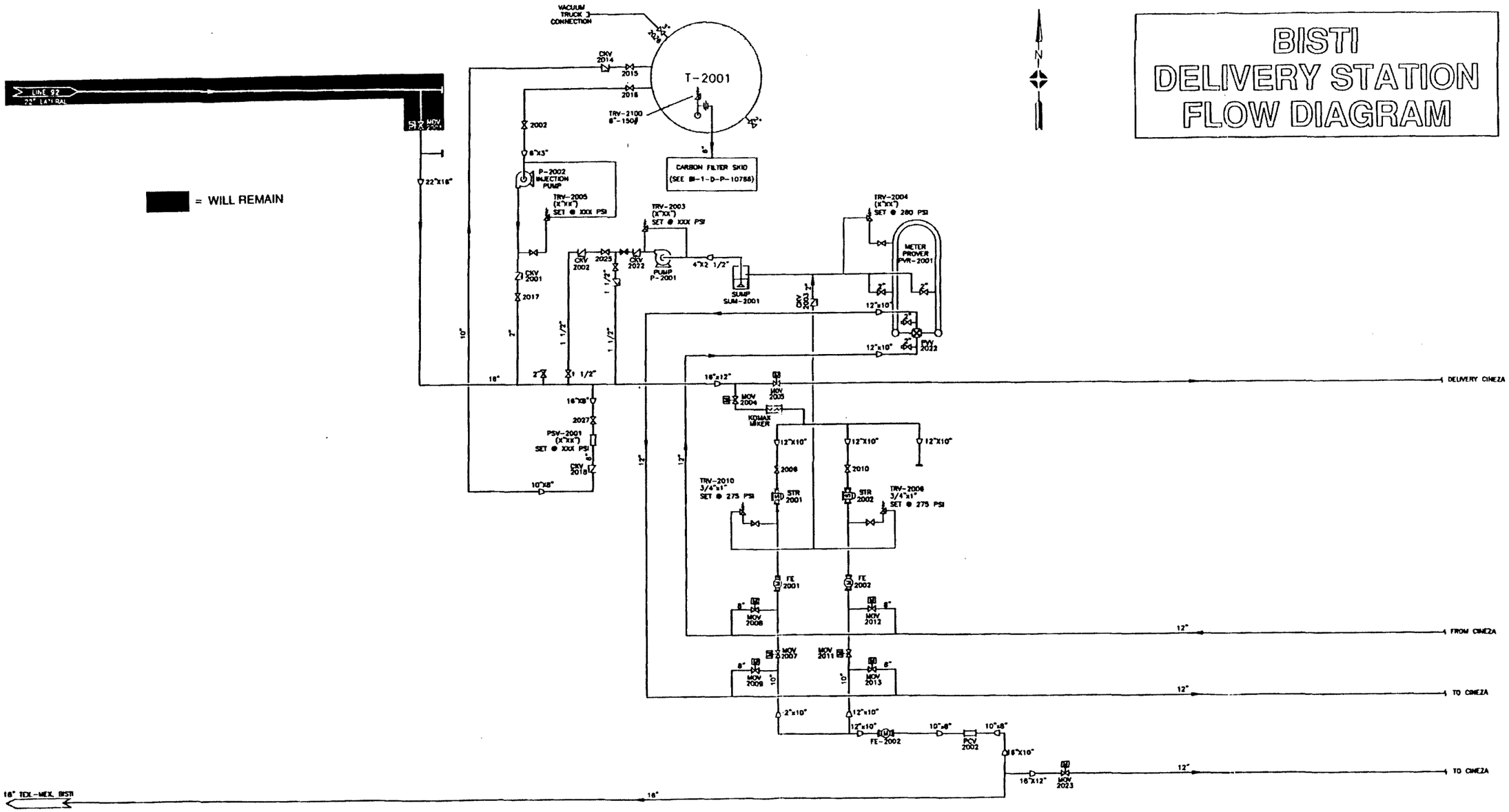
URS Greiner Woodward Clyde

BISTI DELIVERY STATION FLOW DIAGRAM



Source:
Base map taken from Questar Southern Trails Pipeline Report "Asset Recovery Inventory List 1999".

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DEMOLITION PLAN
BISTI PUMP STATION

Project: Arco Pipeline 90	Date: March 2000
Project No.:5700070024.02	Fig.: 5

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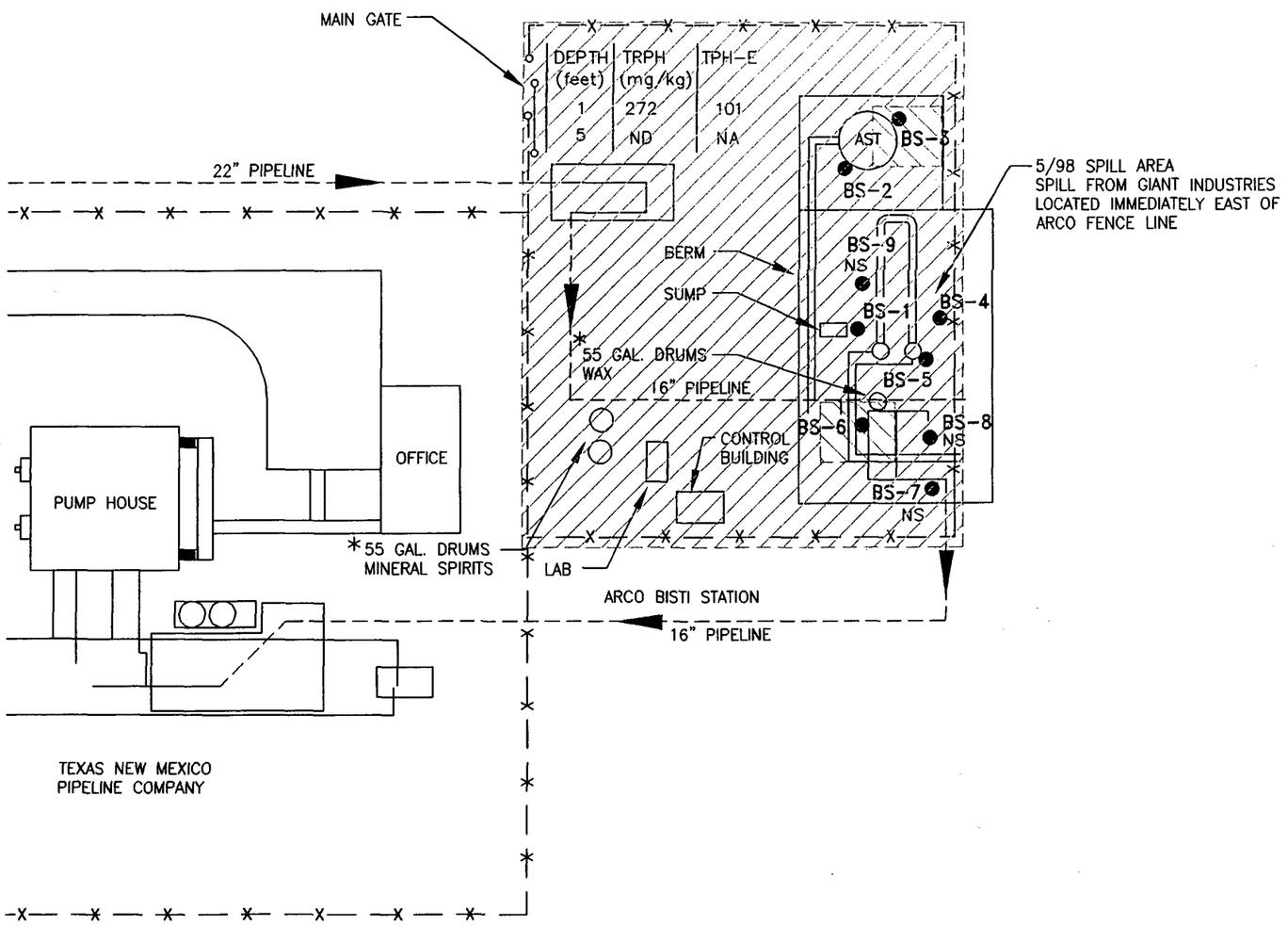

LEGEND

BS-3 ● BORING LOCATION AND DESIGNATION

CURRENT AREA IDENTIFIED AS REQUIRING REMEDIATION. VERIFICATION SOIL SAMPLES TO BE COLLECTION 30 FOOT GRID.

AREAS OF THE SITE WHERE ADDITIONAL CHARACTERIZATION AND POSSIBLE REMEDIAL ACTIVITIES WILL BE UNDERTAKEN IN CONJUNCTION WITH REDEVELOPMENT. VERIFICATION SOIL SAMPLES TO BE COLLECTED ON 30 FOOT GRID.

