DEPARTMENT OF THE AIR FORCE
HEADQUARTERS 49TH FIGHTER WING (ACC)
HOLLOMAN AIR FORCE BASE, NEW MEXICO

MAR 15 2000

MEMORANDUM FOR MR. CORNELIUS AMINDYAS
RCRA PERMITS MANAGEMENT PROGRAM
HAZARDOUS AND RADIOACTIVE MATERIALS BUREAU
NEW MEXICO ENVIRONMENT DEPARTMENT
PO BOX 26110
SANTA FE NM 87502

FROM: 49 CES/CEV
550 Tabosa Ave
Holloman Air Force Base, NM 88330-8458

SUBJECT: Request for Supplemental Information (RSI) on AOC-T, SWMUs 133 and 230 RFI Report dated March 1998, Holloman AFB NM

1. In response to your letter of 13 December 1999 concerning supplemental information on the AOC-T, SWMUs 133 and 230 RFI Report dated March 1998, please find the requested data attached. The RSI Response format, as agreed to during the February 2, 2000, partnering meeting, includes original NMED comments in Bold, followed by the appropriate response, and includes supporting data as attachments.

2. Holloman AFB was granted a 30-day extension of time until 16 March 2000 for submittal of the requested information.

3. If you have any questions please call Court Fesmire at (505) 572-5395.

JOHN R. POLAND
Chief, Environmental Flight

Enclosures: 3.5" Diskette (MS Word 6.1 compatible)
Two Copies of RSI Response Submittal

cc: Ms. Julie Jacobs
Groundwater Protection Bureau
NMED

Mr. A. Chang
EPA Region 6

LIBRARY COPY

3/15/2000

ADDENDUM
TO THE
FINAL CHARACTERIZATION SUMMARY AND NO FURTHER ACTION DOCUMENTATION REPORT FOR IRP SITES SS-2/5 POL YARD (SWMU AOC-T), SD-47 POL WASHRACK AREA (SWMU 133), AND SS-60 BUILDING 828 (SWMU 230), MARCH 1998

RESPONSES
TO THE
REQUEST FOR SUPPLEMENTAL INFORMATION
IRP SITES SS-2/5 (AOC-T), SD-47 (SWMU 133), AND SS-60 (SWMU 230)
HOLLOMAN AIR FORCE BASE

GENERAL COMMENTS

1. **It has been documented in several reports, that after the Soil Vapor Extraction (SVE) system was shut down for several months, the concentration of contaminants rose above regulatory standards, and the system was reactivated. Such a circumstance occurs because contaminants can diffuse slowly from less permeable soils and interact with soil gas and ground water.**

   Without a long term monitoring program, it is difficult to determine whether cleanup levels have been achieved permanently. Therefore, after the acceptable levels of cleanup have been reached and the system is shut off HAFB should continue to sample the sites semi-annually for the same contaminants for two years. The monitoring results may be submitted in support of a no further action (NFA) request when the data suggest that the site is clean.

   However, during the monitoring period, HAFB may be requested to restart the system if there is evidence that the results are above the cleanup levels.

Response:

As previously discussed with the New Mexico Environment Department (NMED) during the Partnering Meeting on February 2, 2000, attachments to this response to the NMED Request for Supplemental Information (RSI) dated December 13, 1999, have been provided that include the following information: laboratory summary data for remediation system long-term monitoring, requested figures and tables, and additional supporting information as required for individual comment responses. The review meeting was held with representatives from the NMED, Holloman Air Force Base (AFB), United States Army Corps of Engineers (USACE) Omaha District, and Foster Wheeler Environmental Corporation (Foster Wheeler).

Given the existing condition of free product on the water table at Installation Restoration Program (IRP) site SS-2/5 (AOC-T), detailed in the Holloman AFB notification to NMED in November 1999, the no further action (NFA) proposal for this site is no longer

applicable and is not requested at this time. Only comments regarding sites SD-47 (SWMU 133) and SS-60 (SWMU 230) will be addressed in this RSI response.

Contaminants can slowly diffuse from less permeable soils and interact with soil gas and groundwater; thus resulting in an increase (or rebounding) of contaminant concentrations above action levels in adjacent soils with higher conductivities (United States Environmental Protection Agency [EPA], 1997a). However, this "rebound effect" primarily occurs at sites with soils consisting of higher clay content where hydraulic conductivities are relatively low (less than 1×10^{-5} centimeters per second [cm/sec]). Diffusion is the predominant transport mechanism observed in heterogeneous soil profiles where permeabilities (conductivities) can range over orders of magnitude. The investigations performed at the two sites being considered for NFA (SD-47 [SWMU 133] and SS-60 [SWMU 230]) concluded lower conductivity soils do not exist (Woodward-Clyde, 1994 and Woodward-Clyde, 1993, respectively), indicating a diffusion-limited rebound effect is unlikely. Hydraulic conductivity values for these two sites were calculated within the range of 1×10^{-4} cm/sec to 2×10^{-4} cm/sec.

Long-term remedial operations continued at SD-47 and SS-60 following the submittal of the subject closure report documentation in March 1998. Remedial operations continue to date at SS-60, where the remediation system has been converted to an air injection/biovent system. The system at SD-47 remained operational until January 1998. Holloman AFB agreed at that time that long-term monitoring was justified and that the request from NMED was reasonable. Beginning in January 1998, Holloman AFB has conducted semi-annual sampling at SD-47 and SS-60, spanning the requested two-year monitoring period. Over this monitoring period, sample data were evaluated and it has been determined that remedial action levels and cleanup goals have been permanently achieved. The monitoring results are submitted as attachments to site-specific responses provided in this RSI response in support of the request for NFA.

The evaluation of explicit/implicit indicator data collected during the previous two-year period, such as confirmation soil sampling, soil gas laboratory testing, and monitoring well data, indicate the sites have been adequately characterized (nature and extent) and that contaminants are no longer present at concentrations greater than remedial action levels. Based on the evaluation of data collected during the previous two-year monitoring period, Holloman AFB believes that the restoration requirements at SD-47 (SWMU 133) and SS-60 (SWMU 230) have been met.

GENERAL COMMENTS (Continued)

2. **Discussion for all three sites makes a general statement that "*measurements taken in various groundwater monitoring wells across the sites show no evidence of LNAPL on the groundwater table.*" More information is needed, in particular about the location of the groundwater monitoring wells in relation to the sites, the time frame in which the measurements were taken, and the actual results.**

Response:

Of the two sites currently proposed for NFA, only site SS-60 (SWMU 230) originally had free product present on the water table (Woodward-Clyde, 1993). Site SD-47 (SWMU 133) has been documented as having no free product on the groundwater table (Woodward-Clyde, 1994). The unconfined aquifer beneath the sites, as well as the remainder of Holloman AFB, exceeds the New Mexico human health standards for total dissolved solids (TDS) and has been designated as unfit for human consumption (Woodward-Clyde, 1994). Additionally, the unconfined aquifer beneath Holloman AFB is classified as a class III-B aquifer, considered nonpotable and having no interconnection with surface water of a higher quality. Based on communications from NMED, contaminated groundwater need only be addressed if free-phase product is present; if this condition occurs, any measurable product thickness that is present on groundwater must be removed. Attachments 1 through 5 to this general comment 2 describe the decision process and timeline for which soil and groundwater remedial action goals were established for Holloman AFB.

Measurements taken in various groundwater monitoring wells at SS-60 include interface probe fluid-level measurements and clear-bailer field observations. These procedures confirm the removal and absence of free-phase product at SS-60 (Woodward-Clyde, 1994). Locations of groundwater monitoring wells in relation to the site, the timeframe in which the measurements were taken, and the actual results are presented in the site-specific comment responses. At site SD-47, long-term groundwater monitoring activities are not required (U.S. Air Force [USAF], 1993) given the fact that no free-phase product has ever been observed.

Action Taken:

The requested information on the location of groundwater monitoring wells relative to site SS-60, the timeframe in which the measurements were taken, and actual results of the interface probe measurements and clear-bailer observations has been provided in the site-specific comment responses for Section 5.

Attachment 1

NMED correspondence to Holloman AFB; Groundwater remediation issues and soil cleanup standards, July 1992.

Attachment 2

NMED correspondence to Holloman AFB; Approval of 1,000 ppm TPH soil cleanup standard, November 1992.

Attachment 3

NMED correspondence to Holloman AFB; Acceptable soil/groundwater remediation standards, January 1993.

Attachment 4

NMED correspondence to Holloman AFB; Update of remediation standards policy, May 1995.

Attachment 5

NMED Groundwater Quality Bureau correspondence to Holloman AFB; Corrective action report approval letter, October 1998.

July 22, 1992

Mr. Howard E. Moffitt, Deputy Base Civil Engineer
49 CES/CEV
Holloman Air Force Base, NM 88330-5000

Dear Mr. Moffitt:

Under the auspices of the Defense-State Memorandum of Agreement concerning IRP sites at Holloman Air Force Base, I am responding to your letter of May 28 to Kathleen M. Sisneros concerning ground water remediation and soil cleanup standards for petroleum product releases at Holloman AFB.

Your understanding is correct that ground water remediation at these sites will not be required. As discussed verbally and mentioned in correspondence relating specifically to underground storage tank sites, any floating hydrocarbon must be removed from the ground water surface, and all "highly contaminated soil" must be removed or remediated. Dissolved phase hydrocarbon contamination of the ground water beneath the base need not be remediated.

The Underground Storage Tank Bureau does not believe it to be feasible at present to assign a numerical value to the regulatory definition of "highly contaminated soil" because of the many site-specific variables that can influence the determination.

As a method of settling this issue, we propose that Holloman AFB staff who will be in Santa Fe on July 28 to discuss the current Remedial Investigation report for IRP sites bring with them a kilogram or two of dry soil known to be representative of that beneath the hydrocarbon release sites. NMED staff will procure a small amount of gasoline and diesel fuel, 1000 ppm of both products can be added to the soil in our laboratory, and the resulting mixture can be evaluated by UST Bureau personnel to determine whether 1000 ppm is less than "highly contaminated". If so, NMED has no objection to its use as the appropriate soil cleanup level.

If you have any questions concerning any of this please contact David Morgan at 505-827-2754.

Sincerely,

Steven J. Cary, Chief
Ground Water Protection and Remediation Bureau

c: Edward Horst, NMED HRMB
Bob Sweeney, NMED USTB

F NEW MEXICO
MENT DEPARTMENT
uce King
Governor
M. Espinosa
Secretary
on Curry
uty Secretary
Runnels Building
St. Francis Drive
Box 26110
Fe, NM 87502
DRUG FREE

General Comment 2
Attachment 1

Rec'd CE 10 NOV 92

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

November 2, 1992

STATE OF NEW MEXICO
ENVIRONMENT DEPARTMENT

Mr. Howard E, Moffitt
Deputy Base Civil Engineer
49 CES/CEV
Holloman AFB, NM 88330-5000

RE: APPROVAL FOR CLEANUP OF SOILS CONTAMINATED WITH GREATER THAN 1000 PARTS PER MILLION TOTAL PETROLEUM HYDROCARBONS

Dear Mr. Moffitt:

The New Mexico Environment Department (NMED) has received your letter dated August 7, 1992 in which you requested a soil cleanup level of 1000 ppm TPH in lieu of remediating all "highly contaminated" soils (as they are defined in Section 1201G of the Underground Storage Tank Regulations) at Holloman AFB. As you mentioned in your letter, 1000 ppm, by weight, of diesel or gasoline is apparently a lower level of contamination than is "highly contaminated". The Environment Department approves your requested 1000 ppm TPH cleanup standard with the following stipulations:

1. determination of contaminant levels will be by laboratory analyses and not by field methods,

2. analysis for aromatic volatile organics by gas chromatograph and a photo-ionization detector will be done where soils are contaminated by gasoline, and analysis for non-halogenated semi-volatile organics by gas chromatograph and a flame-ionization detector will be done where the contaminant is a heavier-than-gasoline petroleum hydrocarbon,

3. samples will be taken from the areas of highest apparent (visual determination method) saturation, or contamination if the area is not saturated, and

4. an NMED representative will be notified prior to the cleanup to observe the removal of soils.

Please advise us when you've decided on the means for determining the lateral extent of contaminated soils, which method(s) you'll be using to remediate and dispose of the soils, and how you intend to sample the soils for contaminant levels.

Bruce King
Governor
Judith M. Espinosa
Secretary
Ron Curry
Deputy Secretary

General Comment 2
Attachment 2

If you have questions please contact Mr. Robert Sweeney at (505) 827-0214.

Sincerely,

James P. Bearzi
Acting Bureau Chief
Underground Storage Tank Bureau

cc: Bob Sweeney, UST Bureau
Steven Cary, GWPRB
David Morgan, GWPRB
NMED District III Office
NMED Alamogordo Field Office

State of New Mexico
ENVIRONMENT DEPARTMENT
Harold Runnels Building
1190 St. Francis Drive, P.O. Box 26110
Santa Fe, New Mexico 87502
(505) 827-2850

BRUCE KING
GOVERNOR

JUDITH M. ESPINOSA
SECRETARY

RON CURRY
DEPUTY SECRETARY

31-C-4-C

January 25, 1993

Mr. Howard E. Moffitt
Deputy Base Civil Engineer
49 CES/CEV
550 Tabosa Ave.
Holloman Air Force Base, NM 88330-8458

Dear Mr. Moffitt:

I have taken this opportunity to respond to your letter of December 16 to David Morgan in regard to soil and ground water remediation standards acceptable to the Environment Department at Holloman Air Force Base.

A basewide soil cleanup standard of 1000 parts per million of total petroleum hydrocarbons (TPH), measured as agreed for UST sites in the letter of November 2, 1992 to you from James P. Bearzi, will be acceptable to NMED at all sites involving release of petroleum hydrocarbons - provided there are no RCRA hazardous constituents present for which risk-based cleanup levels would be more stringent. For instance, levels of benzene in soil under proposed Subpart S corrective action guidance may not exceed 25 parts per million. As a practical matter, it is very unlikely that any constituent associated with petroleum hydrocarbons would be present in unacceptable concentrations at a site where no soil contained more than 1000 ppm TPH. However, enough confirmatory analyses must be performed at each site to ensure that this is the case.

Remediation of existing ground water contamination will not be required by NMED at Holloman Air Force Base, unless a situation is present where a human or ecological receptor is exposed to unacceptable risk from contact with the contaminated water. We agree that direct ingestion of the water by humans is not a plausible exposure scenario. However, additional ground water contamination will not be acceptable. To implement this principle, existing contaminant plumes must be adequately characterized and monitor wells in those plumes must be sampled at least annually for the contaminants present. If contaminants at any point in a plume increase in concentration, or if additional contaminants are discovered, further investigation may be required to locate and remove the source.

General Comment 2
Attachment 3

The Environment Department will, however, insist on remediation of any ground water contamination resulting from current or future activities at Holloman Air Force Base.