NOTE:

SOIL SAMPELS COLLECTED ON 10/21/1998

N

0 40 80

SCALE, feet

PS I:\98\984W484\BISTI6\4-24-00

URS Greiner Woodward Clyde

SOIL EXCAVATION AND SAMPLING PLAN BISTI PUMP STATION

Proj. No.:	57-09970002.01	Date:	Mar. 2000
Project:	ARCO PIPE LINE LINE 90	CAD ID.:	SMPLOC02
		Figure:	6

Appendix A
Health and Safety Protocols

APPENDIX A
ARCO LINE 90 PUMP STATION REMEDIAL HEALTH AND SAFETY PLAN

Prepared for
ARCO Pipeline Company
15600 J.F. Kennedy Boulevard, Ste 300
Houston, Texas 77032

April 2000

URS Greiner Woodward Clyde

URS Greiner Woodward Clyde
2020 East First Street, Suite 400
Santa Ana, California 92705
984W484

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Project Number:	5709970024
Project Location:	ARCO Line 90 Pump Statins at Corona, Beaumont, Morongo, Twenty-nine Palms, Danby, Oatman, New Kingman, Juniper, Cameron, Tonalea, Red Mesa, Shiprock and Bisti
URSGWC Project Manager:	Nigel Goulding
Health and Safety Officer:	Jeff Engels
Health and Safety Manager:	Ron Miller
Effective Dates:	July1, 2000 through July 1, 2001

APPROVALS

Project Manager Nigel Goulding	Date
Site Health and Safety Officer Jeff Engels	Date
Health and Safety Manager Ron Miller	Date

This Health and Safety Plan (HSP) presents health and safety requirements and guidelines for the soil remediation activities to be performed for ARCO Pipe Line Company at pump stations on the Line 90 Pipe Line (See Figure 1). The provisions of this HSP apply to all URS Greiner Woodward Clyde (URSGWC) personnel and subcontractors who will perform the activities associated with this project.

This HSP is in general compliance with applicable sections of 29 Code of Federal Register (CFR) 1910.120 and California Code of Regulations (CCR) Title 8, CCR Section 5192. This HSP shall not be used for work other than that described herein nor shall it be modified or used after the expiration date without written approval by the Project Manager (PM) and the Health and Safety Manager (HSM). In addition, this HSP shall not be used by firms or persons not under contract to URSGWC without written approval from the PM and the HSM. This HSP is not valid unless it is signed and dated by the PM and the HSM.

This HSP and the URSGWC's Health and Safety Manual constitutes an Illness & Injury Prevention Program (IIPP). Personnel covered by this HSP must review it and sign the Individual Compliance Agreement (Appendix A) prior to conducting on-site activities.

URSGWC's Health and Safety Program was established to provide sound, uniform health and safety practices and procedures company-wide. Direction and administration of the program are performed through URSGWC's HSM System, and implementation is the direct responsibility of URSGWC's Administrators and Project Managers.

This HSP is intended for use by the site personnel only. The implementation of health and safety guidelines at the site will be an integrated effort among URSGWC and subcontractor personnel; however, each contractor and subcontractor will be responsible for the safe and healthful performance of work by each of its employees and support personnel who may enter the work zone. Only authorized personnel will be allowed to enter the work area. The authority and responsibilities of project personnel are outlined below.

2.1 HEALTH AND SAFETY MANAGER (HSM): RON MILLER

Responsibilities

- Interface with PM in matters of health and safety
- Develop or review and approve project health and safety plans
- Conduct staff training and orientation on health-and safety-related activities
- Appoint Site Safety Officer (SSO)
- Monitor compliance with health and safety plans and conduct site audits
- Assist PM to obtain required health and safety equipment
- Approve personnel to work on hazardous waste management projects with regard to medical examinations and health and safety training

Authority

- Suspend work or otherwise limit exposures to personnel if HSP appears to be unsuitable or inadequate or if health or safety of personnel are endangered
- Direct personnel to change work practices if existing practices are deemed to be hazardous to health and safety of personnel
- Remove personnel from projects if their actions or condition endanger their health and safety or the health and safety of co-workers

2.2 PROJECT MANAGER (PM): NIGEL GOULDING

Responsibilities (Safety Related)

- Ensure that the project is performed in a manner consistent with the URSGWC Health and Safety Program
- Ensure that the HSP is prepared, approved, and properly implemented
- Provide the HSM with the information needed to develop health and safety plans
- Ensure that adequate funds are allocated to fully implement the project HSP
- Ensure health and safety compliance by subcontractor personnel
- Coordinate with the HSM on health and safety matters

Authority (Safety Related)

- Assign HSM to project and, if necessary, assign a suitably qualified replacement.
- Temporarily suspend field activities if health and safety of personnel are endangered, pending an evaluation by the HSM
- Temporarily suspend an individual from field activities for infractions of the HSP, pending an evaluation by the HSM

2.3 SITE SAFETY OFFICER (SSO): JEFF ENGELS

Responsibilities

- Direct health and safety activities on site in compliance with this HSP
- Provide a copy of the HSP to the field crews
- Report immediately all safety-related incidents or accidents to the HSM and PM
- Assist PM in all aspects of implementing the HSP
- Maintain health and safety equipment on site
- Implement emergency procedures as required

Authority

- Temporarily suspend field activities if health and safety of personnel are endangered, pending further consideration by the HSM
- Temporarily suspend an individual from field activities for infractions of the HSP, pending further consideration by the HSM

2.4 RESPONSIBLE INDIVIDUALS

Responsible individuals are those persons assigned to work at the site. These individuals should be aware of the possible hazards associated with their job performance, hazards of the site itself, proper hazard communication operations, and hazard recognition.

Responsibilities

- Obtain a copy of the HSP and read it in its entirety prior to the start of on-site work
- Follow the HSP guidelines in addition to the supervisor's standard operating procedures for field activities
- Report work-related injuries or illnesses to their supervisors immediately, regardless of severity
- Use personal protective equipment and safety devices that have been provided for use in performing work assignments, and replace or repair defective equipment items and parts
- Report defective equipment immediately to the supervisor
- Report unsafe or dangerous conditions at the work site to the supervisor
- Conduct self in a professional and responsible manner while at the work site

Individuals not required to be at the site will not be allowed to roam the site unless approved by the PM and/or the SSO. Prior to entering any work zones, they will be informed of the contents of this HSP and must sign the Compliance Agreement.

2.5 MEDICAL REQUIREMENTS

URSGWC personnel and its subcontractors must obtain health and safety clearances before beginning work at the site. Employees shall be active participants in the URSGWC medical surveillance program, and field personnel must have completed and passed, without restrictions, an annual and/or baseline occupational medical surveillance examination within the last year.

2.6 TRAINING

Employees shall not participate in field activities until they have been trained to the level required by their job function and responsibility. The specific types of training required include orientation training for new employees, basic training for first-time hazardous waste workers, supervisor training, advanced training, site-specific training, first aid, and refresher training.

Personnel on this project are required to have completed at a minimum 40-hour Occupational Safety and Health Administration (OSHA) Hazardous Waste Operations and Emergency Response (HAZWOPER) training and be current with respect to annual refresher training prior to working at the site. This will include personnel who will be involved with investigations, and activities where contaminated soils and groundwater is likely to be encountered. Personnel for each task will be evaluated on site by the SSO as per HAZWOPER training. URSGWC's SSO must complete an additional 8 hours of OSHA supervisor training. Training content shall be as specified in 29 CFR 1910.120 (e) and 8 CCR 5192 (e).

2.6.1 Personal Protective Equipment Training

Employees should be trained in the proper use of personal protective equipment (PPE) prior to using any PPE on-site. The purpose of training is to: (1) Become familiar with the equipment in a non-hazardous situation; (2) Instill confidence and awareness in the user of the limitations and capabilities of the equipment; (3) Increase the operating and protective efficiency of PPE use; and (4) Reduce maintenance expenses.

2.6.2 Respirator Fit Test

The "fit" of the facepiece-to-face seal of a respirator must be tested on each potential wearer to ensure a tight seal; every facepiece does not fit every wearer. Certain features, such as scars, facial hair, very prominent cheekbones, deep skin creases, dentures or missing teeth, and the chewing of gum and tobacco may interfere with the respirator-to-face seal. Under conditions where these features may impede a good seal, a respirator must not be worn.

Site personnel must obtain health and safety clearances before beginning work at the site, as discussed below in Section Four. The names of all individuals performing work at the site must be recorded and the records will be maintained in the health and safety file of the project office. The SSO or the PM will provide a copy of the Compliance Agreement to the HSM within one week of the initiation of field tasks. Copies of Tailgate Safety Meeting Forms will also be provided to the HSM and the originals will be maintained in the project health and safety file.

3.1 DISTRIBUTION OF THE HEALTH AND SAFETY PLAN

A copy of this HSP will be provided to each subcontractor and their subcontractors, assigned to work at the site. Individuals assigned to work at the site must acknowledge receipt of the plan and agree to comply with its provisions in writing. Each individual performing activities at the site must sign a Compliance Agreement Form.