Sincerely,

Kathleen M. Sisneros, Director
Water and Waste Management Division

c: Benito J. Garcia, Chief, HRMB
Steven J. Cary, Chief, GWPRB
Rich Mayer, EPA Region 6

State of New Mexico
ENVIRONMENT DEPARTMENT
Hazardous & Radioactive Materials Bureau
525 Camino De Los Marquez
P.O. Box 26110
Santa Fe, New Mexico 87502
(505) 827-4358
Fax (505) 827-4389

GARY E. JOHNSON
GOVERNOR

MARK E. WEIDLER
SECRETARY

EDGAR T. THORNTON, III
DEPUTY SECRETARY

CEV

May 15, 1995

Mr. Howard E. Moffitt
Deputy Base Civil Engineer
49 CES/CEV
550 Tabosa Avenue
Holloman Air Force Base, New Mexico 88330-8458

Dear Mr. Moffitt:

This letter serves to update the policy of the New Mexico Environment Department (NMED) in regard to soil and groundwater concerns at Holloman Air Force Base (HAFB). These concerns were addressed initially in NMED's letter of January 25, 1993.

NMED has previously agreed in a November 2, 1992 letter from the Underground Storage Tank (UST) Bureau to HAFB that a basewide soil cleanup standard of 1000 parts per million (ppm) of Total Petroleum Hydrocarbons (TPH) is allowable at UST sites involving release of petroleum hydrocarbons. This 1000 ppm TPH standard is also a solid waste land disposal standard (New Mexico Solid Waste Management Regulations, EIB/SWMR-4, Section 708). This TPH standard is acceptable to NMED provided that there are no RCRA hazardous constituents present in soils for which calculated risk-based levels would be more stringent. Sufficient confirmatory analyses must be performed at each site to ensure that hazardous constituent concentrations are not exceeded in soils containing no more than 1000 parts per million TPH.

Remediation of existing contamination in unprotected groundwater will not be required by NMED at HAFB, unless a situation occurs in which a human or ecological receptor is or may be exposed to unacceptable risk from contact with the contaminated water. NMED agrees that, in cases where the Total Dissolved Solid (TDS) content renders the water non-potable, direct ingestion of the water by humans is not a plausible exposure scenario. However, additional or continued contamination of the groundwater is not and will not be acceptable to NMED. To implement this policy, existing soil and groundwater contaminant plumes must be adequately characterized. Monitoring wells defining contaminant plumes must be sampled at least annually for the contaminants present to determine if a

General Comment 2
Attachment 4

release has occurred and the source of any release. If contaminants at any point in a plume increase in concentration, or if additional contaminants are discovered, further investigation may be required to locate and remove the source. Additionally, NMED will insist on remediation of any groundwater contamination resulting from current or future activities at HAFB.

Sincerely,

Ed Kelley

Ed Kelley, Ph.D., Director
Water and Waste Management Division

EK:RK:rk

cc: Benito Garcia, Chief, HRMB
Marcy Leavitt, Chief, GWPRB
Ronald Kern, HRMB
Dennis McQuillan, GWPRB
Steve Pullen, HRMB
David Morgan, GWPRB
David Neleigh, EPA Region VI, 6H-PN

State of New Mexico
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ARY E. JOHNSON
GOVERNOR

PETER MAGGIORE
Secretary

October 19, 1998

Mr. John R. Poland
Chief, Environmental Flight
49 CES/CEV
550 Tabosa Avenue
Holloman AFB, New Mexico 88330-8458

RE: No Further Action Request for Installation Restoration Program (IRP) Sites SS-2/5, SD-47, and SS 60, at HAFB, New Mexico

Dear Mr. Poland:

The New Mexico Environment Department (NMED), Ground Water Quality Bureau (GWQB) has reviewed the Characterization Summary and No Further Action (NFA) Documentation for IRP Sites SS-2/5, SD-47, and SS-60, dated July 20,1998. Pursuant to 20 NMAC 6.2 Water Quality Control Commission Section 1203.A.7 this document is hereby approved as a Corrective Action Report.

Site SS-2/5 Petroleum Oil Lubricant Yard (POL), is located in the northeastern portion of the POL storage yard where AVGAS and 30,000 gallons of JP-4 were spilled. It was stated in the Summary that 95% of the fuel was recovered at the time of the spill, and a soil vapor extraction (SVE) system was installed in 1995, which removed total petroleum hydrocarbons (TPH) to below the base-specific clean-up level of 1000 mg/kg in the soil. Also it was stated that there is no light non-aqueous phase liquid (LNAPL) on the water table, and long-term ground water monitoring has showed no increase in ground water contamination since the operation of the SVE system began.

Site SD-47 POL Washrack Area is located on the southeast side of HAFB where JP-4 flowed from the washrack area into an unlined ditch contaminating soil and ground water. Removal of approximately 8,000 cubic yards of contaminated soil took place in 1991, however contaminated soil remained in place under a nearby building. In 1995, a bioventing system was installed to remediate the soil under the building to below 1,000 ppm. The Characterization Summary stated that current soil TPH levels are below 1,000 ppm and that there is no LNAPL on the ground water.

Site SS-60 Building 828 is located in the western area of HAFB where diesel and JP-4 leaked from underground storage tanks, and unleaded gasoline leaked from an aboveground storage tank. A dual-phase extraction system was installed in 1995, to recover the 1.6 feet of LNAPL floating on the ground water and to remediate soil contamination to below 1,000 ppm TPH. The summary stated that by September 1996, LNAPL had been removed, and that "measurements taken in various groundwater monitoring wells across the site show no evidence of LNAPL on the groundwater table."

Considering the actions taken to mitigate and remediate soil and groundwater contamination at these site, and that natural background ground water concentration is greater than 10,000 ppm TDS, no further action is required at this time. However, if additional groundwater contamination occurs as a result of the discharges, or if additional information becomes available indicating that these corrective actions are inadequate, further efforts may be required. If you have any questions, please call Julie Jacobs of my staff at 827-2776. Thank you for your cooperation in this matter.

Sincerely,

Marcy Leavitt
Chief, Ground Water Quality Bureau

cc: Drew Lessard, HAFB
Dennis McQuillan, GWQB
Julie A. Jacobs, GWQB
Benito Garcia, HRMB
Ken Smith, NMED District Three

gwqb/jj

GENERAL COMMENTS (Continued)

SECTION 2. HYDROGEOLOGIC SETTING

Description of the hydrogeologic setting in Section 2 is too general and expansive and does not provide information relevant to immediate NFA determinations. Given the wide ranging values for TDS extent in the Tularosa Basin, using average TDS values as a basis for disregarding or designating groundwater at specific locations as unfit for use is not acceptable. Provide water quality information proximate to each location for which NFA documentation is being proposed.

Response:

Water quality in the Tularosa Basin is acceptable, containing TDS concentrations less than 10,000 milligrams per liter (mg/L) near the recharge areas at the base of the surrounding mountains; however, groundwater becomes progressively more mineralized (TDS increases) as it flows toward the interior of the basin. The decrease in water quality can be attributed to the slow groundwater migration from the recharge zones and the presence of readily soluble minerals in the bolson sediments.

On the basis of New Mexico Water Quality Control Commission Regulations (NM WQCC 82-1, as amended through August 18, 1991, Parts 3-100 through 3-103), the groundwater beneath Holloman AFB is designated as unfit for human consumption because it exceeds New Mexico human health standards for TDS and sulfate.

According to the EPA document *Guidelines for Groundwater Classification Under the EPA Groundwater Protection Strategy* (EPA, 1986), groundwater beneath Holloman AFB is classified as III-B. Class III groundwater is characterized as having a TDS concentration greater than 10,000 mg/L, and is not considered a source or a potential source of drinking water. Class III-B groundwater is characterized by a low degree of interconnection to adjacent surface waters or groundwater of a higher class. Because the Tularosa Basin is a closed basin, groundwater does not discharge or connect to an adjacent aquifer.

A Resource Conservation and Recovery Act (RCRA) Facility Assessment performed in September 1988 first identified the groundwater below Holloman AFB as unfit for human consumption based on the rationale presented above (A.T. Kearney, 1988). Attachment 1 to this Section 2 general comment includes text of the groundwater description (Section 3.4) from the referenced report. Attachment 2 contains an additional reference documenting groundwater quality across Holloman AFB. The groundwater quality text of Section 2.3.3 from the Remedial Investigation Report (RI) includes Table 2-2 Groundwater Quality Parameters, which presents the minimum, maximum, and average values of groundwater quality parameters at 29 sites located across Holloman AFB (Radian, 1992). As shown in Table 2-2, the average TDS value (17,750 mg/L) for groundwater across Holloman AFB is greater than 10,000 mg/L and therefore unfit for human consumption.

Action Taken:

Water quality information proximal to SD-47 (SWMU 133) and SS-60 (SWMU 230), collected during respective site investigations has been provided with Section 4 and Section 5 site-specific comment responses.

Attachment 1

Excerpt from RCRA Facility Assessment at Holloman AFB (A.T. Kearney, 1988).

Attachment 2

Excerpt from Remedial Investigation (RI) Report for 29 sites at Holloman AFB (Radian, 1992).

RCRA FACILITY ASSESSMENT

PRELIMINARY REVIEW/VISUAL SITE INSPECTION REPORT

Holloman Air Force Base
New Mexico
NM6572124422

Prepared for:

U.S. Environmental Protection Agency
Region VI
1455 Ross Avenue
Dallas, Texas 75202-2733

Prepared by:

A.T. Kearney, Inc.
Three Lagoon Drive, Suite 170
Redwood City, California 94065

and

DPRA Incorporated
245 East 6th Street, Suite 813
St. Paul, MN 55101

Contract No. 68-01-7374
Work Assignment No. R26-05-49

September 1988

C3 Horizon - 20 to 60 inches; white gypsum, pale brown moist; massive; slightly hard, very friable; slightly sticky and slightly plastic; common fine and very fine interstitial pores; strongly calcareous; moderately alkaline.

The subsurface profile below five feet consists of similar material as the above descriptions with occasional white calcareous layers up to one inch thick and other neses up to one foot thick of crystalline gypsiferous sands (Ref. S-143).

The permeability of the soil horizons range from 4×10^{-4} to 1×10^{-3} cm/sec (Ref. 8).

3.4 Groundwater

Holloman AFB is located approximately seven miles west of Alamogordo, New Mexico. The City of Alamogordo has a population of about 24,000 and close to 18,000 people live at Holloman AFB. The Air Force Base is approximately 17 miles long and covers 50,000 acres. Most of the property is open, undeveloped desert.

Water is supplied to Holloman AFB and to the City of Alamogordo from well fields installed in the bolson fill deposits near the foot of the Sacramento Mountains, eight miles south of Alamogordo and ten miles southeast of the base (Figure 2-1). Additional water is taken from Bonito Lake, located approximately 40 miles northeast of the base, via a 22-inch transmission pipeline system. The well fields include the Boles, San Andres, and Douglas well fields. (Ref. 8, S-139).

A downgradient livestock well is located 3.5 miles west of the Wastewater Lagoons (SWMUs 148-154). No other downgradient potable or irrigation sources exist near the base (Ref. S-139).

Groundwater occurs within the unconsolidated bolson fill deposits at shallow depths beneath Holloman AFB. At the base of the Sacramento Mountains, the hydraulic gradient is steep, but flattens out quickly. The ground surface slopes gently to the southwest, but at a steeper slope than the hydraulic gradient. As a result, the water table occurs at 270 feet below the surface near the mountains and at less than 10 feet at Holloman AFB. The water table is less than 10 feet below ground surface over most of the base. The groundwater flow direction follows the topography, to the southwest. Groundwater contours are shown in Figure 3-5 (Ref. S-139).

The majority of the groundwater recharge to the bolson aquifer occurs through the coarse, unconsolidated alluvial fan deposits along the western flank of the Sacramento Mountains. Water percolates downward into the bolson fill aquifer and migrates downgradient (westward) through progressively finer grained sediments into the basin until discharging through evapotranspiration, as springs or seeps along steep-sided arroyos, or into Lake Lucero (Ref. S-139).

Groundwater of good quality occurs near recharge areas, but becomes progressively more mineralized as it moves downgradient toward the interior of the Tularosa Basin. This is due to the slow migration rate of groundwater from recharge to discharge areas and the presence of readily soluble minerals in the bolson sediments. The primary dissolved ions in the groundwater are sulfate and chloride. Due to the high total dissolved solids (TDS) content of the groundwater below Holloman AFB (in excess of 10,000 mg/L), the groundwater below Holloman AFB is designated as unfit for human consumption based upon New Mexico Water Quality Control Commission Regulations (NMWQR Part 3-100 through 3-103) adopted in November 1984 (Ref. S-139).

49th Fighter Wing

49 SG/CEV
Holloman Air Force Base,
New Mexico

Remedial Investigation (RI) Report

Volume I - Text and Plates

Investigation, Study and Recommendation for 29 Waste Sites

October 1992

Prepared Under Contract With:
US Army Corps of Engineers,
Omaha District

RADIAN CORPORATION

Section 2
Attachment 2

6.8×10^{-5} to 1.7×10^{-2} ft/min, and averaged between 7×10^{-4} and 2×10^{-3} ft/min. This range of conductivities is typical of silty sands, which comprise the near-surface geology seen during the field investigation. The higher conductivity values are characteristic of clean sands, while the lower values are associated with silts and clays. Slug test data plots are provided in Appendix C, and results are discussed on a site-by-site basis in Section 4. Groundwater flow velocities were calculated for each site using the following: a site average for hydraulic conductivity or a high value and a low value if there was a broad range; the calculated magnitude of the hydraulic gradient for the site; and an estimated effective porosity of 25 percent. Groundwater flow velocities ranged from 0.21 ft/yr to 57 ft/yr Base-wide. Groundwater flow velocity calculations are provided in Appendix C.

2.3.3 Groundwater Use

Groundwater Quality

Water quality in the Tularosa Basin is good near recharge areas, but groundwater becomes progressively more mineralized as it flows downgradient toward the interior of the basin. This decrease in water quality can be attributed to slow groundwater migration from recharge to discharge areas, and the presence of readily soluble minerals in the bolson sediments.

The groundwater beneath Holloman AFB is designated as unfit for human consumption based on New Mexico Water Quality Control Commission Regulations (NM WQCC 82-1, as amended through August 18, 1991, Parts 3-100 through 3-103) because it exceeds New Mexico Human Health Standards (HHSs) for total dissolved solids (TDS) and sulfate. Average values of other groundwater quality parameters measured at the Holloman AFB sites (chloride, fluoride, and nitrate-nitrite) also exceed HHSs; and, except for fluoride in downgradient wells, also exceed federal primary and secondary drinking water maximum contaminant levels (MCLs; SMCLs). Table 2-2 presents the minimum, maximum, and

Table 2-2

Groundwater Quality Parameters

Parameter	Total Number of Analyses	Total Number of Detections	Minimum Result	Maximum Result	Average Result	MCL (mg/L)	SMCL (mg/L)	NM HES (mg/L)
Background Wells								
Alkalinity (mg/L)	17	16	100.00	1300.00	390.94	--	--	--
Chloride (mg/L)	17	17	81.00	21000.00	5548.88	--	250	250
Conductivity (μmhos/cm)	17	17	2490.00	51500.00	20682.35	--	--	--
Fluoride (mg/L)	17	16	0.88	4.60	2.05	4	2	1.6
Nitrate-Nitrite (mg/L)	17	17	0.63	110.00	20.27	10	--	10
Sulfate (mg/L)	17	17	1700.00	6700.00	3858.82	400/500	250	600
Total dissolved solids (mg/L)	17	17	3100.00	41000.00	16052.94	--	500	1000
Total phosphorus (mg/L)	17	17	0.06	0.77	0.23	--	--	--
pH	17	17	6.70	7.42	7.17	--	6.5 - 8.5	6.9
Downgradient Wells								
Alkalinity (mg/L)	70	70	60.00	1200.00	313.39	--	--	--
Chloride (mg/L)	66	66	39.00	30000.00	6205.62	--	250	250
Conductivity (μmhos/cm)	70	70	1930.00	80000.00	25564.53	--	--	--
Fluoride (mg/L)	66	66	0.50	4.60	1.87	4	2	1.6
Nitrate-Nitrite (mg/L)	66	64	0.10	130.00	24.72	10	--	10
Sulfate (mg/L)	66	65	1600.00	13000.00	4169.23	400/500	250	600
Total dissolved solids (mg/L)	66	66	2600.00	66000.00	* 17750.00	--	500	1000
Total phosphorus (mg/L)	66	66	0.07	0.73	0.25	--	--	--
pH	70	70	6.68	7.86	7.24	--	6.5 - 8.5	6.9

average values of groundwater quality parameters at the Holloman AFB sites for background and downgradient wells, and lists the MCLs, SMCLs, and HHSs for each parameter. While some groundwater parameters in the downgradient wells average higher than background concentrations, contaminants at the Holloman AFB sites do not contribute to the degradation of a potable groundwater source. Background water quality parameters reflect that the groundwater in this area is not potable.

Based on the EPA document *Guidelines for Groundwater Classification Under the EPA Groundwater Protection Strategy* (EPA, 1986), the groundwater can be classified as III B. Class III groundwater, characterized by having a TDS concentration greater than 10,000 mg/L, is not considered a source or a potential source of drinking water. Class III B groundwater is characterized by a low degree of interconnection to adjacent surface waters or groundwaters of a higher class. As shown in Table 2-2, the average TDS value for groundwater is greater than 10,000 mg/L. Because the Tularosa Basin is a closed basin, its groundwater does not discharge or connect to any adjacent aquifers. Adjacent surface waters include groundwater surfacing in Malone Draw and Lake Holloman. TDS in Lake Holloman ranges from a winter low of 12,400 mg/L to a summer high of 17,000 mg/L (Cole, et al., 1981); therefore, groundwater at Holloman AFB is not interconnected with surface water of a higher class.

Historical and Current Water Resources

Because groundwater beneath the Base is not potable, Holloman AFB historically has sought out other drinking water resources. These resources include surface water and potable groundwater collected from the recharge zones at the base of the Sacramento Mountains. Holloman AFB obtained all of its water supply from the town of Alamogordo during its operation as an Army Air Field during World War II and until the summer of 1947. In 1947, Mr. L. C. Boles drilled an irrigation well on his property, part of the present well field, and found that the water was potable. Subsequently, the USAF

SECTION 3. AOC-T [SITE SS-2/5: POL YARD]

PARAGRAPH 3.3 SUMMARY OF RESULTS AND CURRENT CONDITIONS

As discussed in the February 2, 2000 RSI Partnering meeting and the response to general comment 1, NMED comments regarding site SS-2/5 (AOC-T) requested in Section 3 of the RSI will not be addressed at this time.

SECTION 4. SWMU 133 [SITE SD-47: POL WASH RACK AREA]

1) **What solvents and detergents were used in the wash rack area between 1953 and 1980?**

Response: The 1994 RCRA Facility Investigation (RFI) (Woodward-Clyde, 1994) at site SD-47 (formerly Site 54) was a continuation of the Site 54 RI completed in 1989 (Walk & Haydel, 1989). Soil and groundwater contaminated with jet fuel constituents were identified in the Site 54 RI (west of the western Petroleum, Oils, and Lubricants (POL) Yard boundary fence). Holloman AFB used a rapid response contract for the remedial action performed in September 1991 and removed contaminated soil from the area just west of the POL Yard (USAF, 1993). However, during the excavation operations, contaminated soil extended to the fence line along the west side of the POL Yard. The excavation operations stopped at that point because it was suspected that another source area existed within the POL Yard. Therefore, the 1994 RFI was completed to investigate possible contamination areas east of the former rapid response excavation area (Site 54), which was designated as SD-47, POL Washrack Area.

The POL Washrack Area has been in operation since 1953 and has been used for vehicle and equipment washing. Washwater from the area flowed directly to the nearby drainage ditch until oil/water separators were installed in 1980. The oil/water separators were subsequently found to be malfunctioning and replaced after completion of the Site 54 RI (Woodward-Clyde, 1994). Review of previous reports and personnel interviews indicate there is no record of, nor do personnel interviewed during the preliminary site assessment recall, the use of solvents/detergents during that time period (Woodward-Clyde, 1994).

The selected compounds for analysis were indicative of fuel-related constituents that would be expected at a POL operations area. These compounds included volatile organic compounds (VOCs); benzene, toluene, ethylbenzene, xylenes (BTEX); and light- and heavy-fraction total petroleum hydrocarbons (TPH), that were identified as chemicals of concern during the initial site risk assessment. Since Stage I and Stage II sampling programs had already been completed in 1993 (USAF, 1993), it was determined that only BTEX and TPH analyses were required at site SD-47 for the 1994 RFI. Additionally, all metals (cadmium, chromium, lead, manganese, barium, silicon, iron, aluminum, antimony, beryllium, cobalt, copper, molybdenum, nickel, silver, thallium, vanadium, and zinc) concentrations detected at SD-47 were within background values for Holloman AFB (USAF, 1993).

Action Taken:

No action required.

SECTION 4. SWMU 133 [SITE SD-47: POL WASH RACK AREA] (Continued)

2) **Provide a plot noting surface contours, direction of groundwater flow, and the location of drainage ditch to which contaminants were discharged.**

Response:

The present topography at site SD-47 (SWMU 133) is relatively flat, sloping gently (less than one percent) toward the southwest. The entire SD-47 POL Yard is covered with asphalt or gravel, devoid of vegetation, and nearly level. As depicted in Figure 2A-1 (Attachment 1), taken from the Baseline Risk Assessment (BRA) Report (Walk & Haydel, 1989), the direction of groundwater flow follows the surface topography to the southwest.

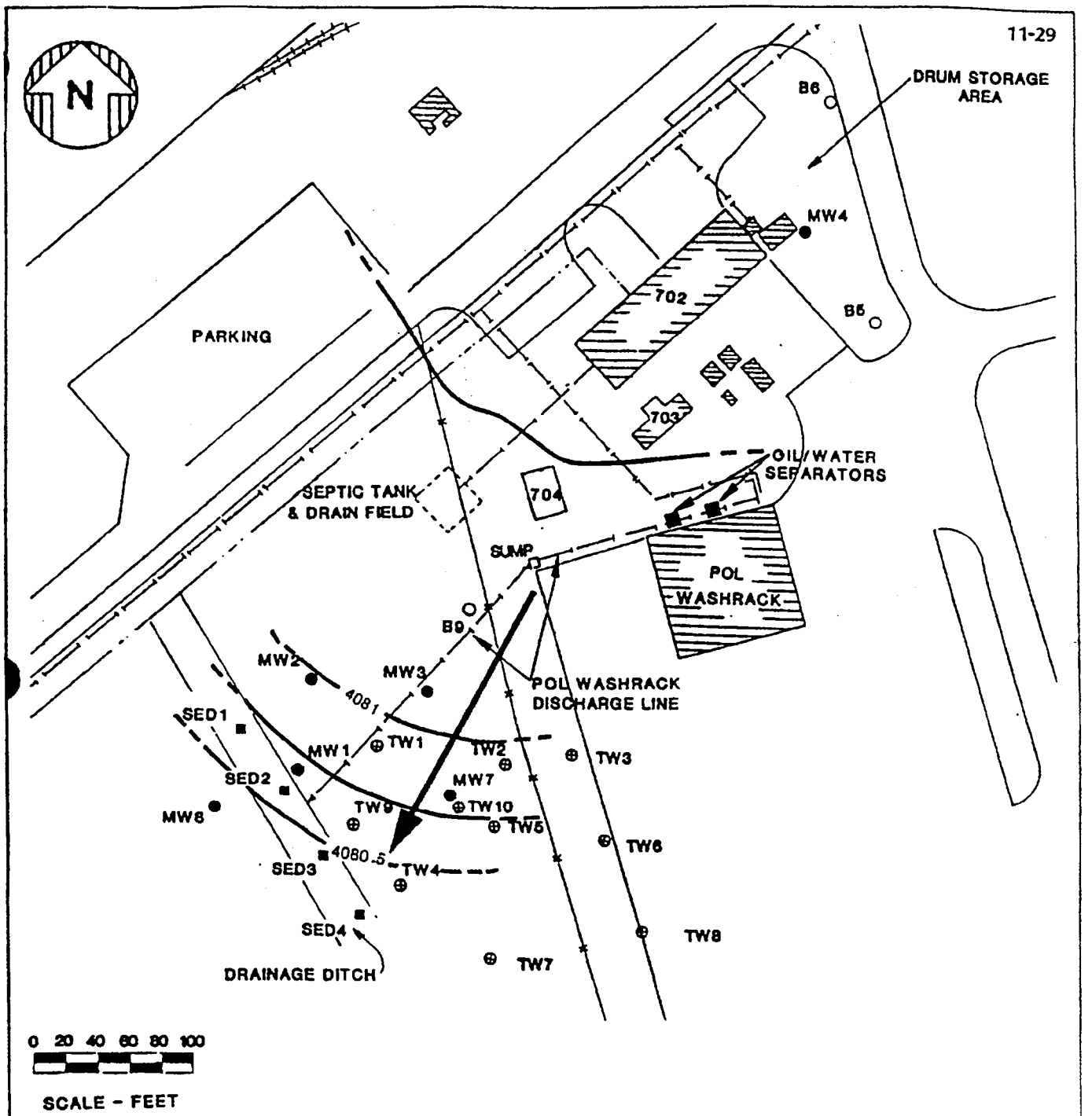
The drainage ditch is located southwest of the estimated excavation area as presented in Figure 4-4 of the March 1998 NFA Report. Attachment 1 shows the location of the drainage ditch. All petroleum-impacted soil west of the POL Yard fence line, along the western boundary of the site, was excavated and removed. Clearance samples collected after the excavation activities were completed confirmed that all petroleum-impacted soils with contaminant concentrations above the Base action level had been removed west of the fence line (USAF, 1993).

Action Taken:

No action required.

Attachment 1

Figure 2A-1 modified from the Baseline Risk Assessment Report (Walk & Haydel, 1989).



LEGEND:

- MONITORING WELLS
- SOIL BORING
- TEMPORARY WELL
- SEDIMENT SAMPLE
- SEWAGE/DRAINAGE LINE
- WATER LINE
- FENCE
- GAS LINE
- RAILROAD
- GROUNDWATER CONTOUR
- GROUNDWATER FLOW DIRECTION

Figure 2A-1

Site SD-47 (SWMU 133)
Groundwater Contour Map

CONTRACT NO. DACA45-86-C-0043

REMEDIAL INVESTIGATION

HOLLOMAN AFB, NEW MEXICO

WH&A 1012 (REV.3/83)

WALK, HAYDEL & ASSOCIATES, INC.
ENGINEERS
NEW ORLEANS—MOBILE—BATON ROUGE

SECTION 4. SWMU 133 [SITE SD-47: POL WASH RACK AREA] (Continued)

3) ***Section 4.3.1 Groundwater*: The conclusion that there is no plausible direct ingestion exposure pathway for humans does not support the conclusion that there is no risk to the environment. Provide the rationale for the above deduction.**

Response:

The statement regarding the direct ingestion pathway for humans, Section 4.3.1 of the subject March 1998 NFA Report, was not made to support the conclusion that there is no risk to the environment. The statement summarizes results from the BRA Report (Walk & Haydel, 1989) presented in Table 4-1, page 4-5, of the subject March 1998 report. The BRA results concluded that the contamination present in soil at Site SD-47 (formerly Site 54) posed no significant risk to the public health or the environment (Walk & Haydel, 1989).

Ecological receptors are not expected to be at significant risk from exposure to groundwater because there is not a complete exposure pathway. Groundwater affected by SD-47 does not discharge to the surface or to any surface water features, including the drainage ditch west of the site. It is feasible that wildlife could visit livestock drinking tanks; however, there are no livestock drinking water wells within 3.5 miles of the Base boundary (USAF, 1993). In addition, groundwater at SD-47 contains greater than 10,000 mg/L TDS (average 21,700 mg/L) and elevated sulfate (Woodward-Clyde, 1994); thus, it is not suitable for livestock (National Academy of Sciences [NAS], 1974; EPA, 1997b; Hem, 1985). Because of poor groundwater quality, is not likely that a well used to supply livestock would be installed near the Holloman AFB boundary in the future.

The BRA (Walk & Haydel, 1989) provides additional information supporting the conclusion that groundwater poses no risk to ecological receptors. Groundwater modeling was performed as part of the BRA to evaluate the potential for migration to a hypothetical off-site livestock well located just outside the Base boundary and downgradient of SD-47. Based on the results of the model, it was concluded that estimated contaminant concentrations in off-site groundwater would not pose a significant risk to livestock. Thus, it is not likely that the groundwater would pose a significant risk to wildlife.

Action Taken:

No action required.

SECTION 4. SWMU 133 [SITE SD-47: POL WASH RACK AREA] (Continued)

4) **The assumption of microorganism degradation of the TPH contamination based on the oxygen utilization rates provided is not evident. The availability of other essential nutrient constituents such as available potassium and nitrogen have not been substantiated. Reported changes in O_2 and CO_2 are for the most part so insignificant as to be within the margin of error for analysis. Provide a rationale for the statement regarding the availability of potassium and nitrogen at SWMU 133.**

Response:

The assumption that microorganism degradation removal of TPH contamination is occurring, based on oxygen utilization rates obtained during *in situ* respiration tests, is well documented and a standard practice (U.S. Air Force Center for Environmental Excellence [AFCEE], 1994a; 1994b). Air Force- and EPA-approved protocols were followed in obtaining test results that indicated the presence of microbiological activity.