3.2 SAFETY MEETING

Before work commences, URSGWC employees and its subcontractors assigned to work at the site shall be briefed by the SSO on the site-specific health and safety requirements contained in this HSP. The dates of briefing sessions and attendees must be recorded on the Tailgate Safety Meeting Form provided in Appendix A. Safety orientation/training meetings must be convened:

- Before field work begins
- When there are modifications to the HSP that are applicable to field personnel
- When additional personnel begin field work

All individuals working at the site must attend safety meetings and must sign the Tailgate Safety Meeting Form acknowledging attendance. The HSP Compliance Agreement will be signed on the first day of field work prior to startup. The SSO will provide a copy of the Compliance Agreement to the HSM within one week of the initiation of field tasks. The Compliance Agreement form is provided in Appendix A. Safety meetings should be held at the start of each workday to discuss possible safety hazards for field operations.

3.3 INCIDENT REPORTING

Injuries, exposures, illnesses, safety infractions, automobile accidents, and other incidents specified in this HSP must be reported to the HSO within 24 hours of occurrence. Incident reporting forms are included in Attachment A.

An incident includes events listed below:

- Illness resulting from known or unknown causes
- Physical injury, including those that do not require medical attention
- Fire, explosions, and flashes resulting from activities performed by site personnel and/or their subcontractors
- Property damage resulting from activities performed by site personnel and/or their subcontractors
- Vehicular accidents occurring on-site or while traveling to and from sites
- Infractions of safety rules and requirements

3.4 SAFETY COMPLETION REPORT

Upon completion of the work, a Safety Completion Report must be submitted to the HSM. The report should include a critical evaluation of this HSP and all approved notifications, names, and affiliations of individuals who worked at the site, exposure monitoring data with monitoring dates and decisions made, summary of incidences and action taken, if any, and recommendations for improving health and safety at similar sites. The Safety Completion Report form is provided in Appendix A.

3.5 RECORDKEEPING

The following records will be maintained in the project file, on-site by the SSO, and copies will be sent to the HSM:

- Attendee signatures, acknowledging receipt and understanding of the HSP and the Compliance Agreement
- The Tailgate Safety Meeting attendance sheets
- Incident HS-502 Forms

3.6 POSTING REQUIREMENTS

The following information shall be posted or readily available on site:

- OSHA poster

- Emergency phone numbers
- Directions to the nearest hospital
- URSGWC's HSP

3.7 HEALTH AND SAFETY PLAN MODIFICATIONS

Modifications to the HSP may result if field personnel encounter additional chemical or physical hazards known or suspected to be present during field activities. Modifications to this HSP that may result in less stringent precautions cannot be undertaken by the SSO or PM without approval of the HSM. Changes to this document must be formally documented.

Site information is provided in the attached remediation work plans. This document should be reviewed fully prior to commencing work. Contaminants likely to be encountered on-site include crude oil range hydrocarbons and lubricants.

The on-site remediation activities will be related to removal of crude oil impacted soils at each of the pump station sites. Activities will include demolition and remedial excavation works and verification soil sampling.

URSGWC employees will provide general oversight of clean-up activities and will undertake all soil sampling activities. Subcontractors will be contracted directly by ARCO and Questar, and will take direction from URSGWC during remedial excavation activities.

Potential hazards associated with this project are discussed in this section. The primary site hazards and recommended controls are listed in the table below. The SSO will assess hazards in the work zone and implement appropriate procedures prior to commencement of work.

5.1 TASK HAZARDS

Hazard	Recommended Controls
Chemical Exposure	The breathing zone will be monitored with an Hnu-101, 11.7 eV probe and/or an organic vapor analyzer during soil boring and sampling activities. Gloves will be worn during sample collection and soils handling. Appropriate personal protective clothing and equipment shall be worn by site personnel.
Physical Injury	Steel-toed boots will be worn at all times in the work zone. Good housekeeping will be required. Hazards presented by uneven surfaces, holes, or equipment protruding through the ground surface should be mitigated by barricading, backfilling, or other means to prevent slips, trips, and falls. Excavation and sampling equipment should be inspected to ensure it is in proper working condition and any necessary equipment repairs/replacement should be made prior to commencing work. Appropriate personal protective clothing and equipment shall be worn by site personnel.
Underground Utilities and Structures	Underground Service Alert and local utility companies will be notified before subsurface intrusion occurs. Underground utilities identified shall be clearly marked.
Traffic and Heavy Equipment Operation	Proper cone delineation and construction and warning signs shall be displayed where necessary. Reflector vests will be worn by personnel in work zones that encroach traffic areas. Site personnel must be alert and aware of their surroundings.
Excavations	OSHA excavation guidelines should be followed at all times. Under no circumstances should personnel enter a trench deeper than 3 feet to undertake sampling activities. Only where adequate battering or shoring has been undertaken, can site personnel enter a trench greater than 3 feet deep to undertake demolition activities.

5.2 CHEMICAL HAZARDS

Chemical hazards associated with the clean-up activities include handling of potential soil possibly contaminated with petroleum derivatives and/or metals. Chemical characteristics and toxicological information and routes of exposures associated with these chemicals are described in the following sections. OSHA recommended exposure limits for these chemicals are included in Table 1.

5.2.1 Petroleum Hydrocarbons

Petroleum hydrocarbons are not expected to be acutely toxic, but can be irritating to the skin. In general, some fuel oils have flash points of 100 degrees Fahrenheit (°F), with auto-ignition temperatures of 494 °F. They are considered to be a moderate fire hazard when exposed to heat, flame, or oxidizers. Many petroleum products are proven skin carcinogens in animals and could lead to the development of similar lesions in humans if allowed to remain on the skin for an extended period of time. Prolonged skin contact should be avoided. Although only crude oil is expected to be encountered under this scope of work, other common refined hydrocarbons have been included in this Health &Safety Plan for reference.

1) ALIPHATIC HYDROCARBONS - Many of the industrially important aliphatic saturated hydrocarbons are found in earth gas or crude oil. Some family members are used and others are formed during combustion of fuels, by catalytic cracking, or in other specialized petrochemical processes. Paraffin mixtures are used extensively as fuels, refrigerants, propellants, pesticides, lubricants, solvents for paints, protective coatings, plastics, degreasing operations, and in purified form as food additives. The toxicity characteristics of the alkanes are minimal for the gases and solids, but are moderate for the liquid materials.

2) ALICYCLIC HYDROCARBONS - Cycloparaffins, also named cycloalkanes, belong to this chemical category. Cyclanes are extensively used to produce reformed aromatics. Some are utilized as inhalation anesthetics, and are synthesized in pure form by the reduction of dihalogenated propane precursors. The lower cycloparaffins are gases and have been used as anesthetics, especially cyclopropane. The higher members are liquids with narcotic properties. From C6 on, the margin between narcosis and death is very narrow and symptomatically barely recognizable. The alicyclics, in general, are Central Nervous System (CNS) depressants with low acute and chronic toxicity. This is due to their rapid excretion in unchanged form or prompt conversion into water-soluble metabolites. Inhalation by humans at high concentrations may cause excitement, loss of equilibrium, stupor, and coma. Cycloparaffins are dermal irritants; they defat the skin to cause morphological changes and hypothermia.

5.2.2 Diesel Fuel

Diesel contains petroleum distillates, generally in the range of 300 to 550 °F boiling point, and probably containing more aromatics than gasoline. Diesel fuel in general comes in several grades and its toxicity is thought to be similar to that of Kerosene, although somewhat more toxic because of the additives. However, there is little toxicological information on Diesel. The following review is based primarily on the effects of kerosene. Currently there is no threshold limit value (TLV) for this product.

This product is expected to be an eye, skin, and respiratory irritant and a CNS depressant. It is not as acutely hazardous as many other petroleum products such as gasoline; nevertheless, breathing of the MIST may produce signs of headache, nausea, weakness, dizziness, and loss of coordination or judgement.

Prolonged or repeated contact with the skin may produce a defatting dermatitis with dryness and cracking of the skin. This product may contain substances that have caused cancer or kidney damage in laboratory animals; however, it is not a known human carcinogen. Persons with eye, skin, respiratory, neurological, liver, or kidney conditions may be more sensitive to diesel fumes or impacted soils than others. Persons exposed to other petroleum products or CNS depressants may be more sensitive to diesel fumes or diesel impacted soils.

Diesel No. 1 is not as hazardous as gasoline from inhalation of the vapors but can nevertheless be able to cause similar effects including CNS depression in acute exposures, especially under conditions of poor ventilation such as in tank cleaning operations.