A bioventing pilot test and feasibility study was performed in October of 1995 (USAF, 1995). The test was performed to assess the applicability of bioventing technology to induce microbial degradation of the TPH contaminant. Nutrient parameters analyzed for the soils at site SD-47 (SWMU 133) included: iron, alkalinity, pH, phosphorus, and total Kjeldahl nitrogen (TKN). The feasibility study concluded that all of the necessary environmental conditions and required nutrient parameters were present in acceptable and available quantities at SD-47 and that bioventing (microbial degradation of contaminant) would achieve the soil concentration remediation goals of less than 1,000 parts per million (ppm) TPH and 25 ppm benzene.

Three general assumptions were made using the respirometry test as an indicator to determine whether efficient biodegradation of contaminants was occurring:

1.) There was available substrate (TPH concentrations) for the *in situ* microorganisms to operate,
2.) No microbial toxins or inhibitors were present, and
3.) All environmental requirements for microbial activity were satisfied (pH, moisture, nutrients, etc.).

The feasibility study confirmed these three assumptions were substantiated at Site SD-47 (SWMU 133).

Subsequent soil sampling indicated the presence of required nutrients and decreasing concentrations of TPH in soil. Long-term monitoring at site SD-47 in the form of confirmation soil sampling corroborate the fact that remedial action goals have been achieved. The explicit confirmation soil sample laboratory analytical results (presented in Section 4, comment response 5) were more heavily weighted than implicit respiration tests in determining that remedial action goals have been achieved.

Action Taken:

No action required.

SECTION 4. SWMU 133 [SITE SD-47: POL WASH RACK AREA] (Continued)

5) **Pages 4-10, and 4-11 and "*Figure 4-5*". The collection of one sample in 1997 is all that is presented to verify that the SWMU 133 is clean. No location for this sample is given. There were no samples collected from the small area to the south of the bioventing remediation site. Is this area impacted, if not where is the contaminated site?**

Response:

The small area of soil to the south of the bioventing remediation area was not considered impacted by TPH. Additional review of the RFI Report (Woodward-Clyde, 1994) shows the only remaining TPH-impacted soil was located in the north area, proximal to monitoring clusters 02 and 04 (MC-02 and MC-04, Figure 4-5), with no evidence from soil laboratory analytical results to indicate an additional TPH-impacted area located to the south. Given the favorable bioremediation feasibility study results obtained in 1995 (USAF, 1995), indicating there were no biologic inhibitors present and that adequate environmental conditions existed to support remediation, the long-term respirometry testing results are acceptable indicators of the relative amount of soil contamination at the site.

Respirometry testing (soil gas monitoring) was performed at the monitoring point closest to the south area (MC-05). Soil gas oxygen levels remained above 19 percent with negligible carbon dioxide production (less than 0.5 percent). These soil gas levels, which are similar to background soil gas levels collected outside the hydrocarbon-impacted area (MC-01), indicate there is no biological activity (i.e., no petroleum hydrocarbon concentrations above background) in soil proximal to the southern area in question.

The long-term monitoring program at Holloman AFB has included several soil sampling events at site SD-47 (SWMU 133), including two events during the past two years. All soil-sampling events at site SD-47 have been summarized in three figures included in Attachment 1. Attachment 1, Figures 5A-1 and 5A-2 show the past soil sample locations from the 1993 and 1996 sampling events and the 1997 and 1999 sampling events, respectively. Sample locations during the 1999 sampling event included the small area in question to the south of the bioventing remediation system to confirm the rationale presented above (laboratory analytical results were nondetect for TPH and benzene).

An additional sampling event was determined to be appropriate for site SD-47 (SWMU 133) during the February 2, 2000 Partnering Meeting with the results to be used for closure/confirmation that remediation goals have been achieved. Attachment 1, Figure 5A-3 shows the two sample locations determined by Holloman AFB/NMED, and pre-approved by NMED prior to sample collection and analysis.

Five sampling events and eleven sample locations (collected within the estimated TPH-impacted area) have been performed at the relatively small site SD-47. Laboratory analytical results for soil samples collected over the past two years confirm soil

concentrations are below the action levels of 1,000 ppm and 25 ppm for TPH and benzene, respectively. Copies of the soil sample laboratory analytical results not included in the subject March 1998 NFA Report (performed in 1999 and 2000) are contained in Attachment 2.

Action Taken:

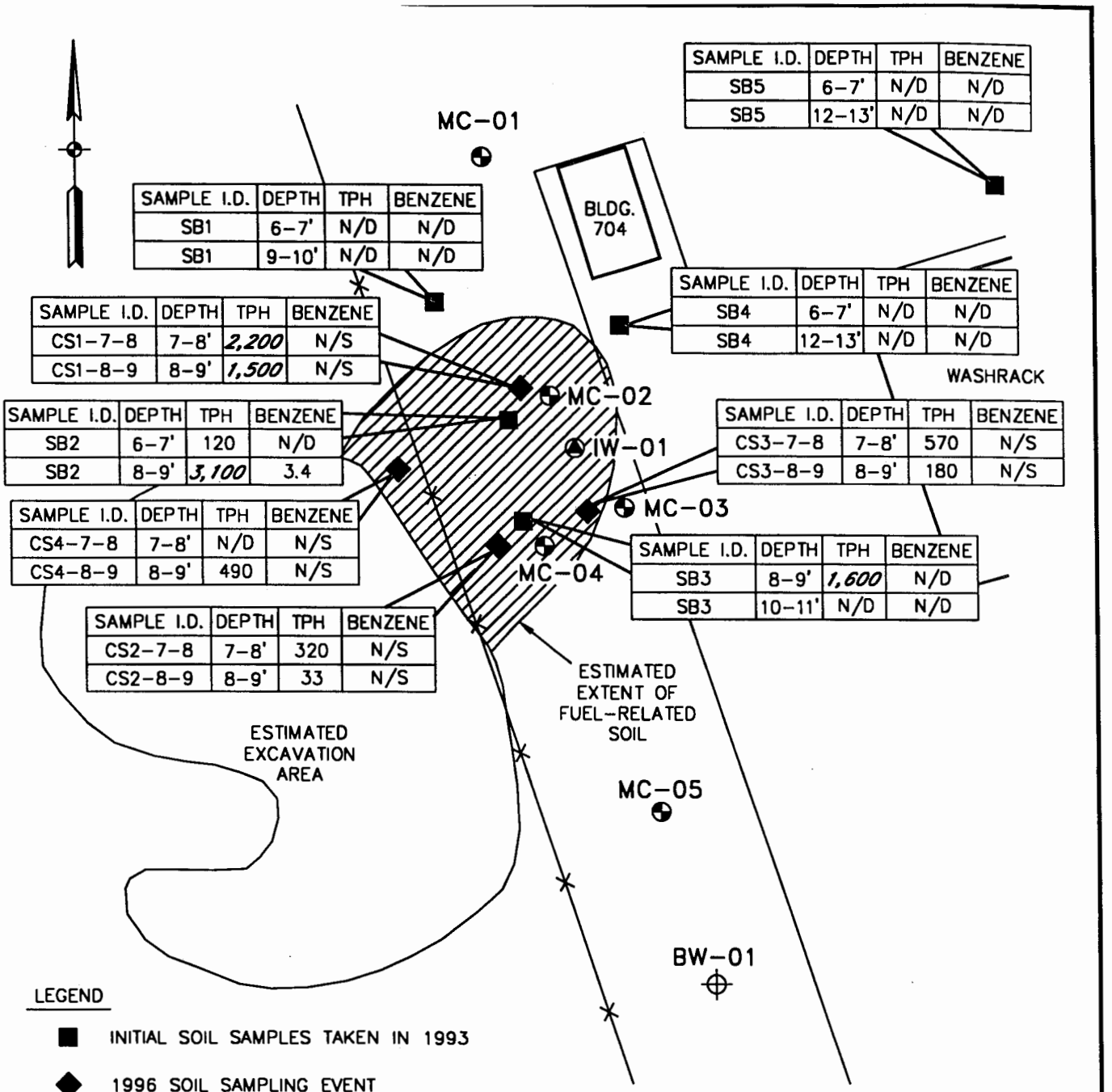
Additional soil sampling events were performed during the previous two-year monitoring period at site SD-47 (SWMU 133) in April 1999 and February 2000. Laboratory analytical results were to be used as closure/confirmation results to support the conclusion that remediation goals have been achieved.

Attachment 1

Soil Sampling Location Figures, 1993 through 2000, SD-47 (SWMU 133).

Attachment 2

Soil Sample Laboratory Analytical Results, 1999 and 2000, SD-47 (SWMU 133).



SAMPLE I.D.	DEPTH	TPH	BENZENE
SB5	6-7'	N/D	N/D
SB5	12-13'	N/D	N/D

SAMPLE I.D.	DEPTH	TPH	BENZENE
SB1	6-7'	N/D	N/D
SB1	9-10'	N/D	N/D

SAMPLE I.D.	DEPTH	TPH	BENZENE
SB4	6-7'	N/D	N/D
SB4	12-13'	N/D	N/D

SAMPLE I.D.	DEPTH	TPH	BENZENE
CS1-7-8	7-8'	***2,200***	N/S
CS1-8-9	8-9'	***1,500***	N/S

SAMPLE I.D.	DEPTH	TPH	BENZENE
SB2	6-7'	120	N/D
SB2	8-9'	***3,100***	3.4

SAMPLE I.D.	DEPTH	TPH	BENZENE
CS3-7-8	7-8'	570	N/S
CS3-8-9	8-9'	180	N/S

SAMPLE I.D.	DEPTH	TPH	BENZENE
CS4-7-8	7-8'	N/D	N/S
CS4-8-9	8-9'	490	N/S

SAMPLE I.D.	DEPTH	TPH	BENZENE
SB3	8-9'	***1,600***	N/D
SB3	10-11'	N/D	N/D

SAMPLE I.D.	DEPTH	TPH	BENZENE
CS2-7-8	7-8'	320	N/S
CS2-8-9	8-9'	33	N/S

LEGEND

- ■ INITIAL SOIL SAMPLES TAKEN IN 1993
- ◆ 1996 SOIL SAMPLING EVENT
- MONITORING POINT CLUSTER LOCATIONS (MC)
- INJECTION WELL LOCATION (IW)
- BACKGROUND MONITORING WELL LOCATION (BW)
- APPROXIMATE FENCE LOCATION

N/D NON DETECT

N/S NOT SAMPLED

NOTES:

- ESTIMATED EXTENT OF HYDROCARBONS AND AREA OF EXCAVATION FROM WOODWARD-CLYDE REPORT, 1/94.
- ANALYTICAL RESULTS PRESENTED IN mg/KG
- BOLD/ITALICS INDICATE CONCENTRATION IS GREATER THAN ACTION LEVEL

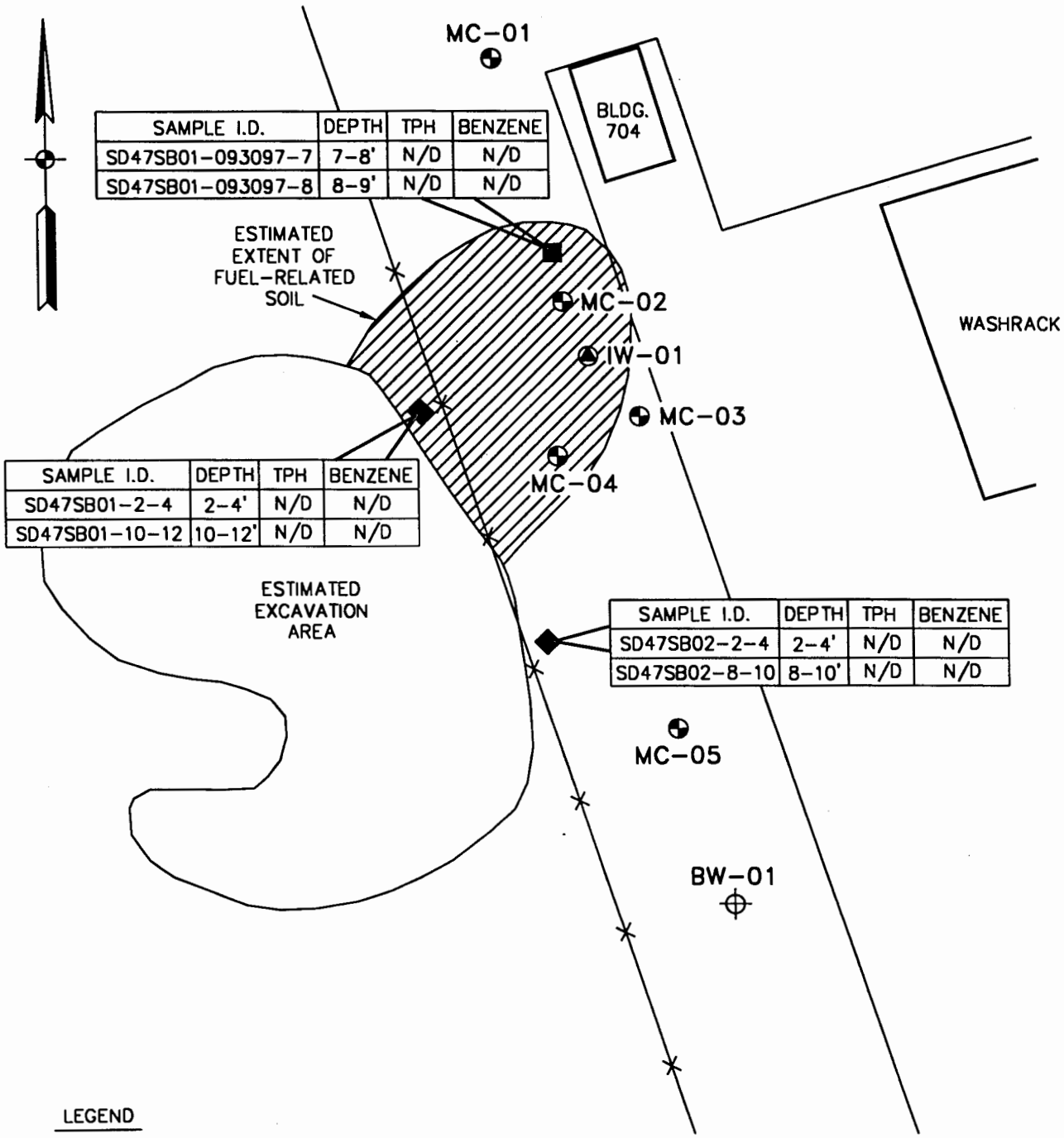
FOSTER WHEELER ENVIRONMENTAL CORPORATION

HOLLOMAN AIR FORCE BASE
ALAMOGORDO, NEW MEXICO

FIGURE 5A-1

SITE SD-47 (SWMU 133)
1993 & 1996
SAMPLING LOCATION MAP

Date: 3-13-00	Project No: 5155.0027
Drawn By: L.GAMBLE	File Name: ESD47FG1



SAMPLE I.D.	DEPTH	TPH	BENZENE
SD47SB01-093097-7	7-8'	N/D	N/D
SD47SB01-093097-8	8-9'	N/D	N/D

SAMPLE I.D.	DEPTH	TPH	BENZENE
SD47SB01-2-4	2-4'	N/D	N/D
SD47SB01-10-12	10-12'	N/D	N/D

SAMPLE I.D.	DEPTH	TPH	BENZENE
SD47SB02-2-4	2-4'	N/D	N/D
SD47SB02-8-10	8-10'	N/D	N/D

LEGEND

- ■ 1997 SOIL SAMPLING EVENT
- ◆ 1999 SOIL SAMPLING EVENT
- MONITORING POINT CLUSTER LOCATIONS (MC)
- INJECTION WELL LOCATION (IW)
- BACKGROUND MONITORING WELL LOCATION (BW)
- APPROXIMATE FENCE LOCATION
- N/D NON DETECT

0 20 40 80
SCALE IN FEET

NOTES:

- ESTIMATED EXTENT OF HYDROCARBONS AND AREA OF EXCAVATION FROM WOODWARD-CLYDE REPORT, 1/94.

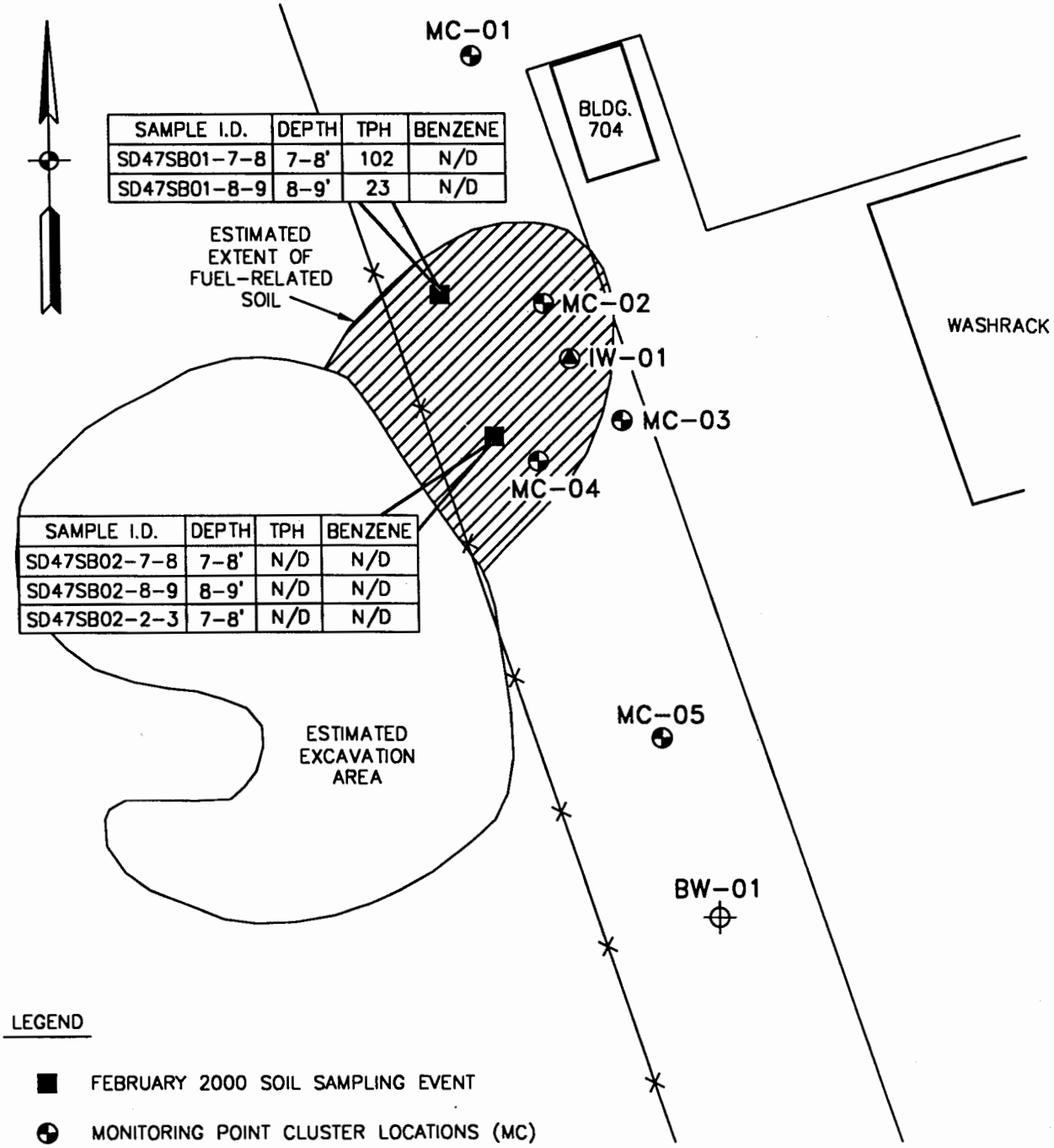
FOSTER WHEELER ENVIRONMENTAL CORPORATION

HOLLOMAN AIR FORCE BASE
ALAMOGORDO, NEW MEXICO

FIGURE 5A-2

SITE SD-47 (SWMU 133)
1997 & 1999
SAMPLING LOCATION MAP

Date: 3-13-00	Project No: 5155.0027
Drawn By: L.GAMBLE	File Name: ESD47FG2



SAMPLE I.D.	DEPTH	TPH	BENZENE
SD47SB01-7-8	7-8'	102	N/D
SD47SB01-8-9	8-9'	23	N/D

SAMPLE I.D.	DEPTH	TPH	BENZENE
SD47SB02-7-8	7-8'	N/D	N/D
SD47SB02-8-9	8-9'	N/D	N/D
SD47SB02-2-3	7-8'	N/D	N/D

LEGEND

- ■ FEBRUARY 2000 SOIL SAMPLING EVENT
- MONITORING POINT CLUSTER LOCATIONS (MC)
- INJECTION WELL LOCATION (IW)
- BACKGROUND MONITORING WELL LOCATION (BW)
- APPROXIMATE FENCE LOCATION

N/D NON DETECT

NOTES:

- ESTIMATED EXTENT OF HYDROCARBONS AND AREA OF EXCAVATION FROM WOODWARD-CLYDE REPORT, 1/94.
- ANALYTICAL RESULTS PRESENTED IN mg/kg
- SAMPLE I.D. SD47SB02-2-3 IS A DUPLICATE OF SAMPLE I.D. SD47SB02-8-9

FOSTER WHEELER ENVIRONMENTAL CORPORATION

HOLLOMAN AIR FORCE BASE
ALAMOGORDO, NEW MEXICO

FIGURE 5A-3

SITE SD-47 (SWMU 133)
FEBRUARY 2000
SAMPLING LOCATION MAP

Date: 3-13-00	Project No: 5155.0027
Drawn By: L.GAMBLE	File Name: ESD47FG3

ASSOCIATED LABORATORIES
806 North Batavia - Orange, California 92868 - 714/771-6900 *FAX 714/538-1209*

CLIENT Foster Wheeler Environmental Corp. (7935)
ATTN: James Morning
241 Arkansas St.
BH / RV Storage
HAFB, NM 88330

LAB REQUEST 35992
REPORTED 4/19/99
RECEIVED 4/10/99

PROJECT LTO-DPT

SUBMITTER Client

COMMENTS

This laboratory request covers the following listed samples which were analyzed for the parameters indicated on the attached Analytical Result Report. All analyses were conducted using the appropriate methods as indicated on the report. This cover letter is an integral part of the final report.

Order No.	Client Sample Identification
116268	SD47SB01-2-4
116269	SD47SB01-10-12
116270	SD47SB02-2-4
116271	SD47SB02-8-10

RECEIVED APR 30 1999

Thank you for the opportunity to be of service to your company. Please feel free to call if there are any questions regarding this report or if we can be of further service.

ASSOCIATED LABORATORIES by,

Edward S. Behare, Ph.D.
Vice President

NOTE: Unless notified in writing, all samples will be discarded by appropriate disposal protocol 30 days from date reported.

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TESTING & CONSULTING
Chemical
Microbiological
Environmental

Section 4 Comment 5
Attachment 2

Order #: 116268
Matrix: SOLID
Date Sampled: 4/ 8/99
Time Sampled: 11:40
Sampled By:

Client: Foster Wheeler Environmental Corp.
Client Sample ID: SD47SB01-2-4

Analyte	Result	DF	DLR	Units	Date/Analyst	
418.1 Total Recoverable Petroleum Hydrocarbons						
Total Recoverable Petroleum Hydrocarbons	ND	1	10	mg/Kg	4/14/99	THU
8021 BTEX + MTBE						
Benzene	ND	1	0.005	mg/Kg	4/16/99	DC
Ethyl benzene	0.02	1	0.005	mg/Kg	4/16/99	DC
Methyl t - butyl ether	ND	1	0.035	mg/Kg	4/16/99	DC
Toluene	ND	1	0.005	mg/Kg	4/16/99	DC
Xylene (total)	0.10	1	0.015	mg/Kg	4/16/99	DC

DLR = Detection limit for reporting purposes, ND = Not Detected below indicated detection limit, DF = Dilution Factor

Order #: 116269
Matrix: SOLID
Date Sampled: 4/ 8/99
Time Sampled: 12:00
Sampled By:

Client: Foster Wheeler Environmental Corp.
Client Sample ID: SD47SB01-10-12

Analyte	Result	DF	DLR	Units	Date/Analyst	
418.1 Total Recoverable Petroleum Hydrocarbons						
Total Recoverable Petroleum Hydrocarbons	ND	1	10	mg/Kg	4/14/99	THU
8021 BTEX + MTBE						
Benzene	ND	1	0.005	mg/Kg	4/16/99	DC
Ethyl benzene	ND	1	0.005	mg/Kg	4/16/99	DC
Methyl t - butyl ether	ND	1	0.035	mg/Kg	4/16/99	DC
Toluene	ND	1	0.005	mg/Kg	4/16/99	DC
Xylene (total)	ND	1	0.015	mg/Kg	4/16/99	DC

DLR = Detection limit for reporting purposes, ND = Not Detected below indicated detection limit, DF = Dilution Factor

Order #: 116270
Matrix: SOLID
Date Sampled: 4/ 8/99
Time Sampled: 13:55
Sampled By:

Client: Foster Wheeler Environmental Corp.
Client Sample ID: SD47SB02-2-4

Analyte	Result	DF	DLR	Units	Date/Analyst	
418.1 Total Recoverable Petroleum Hydrocarbons						
Total Recoverable Petroleum Hydrocarbons	ND	1	10	mg/Kg	4/14/99	THU
8021 BTEX + MTBE						
Benzene	ND	1	0.005	mg/Kg	4/16/99	DC
Ethyl benzene	ND	1	0.005	mg/Kg	4/16/99	DC
Methyl t - butyl ether	ND	1	0.035	mg/Kg	4/16/99	DC
Toluene	ND	1	0.005	mg/Kg	4/16/99	DC
Xylene (total)	ND	1	0.015	mg/Kg	4/16/99	DC

DLR = Detection limit for reporting purposes, ND = Not Detected below indicated detection limit, DF = Dilution Factor

Order #: 116271
Matrix: SOLID
Date Sampled: 4/ 8/99
Time Sampled: 14:15
Sampled By:

Client: Foster Wheeler Environmental Corp.
Client Sample ID: SD47SB02-8-10

Analyte	Result	DF	DLR	Units	Date/Analyst	
418.1 Total Recoverable Petroleum Hydrocarbons						
Total Recoverable Petroleum Hydrocarbons	ND	1	10	mg/Kg	4/14/99	THU
8021 BTEX + MTBE						
Benzene	ND	1	0.005	mg/Kg	4/16/99	DC
Ethyl benzene	ND	1	0.005	mg/Kg	4/16/99	DC
Methyl t - butyl ether	ND	1	0.035	mg/Kg	4/16/99	DC
Toluene	ND	1	0.005	mg/Kg	4/16/99	DC
Xylene (total)	ND	1	0.015	mg/Kg	4/16/99	DC

DLR = Detection limit for reporting purposes, ND = Not Detected below indicated detection limit, DF = Dilution Factor

ASSOCIATED LABORATORIES
806 North Batavia - Orange, California 92868 - 714/771-6900 *FAX 714/538-1209*

CLIENT Foster Wheeler Environmental Corp. (7935)
ATTN: James Morning
241 Arkansas St.
BH / RV Storage
HAFB, NM 88330

LAB REQUEST 48670
REPORTED 02/10/2000
RECEIVED 02/09/2000

PROJECT SD-47

SUBMITTER Client

COMMENTS

This laboratory request covers the following listed samples which were analyzed for the parameters indicated on the attached Analytical Result Report. All analyses were conducted using the appropriate methods as indicated on the report. This cover letter is an integral part of the final report.

Order No.	Client Sample Identification
166533	SD47SB01-7-8
166534	SD47SB01-8-9
166535	SD47SB02-7-8
166536	SD47SB02-8-9
166537	SD47SB02-2-3

Thank you for the opportunity to be of service to your company. Please feel free to call if there are any questions regarding this report or if we can be of further service.

ASSOCIATED LABORATORIES by,

RECEIVED MAR 0 2 2000

Edward S. Behare, Ph.D.
Vice President

NOTE: Unless notified in writing, all samples will be discarded by appropriate disposal protocol 30 days from date reported.

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TESTING & CONSULTING
Chemical
Microbiological
Environmental

Order #: 166533

Client: Foster Wheeler Environmental Corp.

Matrix: SOLID

Client Sample ID: SD47SB01-7-8

Date Sampled: 02/07/2000

Sample Description: SD-47

Time Sampled: 14:00

Sampled By:

Analyte	Result	DF	DLR	Units	Date/Analyst	
418.1 Total Recoverable Petroleum Hydrocarbons						
Total Recoverable Petroleum Hydrocarbons	102	1	10	mg/Kg	02/09/00	THU
8021B BTEX + MTBE						
Benzene	ND	1	0.005	mg/Kg	02/09/00	PP
Ethyl benzene	ND	1	0.005	mg/Kg	02/09/00	PP
Methyl t - butyl ether	ND	1	0.035	mg/Kg	02/09/00	PP
Toluene	ND	1	0.005	mg/Kg	02/09/00	PP
Xylene (total)	ND	1	0.015	mg/Kg	02/09/00	PP

DLR = Detection limit for reporting purposes, ND = Not Detected below indicated detection limit, DF = Dilution Factor

Order #: 166534

Client: Foster Wheeler Environmental Corp.