5.2.3 Aromatic Hydrocarbons

The term "aromatic" can have several meanings, namely: 1) exhibiting an ethereal, balsamy odor, or 2) a distillation grade by the refiner, or 3) the class of aromatic hydrocarbons that deals with benzene and its derivatives. The aromatic hydrocarbons are of considerable economic importance as industrial raw materials, solvents and components of innumerable commercial and consumer products. However, the aromatics differ vastly in physical, chemical, and physiological characteristics from the aliphatic and alicyclic hydrocarbons. Additionally, the aromatics are more highly toxic to the mammalian system. The properties responsible are their higher volatility, accessibility, absorption through the respiratory system and, to a lesser degree, through the skin, and particularly their unusual hematopoietic characteristics. Chemically, the aromatic hydrocarbons can be divided into three groups: a) the alkyl-, and the alicyclic-substituted benzene derivatives, b) the di- and polyphenyls, and c) the polynuclear compounds composed of two or more fused benzene ring systems.

The aromatics are primary skin irritants, and on repeated, prolonged skin contact may cause dermatitis due to their dehydrating and defatting properties. Eye contact with aromatic liquids may cause burns, lacrimation, and irritation. If contact is prolonged, tissue injury may occur. Conjunctivitis and corneal burns have been reported. Direct contact with most liquid hydrocarbons through aerosol incorporation or from ingestion and subsequent aspiration into the lungs can cause severe pulmonary edema, pneumonitis, and hemorrhagins. Overall, benzene is

more highly toxic than any of the substituted benzene derivatives, except for toluene and vinylbenzene. Aromatic hydrocarbons cause local irritation and changes in endothelial cell permeability. The aromatic hydrocarbons, even from a single exposure, exhibit a special affinity to nerve tissue. Benzene, however, is a neuroconvulsant characterized by tremors and convulsions.

1) BENZENE - Benzene is a clear, volatile, colorless, highly flammable liquid with a characteristic aromatic odor. Benzene is a constituent of motor oils and is used as a solvent. It is a human carcinogen with evidence indicating it causes leukemia. Acute exposure may cause CNS depression. Symptoms may include headaches, dizziness, nausea, convulsions, coma and even death. The Federal and Cal-OSHA standard for benzene is 1 part per million (ppm) with a 5 ppm short-term exposure limit (STEL). The American Conference of Governmental Industrial Hygienists (ACGIH) recommends a Threshold Limit Value (TLV) of 10 ppm. The Immediately Dangerous to Life and Health (IDLH) level is 500 ppm. The odor threshold for benzene in air is 12 ppm and in water is 0.17 ppm. Route of exposure is usually inhalation, and the symptoms are dizziness, vomiting, nausea, aplastic anemia, and ventricular fibrillation.

2) TOLUENE - Toluene (toluol, methyl benzene) is used as constituent in the formulation of automotive and aviation fuels. Toluene is a colorless liquid with an aromatic odor. It is flammable by standard tests in air and is not soluble in water. The major response to toluene at high concentrations is depression of the CNS. Olfactory fatigue occurs rapidly upon exposure. The federal standard for toluene is 200 ppm, while the CAL-OSHA standard is 50 ppm. The STEL and IDLH for toluene are 150 and 500 ppm, respectively. The ACGIH recommended TLV for an 8-hour exposure is 50 ppm. Eye irritation occurs around 300 to 400 ppm. The lower explosive limit is 1.3 percent and the upper limit is 7.1 percent.

3) ETHYLBENZENE - Ethylbenzene is a colorless, flammable liquid with an aromatic odor. This compound is employed as a solvent and as an intermediate in the production of styrene. Ethylbenzene is also found in automotive or aviation gasoline. Significant amounts of ethylbenzene are also found in mixed xylenes, which are used as diluents for paint. Ethylbenzene toxicity is characterized by its irritation to the skin, and less markedly, to the mucous membranes. Ethylbenzene is the most severe skin irritant of the benzene series. Symptoms resulting from exposure may include irritation of the eyes, headaches, dermatitis, narcosis and coma. At 1,000 ppm, ethylbenzene causes distinctive eye irritation and tearing, but tolerance develops rapidly; and at 200 ppm, the vapor has a transient irritant effect on human eyes. No systemic effects are expected at levels producing distinctively disagreeable skin and eye irritation. Ethylbenzene is incompatible with strong oxidizers and can be a dangerous fire hazard. It has a lower explosive limit (LEL) of 1.0 percent and an upper explosive limit (UEL) of 6.7 percent. The federal and Cal-OSHA standard for ethylbenzene is 100 ppm. The STEL and IDLH for ethylbenzene are 125 and 800 ppm, respectively. The ACGIH recommended TLV for an 8-hour exposure is

100 ppm. The odor threshold for ethylbenzene in air is 2.3 ppm and in water is 0.029 ppm.

4) XYLENE - Xylene is a clear flammable liquid with an aromatic odor. Commercial xylene is a mixture of the isomers; ortho-, meta- and para- xylene. Xylene mixtures may also contain ethylbenzene and toluene. Xylene is a solvent and a constituent of paint, lacquers, varnishes, cleaning fluids, and aviation fuels. Xylene vapors may cause irritation of the eyes, nose, and throat. Skin contact may cause dermatitis. When inhaled at high concentrations, the initial signs of exposure may include a flushing or reddening of the face and a feeling of increased body heat, owing to the dilation of the superficial blood vessels. In addition, there may be blurred vision, dizziness, tremors, staggering, drowsiness, salivation, cardiac stress, CNS depression, unconsciousness, and eventually coma. Extremely high concentrations may cause pulmonary edema, anorexia, nausea, vomiting, and abdominal pain. Pulmonary retention of xylene vapors in humans amounts to about 64 percent of the inhaled dose. Xylene may also be absorbed through the skin and does not appear to be influenced by the application of barrier creams. Xylene is metabolized to methylhippuric acid, which is excreted in the urine and can be used as a biologic indicator of exposure. Xylene is incompatible with strong oxidizers and can be a dangerous fire hazard. It has a LEL of 1.1 percent and an UEL of 7 percent. The federal and Cal-OSHA standard for xylene is 100 ppm. The STEL and IDLH for xylene are 150 and 900 ppm, respectively. The ACGIH recommended TLV for an 8-hour exposure is 100 ppm. The odor threshold for xylene in air is about 1 ppm. The odor threshold for meta-xylene in air is 1.1 ppm and in water is 0.017 ppm.

5.2.4 Routes of Exposure

5.2.4.1 Inhalation Exposure

When clean-up operations begin, dust or vapor concentrations may occasionally exceed the currently recognized health standards. The risk of overexposure to lead dust or volatiles via inhalation is, however, considered to be low. Because of the possibility, respirator protection will be available on site. Direct reading instruments will be used to monitor the breathing zone. Monitoring instruments to be used, action levels, and appropriate response actions are presented in Table 2. In no case shall workers be exposed to greater than one-half of the PEL for any contaminant unless respiratory protection is worn.

5.2.4.2 Dermal Exposure

Repeated daily contact with contaminated soil and groundwater may irritate the skin and, potentially over a long period of time, lead to the development of skin lesions. The risk of this exposure at this site is expected to be low. Direct skin contact with contaminated soils and groundwater shall be avoided by wearing PPE such as protective gloves, rubber boots, and

disposable coveralls. However, if contact does occur, the exposed areas shall be washed as soon as possible with soap and water and rinsed thoroughly.

5.2.4.3 Ingestion Exposure

Site contaminants can enter the body by ingestion; however, this risk will be limited due to site health and safety protocols. There will be no drinking and/or eating within the contaminated work area. Prior to eating or before leaving the site, personnel will wash their hands and faces and remove their outer coveralls. Smoking is NOT allowed on the site, except in areas designated for that purpose.

5.3 PHYSICAL HAZARDS

The potential physical hazards at the site include the following:

- Slips, trips and falls
- Falling objects/loads
- Underground utilities
- Heat stress
- Ergonomics hazards
- Traffic
- Bloodborne pathogens
- Heavy Equipment Operation
- Noise

5.3.1 Slips, Trips and Falls

Prevention of slip/trip/fall accidents is largely a measure of routine inspections to assure that dangerous areas are properly marked and/or protected. Due to uneven ground, holes, natural erosion, trips and falls are likely to occur. Other potential trip/fall hazards include cluttered equipment, and abandoned construction supports protruding above ground surface. Good housekeeping practices should be employed. In addition, field personnel must be aware of their surroundings, pay attention to where they are and what they are doing and take precautions.

5.3.2 Falling Objects/Loads

Standard PPE for protection against falling objects includes hard hats and steel-toed shoes. Appropriate equipment (e.g., drum dolly) should be used for all tasks to avoid accidents when lifting/transporting heavy loads.

5.3.3 Underground Utilities

In work areas where the exact location of underground electrical power lines is unknown, drilling and excavation activities should be postponed until Underground Service Alert or the utility company is notified. Once located, the underground lines should be clearly marked or flagged.