Matrix: SOLID

Client Sample ID: SD47SB01-8-9

Date Sampled: 02/07/2000

Sample Description: SD-47

Time Sampled: 14:10

Sampled By:

Analyte	Result	DF	DLR	Units	Date/Analyst	
418.1 Total Recoverable Petroleum Hydrocarbons						
Total Recoverable Petroleum Hydrocarbons	23	1	10	mg/Kg	02/09/00	THU
8021B BTEX + MTBE						
Benzene	ND	1	0.005	mg/Kg	02/09/00	PP
Ethyl benzene	ND	1	0.005	mg/Kg	02/09/00	PP
Methyl t - butyl ether	ND	1	0.035	mg/Kg	02/09/00	PP
Toluene	ND	1	0.005	mg/Kg	02/09/00	PP
Xylene (total)	ND	1	0.015	mg/Kg	02/09/00	PP

DLR = Detection limit for reporting purposes, ND = Not Detected below indicated detection limit, DF = Dilution Factor

Order #: 166535

Client: Foster Wheeler Environmental Corp.

Matrix: SOLID

Client Sample ID: SD47SB02-7-8

Date Sampled: 02/07/2000

Sample Description: SD-47

Time Sampled: 15:10

Sampled By:

Analyte	Result	DF	DLR	Units	Date/Analyst	
418.1 Total Recoverable Petroleum Hydrocarbons						
Total Recoverable Petroleum Hydrocarbons	ND	1	10	mg/Kg	02/09/00	THU
8021B BTEX + MTBE						
Benzene	ND	1	0.005	mg/Kg	02/09/00	PP
Ethyl benzene	ND	1	0.005	mg/Kg	02/09/00	PP
Methyl t - butyl ether	ND	1	0.035	mg/Kg	02/09/00	PP
Toluene	ND	1	0.005	mg/Kg	02/09/00	PP
Xylene (total)	ND	1	0.015	mg/Kg	02/09/00	PP

DLR = Detection limit for reporting purposes, ND = Not Detected below indicated detection limit, DF = Dilution Factor

Order #: 166536

Client: Foster Wheeler Environmental Corp.

Matrix: SOLID

Client Sample ID: SD47SB02-8-9

Date Sampled: 02/07/2000

Sample Description: SD-47

Time Sampled: 15:20

Sampled By:

Analyte	Result	DF	DLR	Units	Date/Analyst	
418.1 Total Recoverable Petroleum Hydrocarbons						
Total Recoverable Petroleum Hydrocarbons	ND	1	10	mg/Kg	02/09/00	THU
8021B BTEX + MTBE						
Benzene	ND	1	0.005	mg/Kg	02/09/00	PP
Ethyl benzene	ND	1	0.005	mg/Kg	02/09/00	PP
Methyl t - butyl ether	ND	1	0.035	mg/Kg	02/09/00	PP
Toluene	ND	1	0.005	mg/Kg	02/09/00	PP
Xylene (total)	ND	1	0.015	mg/Kg	02/09/00	PP

DLR = Detection limit for reporting purposes, ND = Not Detected below indicated detection limit, DF = Dilution Factor

Order #: 166537

Client: Foster Wheeler Environmental Corp.

Matrix: SOLID

Client Sample ID: SD47SB02-2-3

Date Sampled: 02/07/2000

Sample Description: SD-47

Time Sampled: 15:25

Sampled By:

Analyte	Result	DF	DLR	Units	Date/Analyst	
418.1 Total Recoverable Petroleum Hydrocarbons						
Total Recoverable Petroleum Hydrocarbons	ND	1	10	mg/Kg	02/09/00	THU
8021B BTEX + MTBE						
Benzene	ND	1	0.005	mg/Kg	02/09/00	PP
Ethyl benzene	ND	1	0.005	mg/Kg	02/09/00	PP
Methyl t - butyl ether	ND	1	0.035	mg/Kg	02/09/00	PP
Toluene	ND	1	0.005	mg/Kg	02/09/00	PP
Xylene (total)	ND	1	0.015	mg/Kg	02/09/00	PP

DLR = Detection limit for reporting purposes, ND = Not Detected below indicated detection limit, DF = Dilution Factor

SECTION 5. SWMU 230 [SITE SS-60: BUILDING 828]

1) **What is the status of the remaining underground unleaded gasoline tank? There is no indication anywhere in the Report that the tank was removed or replaced. Provide a plot noting surface contours and the direction of groundwater flow.**

Response:

There are no remaining underground storage tanks (USTs) associated with site SS-60 (SWMU 230). The leaking USTs identified as the source of contamination were removed on February 29, 1996, and the TPH-impacted soil surrounding the tanks was excavated and disposed of. The 45-Day On-Site Investigation Report submitted to NMED documenting the removal of the USTs is contained in Attachment 1. A Dual-Phase Extraction system was installed as the corrective measure necessary to remove and treat the free-phase product and TPH-impacted soil remaining at the site.

Site SS-60 is a fenced compound used for refueling, maintenance, and storage of aircraft ground support equipment. Most of the area is covered by asphalt pavement. The topography of the site generally slopes to the southwest at less than one percent. As depicted in the Figure 5A-1 (Attachment 2), an estimated potentiometric surface taken from the 1993 RFI Report indicates the direction of groundwater flow is south-southeast (Woodward-Clyde, 1993).

Action Taken:

The corrective action conducted in 1996 that removed the leaking underground tanks and TPH-impacted soil has been well documented and is supplied as an attachment.

Attachment 1

1996 UST removal action documentation (45-Day On-Site Investigation Report) dated 11 April 1996, SS-60 (SWMU 230).

Attachment 2

Modified Potentiometric Surface (Woodward-Clyde, 1993), SS-60 (SWMU 230).

11 APR 1996

MEMORANDUM FOR NEW MEXICO ENVIRONMENT DEPARTMENT
Underground Storage Tank Bureau
Attn: Mr. Ray Montes
Harold Runnels Building
1190 St. Francis Dr.
P.O. Box 26110
Santa Fe NM 87502

FROM: 49 CES/CEV
550 Tabosa Ave
Holloman AFB NM 88330-8458

SUBJECT: Report on Underground Storage Tanks (UST) Release

1. The 45-day report regarding the removal of the USTs located at building 828 Aircraft Ground Support Equipment Facility is attached.

2. I have reviewed the report and am familiar with the project. Based on the contamination data collected in the Corrective Measures Study CMS, Holloman AFB entered into an agreement with the New Mexico Environment Department (NMED) and the U. S. Environmental Protection Agency (EPA) to reduce the contaminants with a High-Vacuum Dual-Phase Extraction (HVDPE) system. The corrective action objectives are to reduce soil contaminant concentration below 1,000 parts per million (ppm) total recoverable pertroleum hydrocarbons (TRPH) and 25 ppm benzene, while removing measurable quantities of light nonaqueous phase liquid (LNAPLs) from the groundwater. No further action is planned in the cleanup of the site and all NMED requirements are believed to have been met.

3. If you have any further questions, please call Darvin St John at (505) 475-5040.

SIGNED
HOWARD E. MOFFITT
Deputy Base Civil Engineer

Attachment:
45 Day Report

Section 5 Comment 1
Attachment 1

Report of On Site Investigation
of
Underground Storage Tank at Builing 828
at
Holloman AFB

BACKGROUND

On 29 February 1996, three underground storage tanks (UST) were removed at builing 828 on Holloman AFB. The tanks had a total capacity of 13,000 gallons and formerly held diesel and mogas. Upon excavation a small hole was discovered in the welded seam of the tank #1. Contaminated soil was found in the area immediately around the tank and fuel was present in groundwater beneath the tank. As required both water and soil samples were taken and sent off for analysis.

As required, researching the impact of the release on the nearby wells providing drinking water began immediately, as did assessing the danger of the release to nearby facilities. The groundwater on Holloman AFB and the surrounding area is highly saline and is considered nonpotable water(>10,000 ppm TDS. There are no drinking water wells on Holloman AFB and the effects of the release on the groundwater are not believed to be significant. The surrounding facilities were also tested for fuel vapor accumulation and none was found.

REMEDIAL ACTION

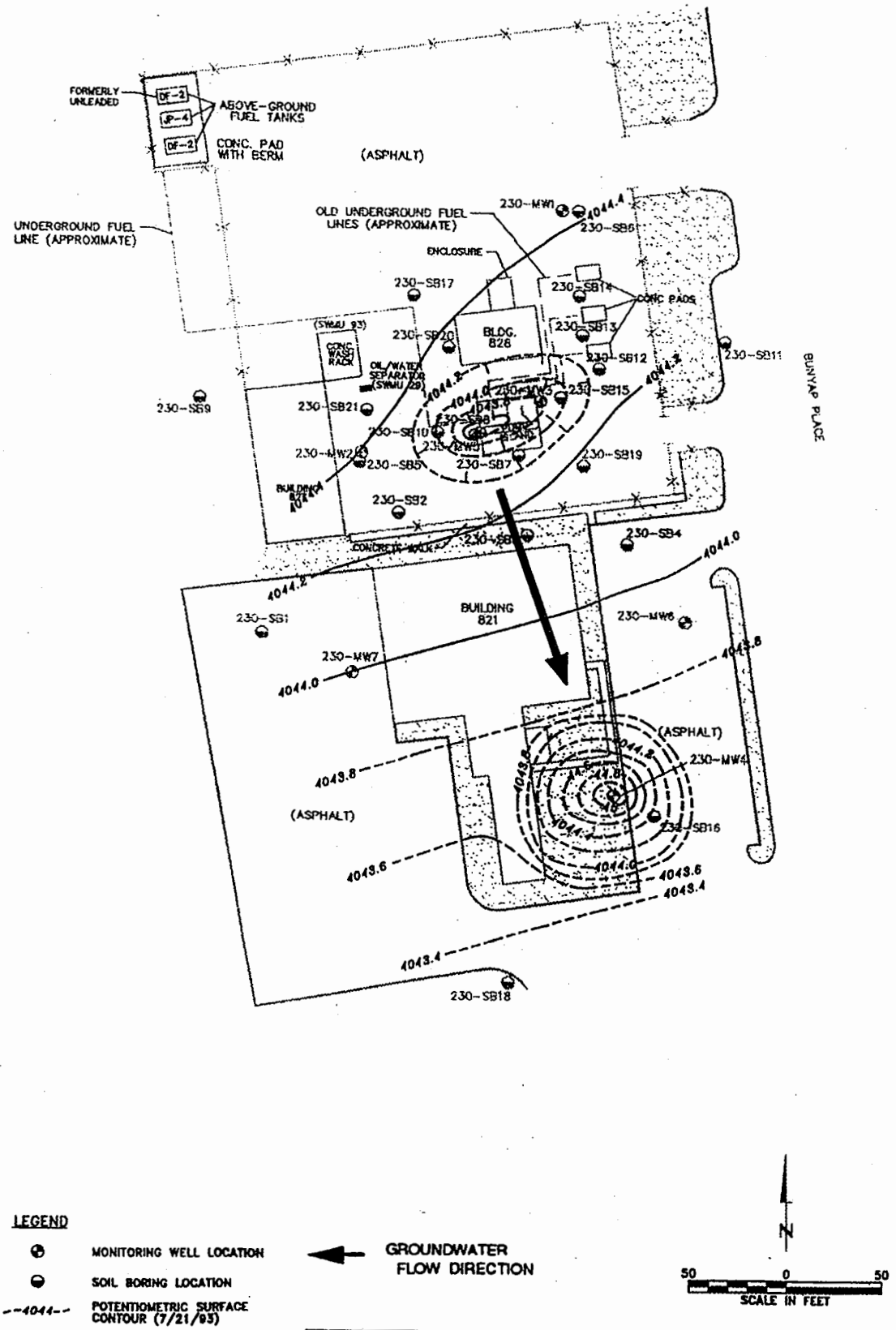
Excavation of the tanks began immediately and the contaminated soil was stockpiled until the excavation was completed and later transported to an approved landfill for disposal. The cavity was filled with clean back fill. Twenty samples were taken initially upon the removal of the UST from the bottom, sides and ends of tanks of the original excavation pit. Samples were also taken from stockpiled soil (See Appendix 1) The analysis was performed by Inland Environmental Laboratories Inc of Spokane WA

Analytical and Quality control results are given in Appendix 2.

The entire pit has since been backfilled with clean soil and a High-Vacuum Dual-Phase Extraction system installed. Appendix 3 contains a complete description of the system installed. No further remedial action is planned for the site.

Figure 5A-1

Site SS-60 (SWMU 230)
Estimated Potentiometric Surface



LEGEND

- MONITORING WELL LOCATION
- SOIL BORING LOCATION
- --4044-- POTENTIOMETRIC SURFACE CONTOUR (7/21/93)
- GRAVEL SURFACE
- GROUNDWATER FLOW DIRECTION

N

50 0 50
SCALE IN FEET

DRN. BY: CJO	DATE: 08/13/93	BUILDING 826 - SWMU 230 ESTIMATED POTENTIOMETRIC SURFACE (07/21/93) HOLLOMAN AIR FORCE BASE NEW MEXICO	PROJECT NO. C3M11K
CHK'D. BY:	REVISION: 0		

Section 5 Comment 1
Attachment 2

SECTION 5. SWMU 230 [SITE SS-60: BUILDING 828] (Continued)

2) **If there were persistent leaks of diesel and JP-4 at the storage tanks located at SWMU 230 prior to the catastrophic 4,000 gallon release, why is the plume limited to the dispensing area, with no indication of contamination in the storage tank area (Figure 5-2)?**

Response:

The "persistent leaks" were not at the aboveground storage tanks located in the northwest portion of the site (Figure 5-2, Attachment 1). In January 1991, leaks were detected in the USTs located east of Building 828. Use of the USTs was discontinued and the remaining fuel was removed. In June 1991, construction of three new aboveground tanks was completed, replacing the USTs (see northwest portion of Figure 5-2). The USTs located on the east side of Building 828 were removed in 1996 (see 45-Day On-Site Investigation Report, comment 1, Attachment 1 above) and the remedial action included the removal of all TPH-impacted at concentrations above Base action levels soil in the previous UST area.