5.3.4 Heat Stress

Due to the Southern California climate, heat stress could be of some concern in the event that PPE is donned. PPE may impair the body's efforts to maintain an acceptable temperature and result in heat stress. Problems related to heat stress include heat fatigue, heat rash, fainting, heat cramps, heat exhaustion, and heat stroke. Heat rash occurs when sweat does not evaporate, causing the skin to be wet for an extended period of time. Standing erect and immobile in heat also allows blood to pool to lower parts of the body. As a result, blood does not return to the heart to be pumped to the brain. Fainting may then occur.

Heat cramps are painful spasms of the muscles due to excessive salt loss associated with profuse sweating. Losing large amounts of fluid and salt may result in heat exhaustion. The skin will be clammy and moist. Affected persons will also exhibit extreme wetness, giddiness, nausea and headache.

Heat stroke occurs when the body's temperature regulatory system has failed. Symptoms of heat stroke include hot, dry, red, and/or spotted skin. The affected person may be mentally confused and delirious. Convulsions could also occur. Early recognition and treatment of heat stroke are the only means of preventing brain damage or death. A person exhibiting signs of heat stroke should be removed from the work area to a shaded area. The affected person should also be soaked with water to promote evaporation. Fan the person's body to increase cooling.

Heat stress can result when activities performed are too strenuous for the temperature, when individuals aren't properly protected from the sun, and when fluid intake is insufficient. If temperatures on-site exceed 75°F during strenuous field operations, then heat stress monitoring should be employed. Monitoring would include watching the workers for visible signs of heat

stress and taking the heart rate of workers. Buddies are responsible for watching one another and knowing when there is a problem. The heart rate should be taken twice daily and the results should be recorded. If no temperatures are elevated at the end of the first week of activity, temperature monitoring frequency may be decreased at the discretion of the SSO. Bottled water will be available at the site so that field personnel can conveniently consume fluids.

5.3.5 Ergonomics Hazards

Ergonomic injuries to muscles, joints, backs, tendons, etc, occur during lifting, moving heavy objects, maintaining static body positions, or performing repetitive motions. Ergonomic injuries can be prevented by evaluating job activities before the start of work and ensuring that adequate tools and equipment are available for the job. Particular attention should be paid to jobs requiring bending, squatting or kneeling positions, transporting heavy loads, exerting heavy forces (e.g., hand augering) or maintaining static positions. For further job analysis, contact the HSM.

5.3.6 Traffic

When a work site encroaches areas of vehicular traffic, the possibility of an individual being injured by vehicular traffic must be considered. Personnel must always be alert while engaged in work activities on and off the site. Personnel should avoid occupying vehicular "blind spots." Barricades and traffic cones should be used, as necessary, to warn traffic. Individuals who are directing or controlling traffic and/or working in traffic zones shall wear a bright reflector vest to be more visible to drivers.

5.3.7 Bloodborne Pathogens

Bloodborne pathogens are pathogenic microorganisms that are present in human blood and cause disease in humans. These pathogens include, but are not limited to, human immunodeficiency virus (HIV) and hepatitis B virus (HBV). The transmission of pathogens may occur through direct contact with blood due to needlestick injuries, puncture injuries, contact with abraded skin, or contact with areas such as eyes, without skin protection. While very few microorganisms can enter the body through normal skin contact, direct contact with blood is to be avoided.

5.3.8 Heavy Equipment Operation

The following are required during work around heavy equipment such as drill rigs or construction equipment :

- Pay attention at all times.
- Maintain visual contact with the operator at all times.
- Establish hand signal communication when verbal communication is difficult. Designate one person per work area to give hand signals to equipment operators.
- All heavy equipment shall have backup alarms as specified by 29 CFR 1926.601.
- All heavy equipment shall be serviceable.
- Only qualified persons will operate heavy equipment.
- Heavy equipment will only be operated while seated and wearing a seat belt.
- Never walk directly in back of or to the side of heavy equipment without the operator's knowledge.
- Never use a piece of equipment unless you are familiar with the operation. This applies to heavy as well as light equipment such as tools.
- Hearing protection will be provided to site personnel.
- Be sure that underground or overhead power lines, sewer lines, gas lines, or telephone lines have been identified and will not present a hazard in the work area.
- Never perform maintenance of heavy equipment without lockout/tagout procedures (29 CFR 1910.147 shall be adhered to when performing maintenance operations on heavy equipment).
- Inspect mechanical equipment daily.

5.3.9 Noise

Working near heavy equipment can subject workers to excessive levels of noise. Personnel who are not required to be near noisy equipment shall stay as far away as possible to lower their risk to noise-induced hearing loss. Noise monitoring will be conducted during the first full day of field work with heavy equipment using sound level meter and dosimeter during a full work shift. Site personnel required to work in areas where the noise levels equal or exceed 85 decibels (dBA) will wear hearing protection such as ear plugs or muffs. Equipment operators shall be advised to wear hearing protection by the SSO. See Operating Procedure HS-212 in Appendix C.

Daily operations shall comply with applicable federal and State OSHA regulations. The following sections summarize some of these regulations, as well as health and safety practices to be upheld at the site.

6.1 PERSONAL PROTECTIVE EQUIPMENT

The purpose of personal protective equipment (PPE) is to isolate or protect personnel from the chemical and physical hazards that may be encountered at the work site. A site-specific PPE program has been developed. The various components of this program are levels of protection, respirator care, and PPE inspection.

6.1.1 Levels of Protection (Clean-up Activities)

The level of protection (LOP) required for the remediation activities will continually be evaluated as field work progresses. It should be noted that there may be increases or decreases in the LOP. The following levels of protection have been defined based on a review of work site histories and tasks to be performed.

6.1.1.1 Level D

Level D may be used when the atmosphere contains no known hazard and when work functions preclude splashes, immersion, or the potential for unexpected inhalation of or contact with, hazardous levels of any chemicals. Level D consists of:

- Work clothes (Long sleeve cotton shirt and cotton pants)
- Construction quality boots
- Hard hats
- Safety glasses and hearing protection

6.1.1.2 Modified Level D

Modified Level D may be required in areas where a quick transition to Level C may occur. Modified Level D consists of Level D gear plus:

- Uncoated Tyvek

- During intrusive activities, Tyvek sleeves will be worn over the cuff of protective gloves and Tyvek legs will be worn over the upper portion of disposable boot covers. Tape will be used to seal the joints between Tyvek, protective gloves, and boot covers.
- Disposable chemical-resistant inner gloves
- Chemical-resistant outer gloves
- Steel-toed rubber boots
- Splash-resistant goggles will be worn if splashing may occur

6.1.1.3 Level C

Level C consists of Modified Level D gear plus:

- Full-face respirator and cartridges sealed in a plastic bag and ready for immediate donning. The cartridges used will be approved for protection in atmospheres containing less than 0.1 percent (1,000 ppm) organic vapors by volume, pesticides, paint, lacquer and enamel mists and dusts, fumes, mists, asbestos-containing dusts and mists, and radionuclides

6.1.1.4 Level B

Level B may be used when a high level of respiratory protection is required. This involves atmospheres with IDLH concentrations of specific substances that do not represent a skin hazard or atmosphere contains less than 19.5 percent oxygen. Level B gear consists of the following:

- Pressure-demand, full-face piece self-contained breathing apparatus (SCBA) or pressure-demand supplied-air respirator with escape SCBA
- Chemically resistant tyvek suits (wet soil)
- Uncoated tyvek suits (dry soil)
- Chemical-resistant inner and outer gloves
- Chemical-resistant steel-toed rubber boots
- Hard hat
- Hearing protection
- Two-way radio communication

When clean-up activities require use of heavy equipment, such as front loaders and backhoes, hard hats and steel-toed boots must be worn. If the boots are of leather, boot covers must be worn over them. If the boots are of rubber or plastic, boot covers are not needed.

Subsurface investigation activities will be conducted in Level D. Levels of protection will be upgraded in accordance with action levels provided in Table 1. PPE ensembles have been selected to ensure a level of protection greater than the minimum required to protect employees from anticipated hazards. The SSO may modify the initial levels of PPE in response to additional information, with the approval of the HSM.

6.1.2 Respirator Care

Each individual is responsible for inspecting and maintaining his or her own respirator. Operating Procedure HS-303 presented in Appendix A provides general procedures for cleaning, inspection, maintenance, and storage of respirators.

Before being taken to the field, all respirators will be inspected, cartridges (if used) installed, a positive and negative pressure check conducted, and the entire respirator assembly will be sealed in a plastic bag. After the respirator is used, the following cleaning procedures will be used:

- Cartridges from air-purifying respirators will be removed and disposed of as contaminated PPE.
- The respirator face piece interior and exterior will be wiped down with pre-moistened towelettes such as baby wipes and subsequently sealed in a plastic bag for transport to the respirator cleaning station at the personal decontamination facility.
- After a respirator has been cleaned and rinsed, it will be patted dry with a clean towel and stored.

6.1.3 PPE Inspection

PPE inspection will be done before use, during use, and after use. The following will be inspected during the course of the work activities at the site.

6.1.3.1 Clothing

Before use:

- Determine that the level of protection (LOP) is correct for the specific task at hand by consulting with the SSO

- Visually inspect for:
  - Imperfect seams
  - Tears
  - Malfunctioning closures

During use look for:

- Evidence of chemical attack, such as discoloration, swelling, stiffening, and softening. However, chemical permeation can occur without any visible effects.
- Closure failure
- Tears
- Punctures
- Seam discontinuities

6.1.3.2 Gloves

Before use:

- Pressurize glove to check for pinholes. Blow into glove and make sure no air escape.

6.1.3.3 Respirator

Before use:

- Make sure that respirators have been adequately cleaned.
- Check material condition for signs of deterioration and distortion.
- Examine cartridges or canisters for expiration dates and ensure that they are the proper types for intended use. Also make sure that the canisters or cartridges have not been used previously.

After use:

- Make sure that respirators have been adequately cleaned

6.2 PERSONNEL AND EQUIPMENT DECONTAMINATION

Decontamination procedures are a component of the site-specific health and safety plan. The site health and safety officer must require and monitor decontamination of the site personnel before

employees leave the work area. Site personnel should never move asbestos contaminated clothing or equipment in vehicles or occupied work areas.

6.2.1 Subsurface Decontamination Procedures

The following decontamination procedures will be used for all personnel and equipment used during subsurface environmental activities. The decontamination procedure shall, as a minimum, utilize:

- An initial water rinse, followed by,
- Washing with a non phosphatic detergent,
- A second water rinse, and
- A final rinse with deionized water (equipment only).

All personnel will wash thoroughly each time before leaving the work area, including lunch, rest breaks, and at the end of the work shift. Skin splashes will be washed off immediately with a soap and water solution. If the contaminated water splashes in the eyes, the eyes will be rinsed with portable first-aid eyewash solution.

The protective equipment will be considered contaminated until proven otherwise by field or analytical testing results. Disposable PPE and sampling equipment will be discarded appropriately depending upon the results of the sampling. All waste soils will be temporarily stored on-site in 55-gallon drums and disposed of in accordance with regulatory requirements.

6.3 AIR MONITORING

Air monitoring will be used to identify and quantify airborne levels of hazardous substances that could be present at the site. Site monitoring will be accomplished by the use of the following direct reading instruments:

- Photoionization Detector (PID) - This is the preferred instrument for monitoring total organic concentrations at the site during intrusive activities. At each monitoring location, the ambient background reading will be measured upwind of the work zone.
- Draeger Tubes – These may be used to ascertain the type of chemical contamination present at the site. If a PID reading of 5 ppm above background is observed in the breathing zone, air samples will be collected for benzene determination with the Draeger benzene tube (0.5/C).

Vapor monitoring will be performed to protect field personnel from overexposure to hazardous vapors. Monitoring must be performed by individuals trained in the use and care of the required instruments. Because toxicity levels are considerably lower then explosivity action levels, monitoring efforts will focus initially on detection of toxic vapors. The presence of explosive levels of gases and vapors should be performed only when gas/vapor concentrations exceed the ppm range of the monitoring instruments and when explosive levels are expected. The lamp strength of the PID to be used is 11.7 electron volts (eV), which should detect most of the chemicals of concern.

During subsurface intrusive operations, vapor emissions should be measured continuously. The sample intake orifice or the detector must be positioned in a safe place downwind of the boring and the instrument alarm should be set to sound at the action level. If the alarm sounds while monitoring continuously for toxic concentrations, the sample intake orifice or detector should be moved so that vapor concentrations in the breathing zone of individuals closest to the boring are measured. Decisions regarding respirator use should be based on breathing zone vapor concentrations. If the alarm sounds while continuously monitoring explosive levels, initiate shut-down and evacuation procedures immediately.

Draeger Tubes will be available for detecting selected contaminants and will be used periodically during activities within contaminated zones. If elevated readings, greater than 5 ppm above background for about 10 seconds, are indicated by the PID, detector tubes will then be used to more specifically characterize the airborne contaminants. Polytest, methyl bromide, and ethyl acetate tubes will be used in the decision process. The typical variation of detector tubes varies from 10 to 30 percent, depending on the compounds of concern and the concentration ranges measured. Detector tubes are designed for concentration levels at or around the TLV for each respective substance.

Maintenance (calibration, operational checks, etc.) will be performed at the frequency and in the manner specified by the equipment manufacturer. Records will be maintained of each maintenance event. The records will include the equipment, manufacturer, model, and serial number; name of the person conducting the maintenance; type of maintenance conducted; results of maintenance (such as battery check indicated fully charged, calibration with the appropriate calibration gas, pre- and post-sampling flow rate checks, etc.); and date and time.

6.4 AREA CONTROL

Access to hazardous and potentially hazardous areas must be controlled to reduce the probability of physical injury to field personnel, visitors, and the public. Site access will be controlled to reduce the possibility of unauthorized or unprotected individuals and prevent the transfer of contaminants by personnel or equipment from the site. As an administrative measure to limit personnel exposure to site hazards, URSGWC will restrict the number of personnel allowed on-site to the minimum needed to complete the required work.

Limited access work zones are the most hazardous portion of the site. The perimeter must be clearly marked. Access control is established at the periphery of the work zone to regulate the flow of personnel and equipment into and out of the zone. No one will be allowed into the work zone without the appropriate protective equipment and required training. No unauthorized person will be allowed into the zone once work commences.

If hazardous or potentially hazardous areas are left unattended, signs warning of the danger and forbidding entry must be placed around the perimeter of the site. If signs are unrealistic, then the hazardous area must be identified by cordons, barricades, or emergency traffic cones. This is especially important if the work areas are accessible to the public.

Entry of hazardous areas shall be limited to individuals who must work in those areas. Unofficial visitors must not be permitted to enter hazardous areas while work in those areas is in progress. Official visitors should be discouraged from entering hazardous areas, but may be allowed to enter only if they agree to abide by the provisions of this document, follow orders issued by the SSO, and sign the Compliance Agreement that they were informed of the potential dangers that could be encountered in the areas.

6.4.1 Exclusion Zone

This is the area where the washing, sampling, or soil and concrete removal operations are taking place. It will be clearly marked with barricades or caution tape. Access to this area will be restricted to only properly qualified and trained personnel. The access restrictions will be enforced by the SSO.

6.4.2 Decontamination Zone

This is the area where equipment and personnel will be decontaminated prior to entering the support zone. All used disposable personnel protection equipment will be contained in this area.

Decontamination staging areas will be established for decontaminated of bulky equipment (i.e., augers, buckets).

6.4.3 Support Zone

This is the remaining area of the site where clean sampling and decontamination gear will be stored when not in use.

6.4.4 Emergency Decontamination

The life of the employee far exceeds the urgency of decontamination. If someone is injured in the exclusion zone, remove them as quickly as possible. Decontamination should be secondary. If the injury is chemically related, then flush the victim as described in Section 7.2.1.

The following sections describe response levels and contingency plans for the work to be performed at the site.

7.1 RESPONSE LEVELS

Table 2 lists the actions to be taken when certain response levels are reached. The response levels and associated actions are described below.

7.1.1 Response Level I

If a PID reading of 5 ppm or greater over background and at every 5 ppm reading increase on the PID, the SSO will measure the benzene concentration with Draeger benzene tubes (0.5/C). If the benzene concentration is greater than 0.5 ppm in the breathing zone, the field actions that will be performed at Response Level I to protect site personnel are:

- Workers within the zone will stop work and move upwind until the SSO determines that the benzene concentration has decreased below 0.5 ppm on the Draeger tubes or workers will upgrade to Level B. Workers outside the zone will be warned and will move upwind.
- The SSO will continue to monitor the area and Exclusion Zone perimeter.
- Notify the HSM and PM.

7.1.2 Response Level II

If a PID reading of 25 ppm or greater is observed in the breathing zone, the field actions that will be performed at Response Level II to protect site personnel are:

- Workers within the zone will upgrade to Level C – Full-face respirators when 25 ppm total organic is detected on the PID.
- The SSO will continue to monitor the immediate area and Exclusion Zone perimeter.
- Notify the HSM and PM.

7.1.3 Response Level III

Response Level III is triggered by reaching or exceeding 100 ppm (over background) on the PID. Field actions that will be implemented include the following:

- Suspend all work in the immediate area.

- Take actions to suppress emissions with appropriate protective equipment (water, plastic, etc.).
- Continue monitoring within and at the downwind boundary of the contaminated zone.
- Resume work only when clearance has been obtained from the SSO or upgrade to Level B.
- Notify the HSM and PM.