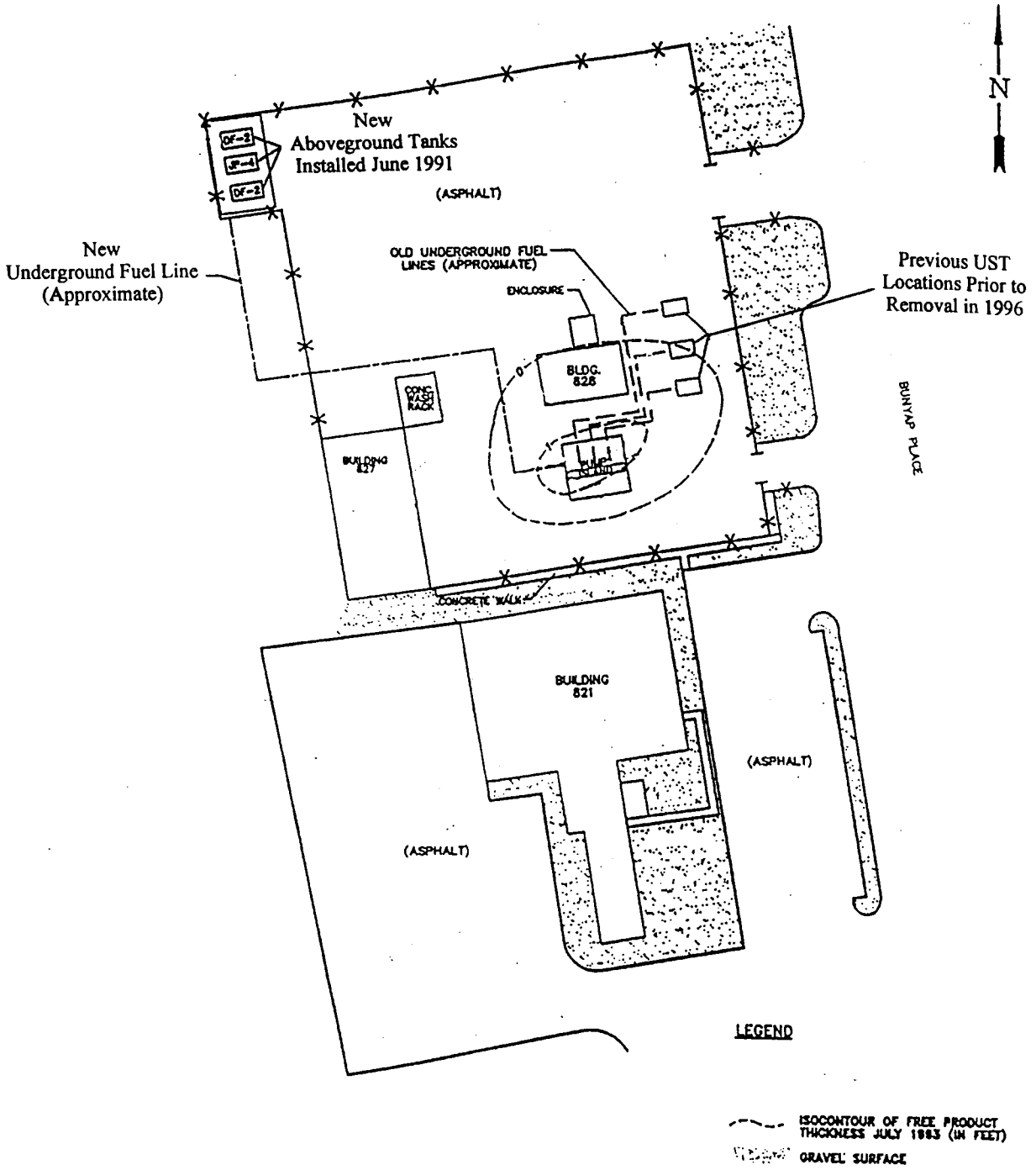
After operation of the new aboveground tanks commenced, leak tests indicated the aboveground systems were leaking through the underground piping. A faulty connection of the new underground fuel line, to the furthest west dispenser at the Pump Island, was confirmed to be the point of release and was subsequently repaired (Woodward-Clyde, 1993). A Dual-Phase Extraction remediation system was subsequently installed in 1996 to remove and treat the free-phase product and TPH-impacted soil immediately surrounding the Pump Island.

Action Taken:

For clarification, Figure 5-2 from the subject March 1998 NFA Report has been modified and included as Attachment 1.

Attachment 1

Modified Site Plan Figure (Woodward-Clyde, 1993), SS-60 (SWMU 230).



PROJECT:	50 0 50 SCALE IN FEET	Site SS-60 (SWMU 230) Modified Site Plan & Extent of Free-Product			
CLIENT: HOLLOMAN AIR FORCE BASE	FILE:		PROJECT NO.:	PM	PE/RG
	REV.				
LOCATION: ALAMOGORDO, NEW MEXICO	DES.	DET.	DATE:	FIGURE: 5-2	

Section 5 Comment 2
Attachment 1

SECTION 5. SWMU 230 [SITE SS-60: BUILDING 828] (Continued)

3) Trend line in Figure 5-6 does not appear to be an accurate fit or estimate of trend for the data. Re-evaluate the plot.

Response:

The Dual-Phase Extraction system at site SS-60 was originally installed in June 1996. Following excellent system performance, all free-phase product had been recovered at the site and the system was converted to a Soil Vapor Extraction (SVE) system in June 1997. Laboratory analytical results for the extracted soil gas and soil sampling events conducted in 1997 and 1999 indicated soil remedial action goals were being approached. The remediation system was converted to air injection operation in May 1999 in order to cost effectively continue remediation operations during the final stages of the project.

As part of the long-term monitoring program, additional extracted soil vapor data was collected on a monthly basis prior to system conversion to an air injection operation. Figure 3A-1 (Attachment 1) shows the continuously decreasing trend of the extracted soil gas from 1997 (start SVE operations), with the most recent asymptotic results (post November 1997) indicative of remediation projects in the final stages approaching cleanup goals. Summary tables of the additional extracted soil vapor data collected, used to generate a new figure, are presented in Attachment 2. The figure serves as an engineering estimate of the trend (i.e., decreasing extracted soil gas concentrations and therefore decreasing soil concentrations via contaminant removal).

Action Taken:

A modified Extracted Soil Vapor figure, to include additional SVE data collected, was generated and included as Attachment 1.

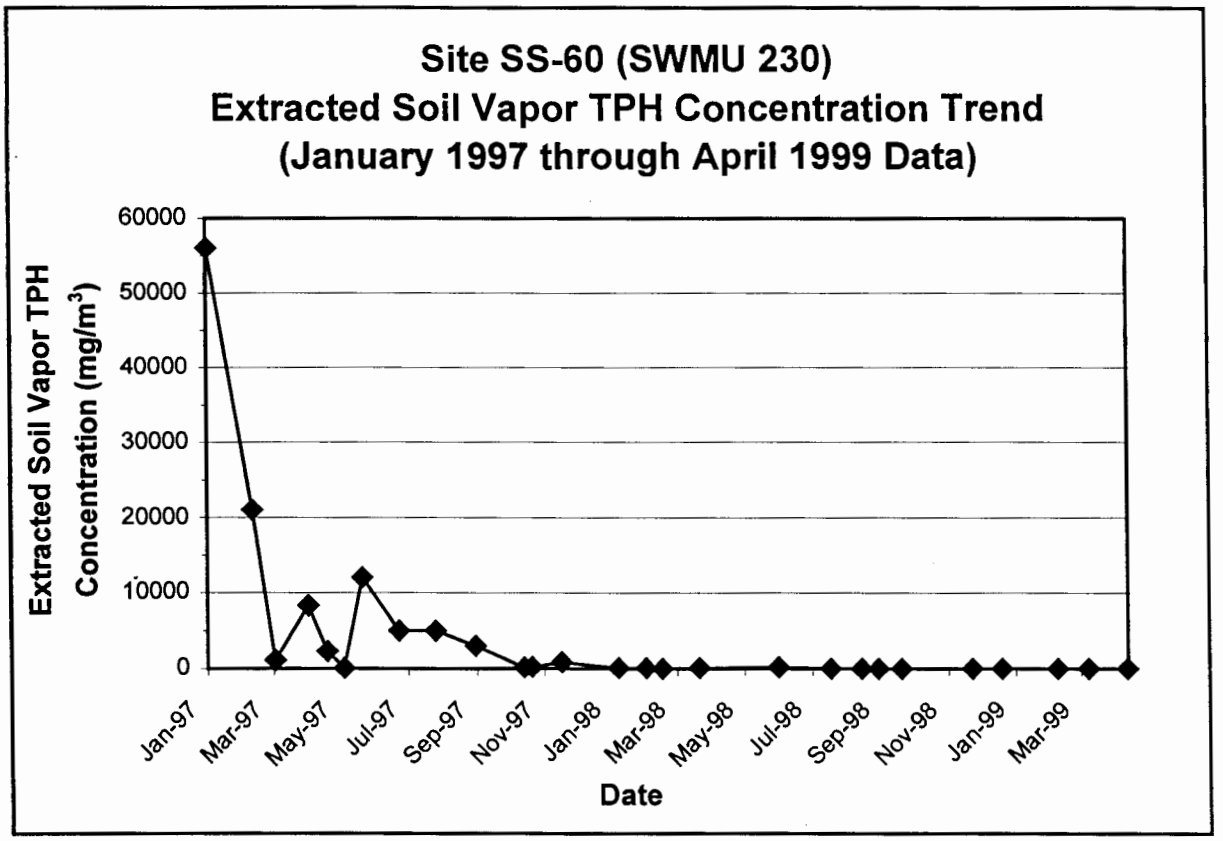
Attachment 1

Modified Extracted Soil Vapor Analytical Results figure, SS-60 (SWMU 230).

Attachment 2

Additional SVE oil gas data, SS-60 (SWMU 230).

FIGURE 3A-1


Site SS-60 (SWMU 230)
Extracted Soil Vapor TPH Concentration Trend
(January 1997 through April 1999 Data)
Extracted Soil Vapor TPH Concentration (mg/m3)
60000
50000
40000
30000
20000
10000
0
Jan-97
Mar-97
May-97
Jul-97
Sep-97
Nov-97
Jan-98
Mar-98
May-98
Jul-98
Sep-98
Nov-98
Jan-99
Mar-99
Date

Extraction / Emission Calculations
Sample Date: 18 JAN 97

INFLUENT	*concentration*	*flowrate*		*rate*		
	mg/m^3 (= µg/l)	(ft^3/min)	(m^3/sec)	(g/sec)	(lbs/hr)	(lbs/day)
		124	0.0585			
Benzene	160.0			0.0094	0.0743	1.7835
Toluene	320.0			0.0187	0.1486	3.5671
Ethyl Benzene	130.0			0.0076	0.0604	1.4491
Total Xylenes	530.0			0.0310	0.2462	5.9080
TPH (C5+ hydrocarbons)	56000			3.2772	26.0100	624.2396
				Total	**26.5**	**636.95**

EFFLUENT	*concentration*	*flowrate*		*rate*		
	mg/m^3 (= µg/l)	(ft^3/min)	(m^3/sec)	(g/sec)	(lbs/hr)	(lbs/day)
		124	0.0585			
Benzene	12.0000			0.0007	0.0056	0.1338
Toluene	4.6000			0.0003	0.0021	0.0513
Ethyl Benzene	0.9700			0.0001	0.0005	0.0108
Total Xylenes	4.8000			0.0003	0.0022	0.0535
TPH (C5+ hydrocarbons)	710.0000			0.0416	0.3298	7.9145
				Total	**0.3402**	**8.16**

Destruction Efficiency
0.9872

Based on:
- day's site visit data
- lab analytical results
- negligible combustion air
- inflow = outflow

HAFB - Building 828
SS-60

Extraction / Emission Calculations
Sample Date: 27 FEB 97

INFLUENT	*concentration*	*flowrate*		*rate*		
	mg/m^3 (= µg/l)	(ft^3/min)	(m^3/sec)	(g/sec)	(lbs/hr)	(lbs/day)
		112	0.0529			
Benzene	71.0			0.0038	0.0298	0.7149
Toluene	140.0			0.0074	0.0587	1.4096
Ethyl Benzene	48.0			0.0025	0.0201	0.4833
Total Xylenes	240.0			0.0127	0.1007	2.4164
TPH (C5+ hydrocarbons)	21000			1.1100	8.8098	211.4360
				Total	**9.0**	**216.46**

EFFLUENT	*concentration*	*flowrate*		*rate*		
	mg/m^3 (= µg/l)	(ft^3/min)	(m^3/sec)	(g/sec)	(lbs/hr)	(lbs/day)
		112	0.0529			
Benzene	0.0070			0.0000	0.0000	0.0001
Toluene	0.0310			0.0000	0.0000	0.0003
Ethyl Benzene	0.0100			0.0000	0.0000	0.0001
Total Xylenes	0.0180			0.0000	0.0000	0.0002
TPH (C5+ hydrocarbons)	8.4000			0.0004	0.0035	0.0846
				Total	**0.0036**	**0.09**

Destruction Efficiency
0.9996

Based on:
- day's site visit data
- lab analytical results
- negligible combustion air
- inflow = outflow

HAFB - Building 828
SS-60

Extraction / Emission Calculations
Sample Date: 19 MAR 97

INFLUENT	*concentration*	*flowrate*		*rate*		
	mg/m^3 (= µg/l)	(ft^3/min)	(m^3/sec)	(g/sec)	(lbs/hr)	(lbs/day)
		113	0.0533			
Benzene	9.1			0.0005	0.0039	0.0924
Toluene	24.0			0.0013	0.0102	0.2438
Ethyl Benzene	8.4			0.0004	0.0036	0.0853
Total Xylenes	41.0			0.0022	0.0174	0.4165
TPH (C5+ hydrocarbons)	1100			0.0587	0.4656	11.1741
				Total	**0.5**	**12.01**

EFFLUENT	*concentration*	*flowrate*		*rate*		
	mg/m^3 (= µg/l)	(ft^3/min)	(m^3/sec)	(g/sec)	(lbs/hr)	(lbs/day)
		113	0.0533			
Benzene	0.3100			0.0000	0.0001	0.0031
Toluene	0.1100			0.0000	0.0000	0.0011
Ethyl Benzene	0.0400			0.0000	0.0000	0.0004
Total Xylenes	0.1600			0.0000	0.0001	0.0016
TPH (C5+ hydrocarbons)	7.1000			0.0004	0.0030	0.0721
				Total	**0.0033**	**0.08**

Destruction Efficiency
0.9935

Based on:
- day's site visit data
- lab analytical results
- negligible combustion air
- inflow = outflow

HAFB - Building 828
SS-60

Extraction / Emission Calculations
Sample Date: 18 APR 97

INFLUENT	concentration	flowrate		rate		
	mg/m^3 (= µg/l)	(ft^3/min)	(m^3/sec)	(g/sec)	(lbs/hr)	(lbs/day)
		244	0.1152			
Benzene	84.0			0.0097	0.0768	1.8425
Toluene	190.0			0.0219	0.1736	4.1676
Ethyl Benzene	75.0			0.0086	0.0685	1.6451
Total Xylenes	270.0			0.0311	0.2468	5.9224
TPH (C5+ hydrocarbons)	8300			0.9558	7.5857	182.0579
				Total	**8.2**	**195.64**

TNMOC	4600			0.5297	**4.20**	**100.90**

EFFLUENT	concentration	flowrate		rate		
	mg/m^3 (= µg/l)	(ft^3/min)	(m^3/sec)	(g/sec)	(lbs/hr)	(lbs/day)
		244	0.1152			
Benzene	0.0260			0.0000	0.0000	0.0006
Toluene	Non Detect			0.0000	0.0000	0.0000
Ethyl Benzene	Non Detect			0.0000	0.0000	0.0000
Total Xylenes	Non Detect			0.0000	0.0000	0.0000
TPH (C5+ hydrocarbons)	1.7000			0.0002	0.0016	0.0373
				Total	**0.0016**	**0.04**