7.2 EMERGENCY MEDICAL CARE AND TREATMENT

All injuries and exposures will be reported to the SSO, regardless of whether the incident appears to be serious or not, or whether any adverse health effects or symptoms are apparent after the exposure.

7.2.1 Onsite Medical Services

A first-aid station will be established onsite in the Support Zone. The facility will be equipped with an "industrial" first-aid kit and additional supplies, including potable water, ice, emergency eyewash, decontamination solutions, and fire extinguishers. The SSO will be responsible for restocking the supplies as needed. Personnel certified by the American Red Cross (or equivalent) to render first aid and CPR will be available on site.

Qualified personnel shall give first aid and stabilize any employee needing assistance. The first-aid kit and portable eyewash maintained at the site should be kept in a clean location, easily accessible from the work area. Emergency first-aid procedures for organic compounds include:

Eyes	Flush eyes immediately with fresh water for at least 15 minutes while holding the eyelids open. If injury occurs or irritation persists, transport person to emergency room for medical attention as soon as possible.
Skin	Remove contaminated clothing/shoes and wipe excess chemical from the skin. Wash skin thoroughly with soap and water. See a doctor if any unusual signs or symptoms or if any skin irritation occurs. Launder contaminated clothing.
Inhalation	Move exposed person to fresh air. If breathing has stopped, apply artificial respiration and call 911 immediately.
Ingestion	If a person swallows a poisonous substance, DO NOT make them vomit. Call Poison Control Center immediately.

7.2.2 Off-Site Medical Services

In the event of an injury, prompt medical attention should be obtained. If ambulance transport is required, the SSO will coordinate assistance with the fire department/paramedics. If it is deemed safe to transport the injured party in a site vehicle, the injured party may be transported to the medical center. A summary of the closest emergency medical facilities (relative to each site), address, and contact information is provided in Table 3.

7.3 EMERGENCY NOTIFICATION LIST

The SSO will be trained to render basic first aid. Every injury will be reported and entered in the field log and an incident report will be completed. In the event of fire, accident, or injury, the SSO or other site personnel will contact the appropriate emergency response group. The emergency telephone numbers listed below are for obtaining emergency services for the site.

1.	URSGWC Project Manager Nigel Goulding	Work (714) 835-6886 Pager (714) 810-5233
2.	Health and Safety Manager Ron Miller	Work (714) 835-6886 Pager (800) 970-8131
3.	Fire Emergency Police Ambulance Service	911
4.	Poison Control Center	(800) 777-6476
5.	California DHS Toxic Substance Line	(818) 567-3000

7.4 SMALL CONTAINED FIRES

- Locate fire extinguisher(s) in the area.
- Be sure that the extinguisher is manufactured for the type of fire that you will be extinguishing (see classes below).

  Class A - Ordinary combustibles (wood, paper, brush)

  Class B - Flammable liquids (solvents, gasoline, greases, oils)

  Class C - Electrical Equipment

  Class D - Combustible metals (magnesium, titanium)

  NOTE: Do not use water on a Class D fire
- Put out the fire according to the directions on the extinguisher.

- Call the fire department or 911.

7.5 LARGE FIRES OR OTHER EMERGENCIES

- Call 911.
- Tell the dispatcher the following.
  - The location of the fire
  - The type of fire (electric, brush, etc.)
  - A description of a safe access route to the emergency location, if known

7.6 VEHICLE ACCIDENT

In the event of a vehicular accident, call 911 and report the following.

- Location of emergency
- Number of people injured and, if known the type of injuries
- Obtain information for the automobile loss notice

7.7 EARTHQUAKE PREPAREDNESS

During an earthquake:

- Stay calm.
- If indoors, stay there. Get under a desk or a table or stand in a doorway or corner. Stay away from windows, glass dividers, or display shelves containing objects that could fall.
- If outdoors, get into an open area away from trees, buildings, walls, and power lines.

Following a major earthquake.

- Check for injuries.
- If anyone has stopped breathing, give mouth to mouth rescue breathing.
- Stop any bleeding injury by applying direct pressure over the site of the wound.
- Do not attempt to move seriously injured persons unless they are in immediate danger of further injury.

- Cover injured persons with blankets or clothing to keep them warm.
- Check for safety.
- Check for fire hazards.
- Check power cords and equipment for damage. Do not touch electrical wiring of any kind.
- Do not use your telephone to report a suspected gas leak, as a tiny spark could be enough to cause an explosion. Until you are certain that no gas leak exists, do not use lighters or open flames; do not operate electrical switches or equipment.
- Check excavations for signs of tension, cracks, bulging, or other indications of cave-ins.
- Assemble in the parking lot in front of the building. Notify Emergency Personnel of any injuries or safety hazards.

Table 1

Chemical Exposure Limits

Chemical	EXPOSURE LIMITS (PPM)			
	PEL	TLV	STEL	IDLH
Gasoline*	300	--	--	--
Diesel Fuel†	300	--	--	--
Benzene*	1	10	5	500
Toluene*	50	50	150	500
Ethylbenzene	100	100	125	800
Xylene	100	100	150	900

* Chemicals known to the State of California to cause cancer or reproductive harm.

† Based on the PEL of gasoline.

Table 2

Health and Safety Air Monitoring Response Level and Action

Instrument	Reading	Additional Monitoring	Action
PID (breathing zone)	> 5 ppm above background sustained for 10 seconds	Collect Draeger air sample for benzene using Draeger Benzene Tube (0.5/C)	If no benzene is detected, continue working in Level D. If benzene is detected above 0.5 ppm, stop work, move upwind, monitor perimeter, and notify HSM and PM; may continue in Level B.
	Every 5 ppm increase	Collect Draeger air sample for benzene using Draeger Benzene Tube (0.5/C)	If no benzene is detected, continue working in current PPE. If benzene is detected above 0.5 ppm, stop work, move upwind, monitor perimeter, and notify HSM and PM; may continue in Level B.
	>25 ppm	--	Stop work, move upwind, monitor perimeter, and notify HSM and PM; may continue in Level C.
	> 100 ppm	--	Stop work, move upwind, monitor perimeter, and notify HSM and PM; may continue in Level B.
Observation	Potential for splashing/ dust	--	Upgrade to Modified Level D
Thermometer	> 75°F	--	Institute heat stress program
Noise	> 85 dBA	--	Require ear plugs

Abbreviations:

PID – photoionization detector
ppm – parts per million
HSM – Health and Safety Manager
PM – Project Manager
PPE – Personal Protective Equipment
C – Celsius
F – Fahrenheit
dBA – decibel A

TABLE 3
ARCO Pipe Line (APL)
Pump Sites and Local Hospitals

PUMP STATION	ADDRESS	HOSPITAL	ADDRESS	PHONE
LINE 90				
Corona	Corona, CA.	Corona Regional Medical Center	800 S. Main Street Corona, CA. 91720	(909) 737-4343
Beaumont	California	San Gorgonia Memorial Hospital	600 N. Highland Springs, Banning, CA. 92220	(909) 845-1121
Morongo	10750 Malibu Trail, Morongo Vl. CA. 92256	San Gorgonia Memorial Hospital	600 N. Highland Springs, Banning, CA. 92220	(909) 845-1121
Twenty-Nine Palms	71451 Indian Trail, Twty-Nine Palms.CA.92277	San Gorgonia Memorial Hospital	600 N. Highland Springs, Banning, CA. 92220	(909) 845-1121
Cadiz	Off Highway 66 on Cadiz Road, CA.	Needles Desert Community Hosp.	1401 Bailey Avenue, Needles, CA. 92363	(619) 326-4531
Danby	California	Desert Community Hospital	1401 Bailey Avenue, Needles, CA. 92363	(619) 326-4531
Oatman	So. on I-40 to Oatman Road, AZ/	Kingman Regional Hospital	3269 Stockton Hill Rd. Kingman, AZ 86401	(520) 757-2101
New Kingman	Off Highway 66, AZ.	Kingman Regional Hospital	3269 Stockton Hill Rd. Kingman, AZ 86401	(520) 757-2101
Old Kingman	3755 Haulapai Mt. Road, Kingman, AZ.	Kingman Regional Hospital	3269 Stockton Hill Rd. Kingman, AZ 86401	(520) 757-2101
Juniper	Off Highway 40 (Yavapi Co.), AZ.	Kingman Regional Hospital	3269 Stockton Hill Rd. Kingman, AZ 86401	(520) 757-2101
Cameron	Off Highway 89 (Marker #461.7), AZ.	Flagstaff Medical Center	1200 No. Beaver Street, Flagstaff, AZ. 86001	(520) 779-3366
Tonalea	So. of Highway 160 (Marker #344), AZ.	Flagstaff Medical Center	1200 No. Beaver Street, Flagstaff, AZ. 86001	(520) 779-3366
Red Mesa	Off Hwy 160 (Past Trading Post) AZ.	Northern Navajo Medical Center	North Highway 666, Shiprock, AZ. 87420	(800) 549-5644
Shiprock	Off Highway 666, New Mexico	Northern Navajo Medical Center	North Highway 666, Shiprock, AZ. 87420	(800) 549-5644
Bisti	New Mexico	Northern Navajo Medical Center	North Highway 666, Shiprock, AZ. 87420	(800) 549-5644

Appendix A
HEALTH AND SAFETY FORMS

HEALTH AND SAFETY COMPLIANCE AGREEMENT

I the undersigned, have received a copy of the health and safety plan for the Port of Los Angeles Activities at the Port of Los Angeles, California. I have read the plan, understand it, and agree to comply with all of the health and safety requirements within. I understand that I may be prohibited from working on the project for violating any of the requirements.

NAME	COMPANY	SIGNATURE	DATE

TAILGATE SAFETY MEETING

Project Name: _____ Project Number: _____
Date: _____ Time: _____
Specific Location: _____
Type of Work: _____

SAFETY TOPICS PRESENTED AND DISCUSSED

Protective Equipment Necessary for Work Zone: _____
_____

Physical Hazards: _____
_____

Emergency Procedures: _____
_____

Hospital Name, Address and Directions: _____
_____
_____

Special Equipment: _____
_____

ATTENDEES

NAME PRINTED	SIGNATURE
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

Meeting Conducted By: _____

TAILGATE SAFETY MEETING ATTENDANCE SHEET (Continued)

NAME PRINTED	SIGNATURE

Appendix B
Soil Sampling Methodology

1.0 SOIL SAMPLING

Soil sampling activities will consist of identifying sample locations, collection of soil samples, decontamination of equipment, and photographing the extent of remedial excavations and sampling locations. The following sections provide a description of each of the activities associated with soil sampling.

1.1 Locations and Procedures

Based on site inspections and consultation with ARCO and Questar, soil samples will be collected from the base and sidewalls of remedial excavations and from subsurface excavations associated with the demolition and removal of the following:

- Above ground storage tanks (ASTs);
- Chemical storage areas;
- Diesel tank (existing and former locations);
- Drum Rack;
- Former underground storage tanks (USTs);
- Pumps;
- Scraper trap;
- Sumps and oil/water separators;;
- Transformers (pad-mounted);
- Valves; and
- Underground pipeworks.

1.2 Sampling Procedures

Soil samples will be collected from shallow excavations (less than 3 feet) directly using a stainless steel spade or trowel. In deep excavations, soil samples will be collected using the bucket of the excavator and a subsample collected directly from the bucket.

At the end of each day, equipment rinsate blank samples will be collected for verification of equipment decontamination procedures. Rinsate blank samples will be collected during sampling activities when non-dedicated equipment is used for sampling by pouring organic free water over or through the sampling equipment after decontamination procedures. The rinsate

blank samples will be analyzed for the same suite of chemicals as the soil samples for that particular day.

2.0 DECONTAMINATION PROCEDURES

Reusable soil sampling equipment shall be decontaminated between each sampling location using the following procedures:

1. Wash with Liquinox and brush, to remove contaminants.
2. Second wash with Liquinox and brush.
3. Rinse with deionized water.
4. Second rinse with deionized water.
5. Dry with paper towels or drip dry.
6. Keep sampling equipment covered with plastic bags when not in use or between sampling locations.

3.0 SAMPLE LABELING

Sample labels will be filled out with indelible ink and uniquely numbered as described below

- The first two letter indicate the name of the pump station (e.g. NH = Newhall).
- The next two digits represent the sample location number (e.g. 01).
- The two or three digits following that indicate the sample depth at a particular sampling location. Sometimes the digits were separated by a period (e.g., a soil sample collected at 5 feet bgs would be labeled 05; a soil sample collected at 4 feet, 6 inches bgs would be labeled 4.5; and a soil sample collected at 3 feet and 3 inches bgs would be labeled 3.25).
- The last two digits indicated whether the sample is a field sample, field duplicate or rinsate blank (i.e., 01 = Field Sample, 02 = Field Duplicate, 03 = Rinsate Blank).

For example: NH-01-05-02 represents a sample collected from the Newhall Pump Station (NH) at the first sampling location (-01) from a depth of 5 feet bgs (05) and this sample is a duplicate (02).

In addition, the sample labels also included the following information:

- Project name and number
- Site location
- Date and time of sample collection

- Sample identification
- Sample depth
- Analyses requested
- Laboratory name
- Sampler's signature

4.0 SAMPLE HANDLING AND PRESERVATION

Soil samples collected in glass jars will be sealed with Teflon-lined caps. The sealed sample jars will be placed in a portable ice chest and cooled with ice for delivery to the analytical laboratory for analysis. The soil samples will be sent to the laboratory under proper chain-of-custody (COC) procedures and within sample holding times. Table B-2 provides the sample holding times and required sample volume for each analytical method.

5.0 CHAIN-OF-CUSTODY PROTOCOL

Each cooler containing samples will be sent to the analytical laboratory accompanied by a COC record. This section describes the procedures for sample documentation utilizing COC protocol. The primary purpose of the COC procedures is to document and track samples from collection through storage and analysis to reporting. COC forms are the permanent records of all sample handling and shipment.

5.1 Field Protocol

URS's field personnel will be responsible for the care and custody of the samples collected until the samples were transferred to another party and/or dispatched to the laboratory.

General COC procedures followed during the field investigation are provided below.

- The COC form will be completed for each shipping container of samples collected. The sample identification number, sample date, number of sample containers, analytical parameter and method requested, preservative, and other pertinent information were recorded on the form.

- When the form is completed or when all samples have been collected that will fit in a single shipping container, the field personnel cross-checked the form for possible errors and signed the COC record. Corrections were made to the record with a single strike mark, dated and initialed. All entries were made in indelible blue or black ink. Each container was accompanied by the original COC, sealed in a sealable bag, and taped to the inside of the container lid.

When transferring custody of the samples, the COC will be signed and dated documenting sample custody transfer from the sampler to Federal Express, a courier, or the contracted analytical laboratory. A copy of each COC form will be retained by the sampling team for the project file and the original sent with the samples to the laboratory.

In conjunction with data reporting, the analytical laboratory will return the original or a photocopy of the original COC to the Project Manager. Where errors are made on the COC with respect to samples, the errors were corrected and these changes duly noted on the laboratory report.

5.2 Laboratory Protocol

The laboratory has established custody procedures that ensured that the integrity of the samples is maintained. Upon receipt of the samples, the laboratory's sample custodian cross-checked the sample labels to the COCs and filled out a sample receiving checklist.

Samples were then logged into the Laboratory's Information Management System (LIMS) and given a unique laboratory identification number. Once logged into the tracking system, samples were placed into the appropriate storage areas for analyses.

6.0 FIELD DOCUMENTATION

Field documentation will include field activity reports and photographic documentation, as described below.

The field information and pertinent quality assurance/quality control (QA/QC) information will be summarized daily in the field activity report. This report will be maintained and cross-checked for completeness at the end of each day by the field personnel. The report will be signed and dated by the field personnel.

Representative photographs will be taken of excavation activities and soil sampling at each pump station. The picture number and roll number, including description and viewing direction, will be logged on the photographic log form to identify the object depicted in the photograph. Photographic log forms will be maintained by the field personnel during the field activities and were sent to URS's Santa Ana office for filing.

Table B-1

List of Equipment and Supplies

Equipment and Supplies	URS
Sampling Equipment	Field book
	Hazwaste kit
	Sample labels
	4-oz glass jars
	Stainless Steel Trowel
Decontamination Equipment	5 gallon plastic buckets
	Scrub brushes
	Alconox surfactant
	Spray bottles
Health and Safety Equipment	Photo Ionization Detector (PID), Combustible Gas Indicator (CGI)
	Calibration gas
	Half-face/Full-face Respirator
	Tyvek suits
	Inner/outer gloves
	Safety glasses
	Hard hats
	First-aid kit
Miscellaneous Equipment	Bolt cutter
	Padlocks
	Measuring wheel or tape
Shipping Supplies	Coolers
	Trash bags
	Packaging tape and material
	Zip-lock bags
	Custody seals
	Shipping labels

Table B-2

Summary of Sample Containers, Preservatives, and Holding Times for Analytical Methods

Analyte	Matrix	Minimum Volume	Container	Preservation	Holding Time
TPH	Soil	50 grams	Stainless Steel Liner/ 4-oz glass jars	Cool to 4 ^{0}C	14 days from collection
VOCs	Soil	50 grams	Stainless Steel Liner/ 4-oz glass jars	Cool to 4 ^{0}C	14 days from collection
SVOCs	Soil	50 grams	Stainless Steel Liner/ 4-oz glass jars	Cool to 4 ^{0}C	7 days from collection
PCBs	Soil	50 grams	Stainless Steel Liner/ 4-oz glass jars	Cool to 4 ^{0}C	14 days from collection