TNMOC	1.0			0.0001	**0.00**	**0.02**

Destruction Efficiency
0.9998

Sample Date: 17 APR 97

AERATOR DISCHARGE	concentration	flowrate		rate		
	mg/m^3 (= µg/l)	(ft^3/min)	(m^3/sec)	(g/sec)	(lbs/hr)	(lbs/day)
		244	0.1152			
Benzene	3.9			0.0004	0.0036	0.0855
Toluene	7.6			0.0009	0.0069	0.1667
Ethyl Benzene	1.8			0.0002	0.0016	0.0395
Total Xylenes	14.0			0.0016	0.0128	0.3071
TPH (C5+ hydrocarbons)	220			0.0253	0.2011	4.8256
				Total	**0.2**	**5.42**

TNMOC	79			0.0091	**0.07**	**1.73**

Based on: - day's site visit data

HAFB - Building 828

SS-60

Extraction / Emission Calculations

Sample Date: 5 MAY 97

INFLUENT	concentration	flowrate		rate		
	mg/m^3 (= µg/l)	(ft^3/min)	(m^3/sec)	(g/sec)	(lbs/hr)	(lbs/day)
		250	0.1180			
Benzene	25.0			0.0029	0.0234	0.5619
Toluene	61.0			0.0072	0.0571	1.3709
Ethyl Benzene	29.0			0.0034	0.0272	0.6517
Total Xylenes	97.0			0.0114	0.0908	2.1800
TPH (C5+ hydrocarbons)	2300			0.2714	2.1538	51.6903
				Total	**2.35**	**56.45**
TNMOC	1300			0.1534	**1.22**	**29.22**

EFFLUENT	concentration	flowrate		rate		
	mg/m^3 (= µg/l)	(ft^3/min)	(m^3/sec)	(g/sec)	(lbs/hr)	(lbs/day)
		250	0.1180			
Benzene	0.0100			0.0000	0.0000	0.0002
Toluene	Non Detect			0.0000	0.0000	0.0000
Ethyl Benzene	Non Detect			0.0000	0.0000	0.0000
Total Xylenes	0.0180			0.0000	0.0000	0.0004
TPH (C5+ hydrocarbons)	3.2000			0.0004	0.0030	0.0719
				Total	**0.0030**	**0.07**
TNMOC	3.6			0.0004	**0.00**	**0.08**

Destruction Efficiency
0.9987

Sample Date: 12 MAY 97

AERATOR DISCHARGE	concentration	flowrate		rate		
	mg/m^3 (= µg/l)	(ft^3/min)	(m^3/sec)	(g/sec)	(lbs/hr)	(lbs/day)
		150	0.0708			
Benzene	Non Detect			0.0000	0.0000	0.0000
Toluene	Non Detect			0.0000	0.0000	0.0000
Ethyl Benzene	Non Detect			0.0000	0.0000	0.0000
Total Xylenes	0.057			0.0000	0.0000	0.0008
TPH (C5+ hydrocarbons)	4.2			0.0003	0.0024	0.0566
				Total	**0.002**	**0.06**
TNMOC	2.2			0.0003	**0.00**	**0.05**

Based on: - day's site visit data

HAFB - Building 828

SS-60

Extraction / Emission Calculations

Sample Date: 6 JUN 97

INFLUENT	concentration	flowrate		rate		
	mg/m^3 (= µg/l)	(ft^3/min)	(m^3/sec)	(g/sec)	(lbs/hr)	(lbs/day)
		270	0.1274			
Benzene	65.0			0.0083	0.0657	1.5777
Toluene	230.0			0.0293	0.2326	5.5826
Ethyl Benzene	110.0			0.0140	0.1112	2.6699
Total Xylenes	400.0			0.0510	0.4045	9.7088
TPH (C5+ hydrocarbons)	12000			1.5291	12.1360	291.2639
				Total	**12.95**	**310.80**
TNMOC	6600			0.8410	**6.67**	**160.20**

EFFLUENT	concentration	flowrate		rate		
	mg/m^3 (= µg/l)	(ft^3/min)	(m^3/sec)	(g/sec)	(lbs/hr)	(lbs/day)
		270	0.1274			
Benzene	7.5000			0.0010	0.0076	0.1820
Toluene	0.6100			0.0001	0.0006	0.0148
Ethyl Benzene	0.1100			0.0000	0.0001	0.0027
Total Xylenes	0.3700			0.0000	0.0004	0.0090
TPH (C5+ hydrocarbons)	91.0000			0.0116	0.0920	2.2088
				Total	**0.1007**	**2.42**
TNMOC	120.0			0.0153	**0.12**	**2.91**

Destruction Efficiency
0.9922

Sample Date: 18 JUN 97

AERATOR DISCHARGE	concentration	flowrate		rate		
	mg/m^3 (= µg/l)	(ft^3/min)	(m^3/sec)	(g/sec)	(lbs/hr)	(lbs/day)
		150	0.0708			
Benzene	3.6			0.000	0.0020	0.0485
Toluene	7.3			0.001	0.0003	0.0061
Ethyl Benzene	2.1			0.000	0.0012	0.0283
Total Xylenes	23.0			0.002	0.0129	0.3101
TPH (C5+ hydrocarbons)	240			0.0306	0.2427	5.8253
				Total	**0.26**	**6.22**
TNMOC	130			0.0166	**0.13**	**3.16**

Based on: - day's site visit data

HAFB - Building 828
SS-60

Extraction / Emission Calculations
Sample Date: 9 JULY 97

INFLUENT	concentration	flowrate		rate		
	mg/m^3 (= µg/l)	(ft^3/min)	(m^3/sec)	(g/sec)	(lbs/hr)	(lbs/day)
		240	0.1133			
Benzene	14.0			0.0016	0.0126	0.3021
Toluene	54.0			0.0061	0.0485	1.1651
Ethyl Benzene	32.0			0.0036	0.0288	0.6904
Total Xylenes	160.0			0.0181	0.1438	3.4520
TPH (C5+ hydrocarbons)	5000			0.5663	4.4948	107.8755
				Total	**4.73**	**113.49**
TNMOC	2700			0.3058	**2.43**	**58.25**

EFFLUENT	concentration	flowrate		rate		
	mg/m^3 (= µg/l)	(ft^3/min)	(m^3/sec)	(g/sec)	(lbs/hr)	(lbs/day)
		240	0.1133			
Benzene	0.0090			0.0000	0.0000	0.0002
Toluene	0.0110			0.0000	0.0000	0.0002
Ethyl Benzene	0.0120			0.0000	0.0000	0.0003
Total Xylenes	0.0120			0.0000	0.0000	0.0003
TPH (C5+ hydrocarbons)	3.0000			0.0003	0.0027	0.0647
				Total	**0.0027**	**0.07**
TNMOC	5.0			0.0006	**0.00**	**0.11**

Destruction Efficiency
0.9994

Sample Date: 9 JULY 97

AERATOR DISCHARGE	concentration	flowrate		rate		
	mg/m^3 (= µg/l)	(ft^3/min)	(m^3/sec)	(g/sec)	(lbs/hr)	(lbs/day)
		99	0.0467			
Benzene	0.006			0.0000	0.0000	0.0001
Toluene	0.008			0.0000	0.0000	0.0001
Ethyl Benzene	0.009			0.0000	0.0000	0.0001
Total Xylenes	0.009			0.0000	0.0000	0.0001
TPH (C5+ hydrocarbons)	2.4			0.0003	0.0022	0.0518
				Total	**0.00**	**0.05**
TNMOC	1.3			0.0001	**0.00**	**0.03**

Based on: - day's site visit data

HAFB - Building 828
SS-60

Extraction / Emission Calculations
Sample Date: 11 AUGUST 97

INFLUENT	concentration	flowrate		rate		
	mg/m^3 (= µg/l)	(ft^3/min)	(m^3/sec)	(g/sec)	(lbs/hr)	(lbs/day)
		260	0.1227			
Benzene	17.0			0.0021	0.0166	0.3973
Toluene	61.0			0.0075	0.0594	1.4258
Ethyl Benzene	37.0			0.0045	0.0360	0.8648
Total Xylenes	230.0			0.0282	0.2240	5.3758
TPH (C5+ hydrocarbons)	5000			0.6135	4.8694	116.8651
				Total	**5.21**	**124.93**

TNMOC	3600			0.4417	**3.51**	**84.14**

EFFLUENT	concentration	flowrate		rate		
	mg/m^3 (= µg/l)	(ft^3/min)	(m^3/sec)	(g/sec)	(lbs/hr)	(lbs/day)
		260	0.1227			
Benzene	0.6500			0.0001	0.0006	0.0152
Toluene	0.0880			0.0000	0.0001	0.0021
Ethyl Benzene	0.0310			0.0000	0.0000	0.0007
Total Xylenes	0.1100			0.0000	0.0001	0.0026
TPH (C5+ hydrocarbons)	13.0000			0.0016	0.0127	0.3038
				Total	**0.0135**	**0.32**

TNMOC	34.0			0.0042	**0.03**	**0.79**

Destruction Efficiency
0.9974

Based on:
- day's site visit data
- lab analytical results
- negligible combustion air
- inflow = outflow

HAFB - Building 828
SS-60

Extraction / Emission Calculations
Sample Date: 16 SEPTEMBER 97

INFLUENT	concentration	flowrate		rate		
	mg/m^3 (= µg/l)	(ft^3/min)	(m^3/sec)	(g/sec)	(lbs/hr)	(lbs/day)
		265	0.1251			
Benzene	7.8			0.0010	0.0077	0.1858
Toluene	27.0			0.0034	0.0268	0.6432
Ethyl Benzene	18.0			0.0023	0.0179	0.4288
Total Xylenes	120.0			0.0150	0.1191	2.8587
TPH (C5+ hydrocarbons	3000			0.3752	2.9778	71.4675
				Total	**3.15**	**75.58**
TNMOC	930			0.1163	**0.92**	**22.15**

EFFLUENT	concentration	flowrate		rate		
	mg/m^3 (= µg/l)	(ft^3/min)	(m^3/sec)	(g/sec)	(lbs/hr)	(lbs/day)
		265	0.1251			
Benzene	0.6500			0.0001	0.0006	0.0155
Toluene	0.2100			0.0000	0.0002	0.0050
Ethyl Benzene	0.0480			0.0000	0.0000	0.0011
Total Xylenes	0.1600			0.0000	0.0002	0.0038
TPH (C5+ hydrocarbons	15.0000			0.0019	0.0149	0.3573
				Total	**0.0159**	**0.38**
TNMOC	17.0			0.0021	**0.02**	**0.40**

Destruction Efficiency
0.9949

Sample Date: 16 SEPTEMBER 97

AERATOR DISCHARG	concentration	flowrate		rate		
	mg/m^3 (= µg/l)	(ft^3/min)	(m^3/sec)	(g/sec)	(lbs/hr)	(lbs/day)
		99	0.0467			
Benzene	0.008			0.0000	0.0000	0.0001
Toluene	0.009			0.0000	0.0000	0.0001
Ethyl Benzene	0.011			0.0000	0.0000	0.0001
Total Xylenes	0.013			0.0000	0.0000	0.0001
TPH (C5+ hydrocarbons	2.1			0.0003	0.0021	0.0500
				Total	**0.00**	**0.05**
TNMOC	1.2			0.0002	**0.00**	**0.03**

Based on:
- day's site visit data
- lab analytical results
- negligible combustion air
- inflow = outflow

HAFB - Building 828
SS-60

Extraction / Emission Calculations
Sample Date: 30 OCTOBER 97

INFLUENT	concentration	flowrate		rate		
	mg/m^3 (= µg/l)	(ft^3/min)	(m^3/sec)	(g/sec)	(lbs/hr)	(lbs/day)
		240	0.1133			
Benzene	0.1			0.0000	0.0001	0.0022
Toluene	1.8			0.0002	0.0016	0.0388
Ethyl Benzene	1.5			0.0002	0.0013	0.0324
Total Xylenes	11.0			0.0012	0.0099	0.2373
TPH (C5+ hydrocarbons	120			0.0136	0.1079	2.5890
				Total	**0.12**	**2.90**
TNMOC	77			0.0087	**0.07**	**1.66**

EFFLUENT	concentration	flowrate		rate		
	mg/m^3 (= µg/l)	(ft^3/min)	(m^3/sec)	(g/sec)	(lbs/hr)	(lbs/day)
		240	0.1133			
Benzene	0.1000			0.0000	0.0001	0.0022
Toluene	0.0610			0.0000	0.0001	0.0013
Ethyl Benzene	0.0220			0.0000	0.0000	0.0005
Total Xylenes	0.0160			0.0000	0.0000	0.0003
TPH (C5+ hydrocarbons	2.3000			0.0003	0.0021	0.0496
				Total	**0.0022**	**0.05**
TNMOC	8.2			0.0009	**0.01**	**0.18**

Destruction Efficiency
0.9814

Sample Date: 16 SEPTEMBER 97

AERATOR DISCHARG	concentration	flowrate		rate		
	mg/m^3 (= µg/l)	(ft^3/min)	(m^3/sec)	(g/sec)	(lbs/hr)	(lbs/day)
		99	0.0467			
Benzene	0.000			0.0000	0.0000	0.0000
Toluene	0.019			0.0000	0.0000	0.0002
Ethyl Benzene	0.022			0.0000	0.0000	0.0002
Total Xylenes	0.140			0.0000	0.0001	0.0012
TPH (C5+ hydrocarbons	1.4			0.0002	0.0013	0.0302
				Total	**0.00**	**0.03**
TNMOC	0.91			0.0001	**0.00**	**0.02**

Based on:
- day's site visit data
- lab analytical results
- negligible combustion air
- inflow = outflow

HAFB - Building 828
SS-60

Extraction / Emission Calculations
Sample Date: 06 NOVEMBER 97

INFLUENT	concentration	flowrate		rate		
	mg/m^3 (= µg/l)	(ft^3/min)	(m^3/sec)	(g/sec)	(lbs/hr)	(lbs/day)
		201	0.0949			
Benzene	2.8			0.0003	0.0021	0.0506
Toluene	10.0			0.0009	0.0075	0.1807
Ethyl Benzene	5.7			0.0005	0.0043	0.1030
Total Xylenes	38.0			0.0036	0.0286	0.6866
TPH (C5+ hydrocarbons	220			0.0209	0.1656	3.9752
				Total	**0.21**	**5.00**

TNMOC	180			0.0171	**0.14**	**3.25**

EFFLUENT	concentration	flowrate		rate		
	mg/m^3 (= µg/l)	(ft^3/min)	(m^3/sec)	(g/sec)	(lbs/hr)	(lbs/day)
		201	0.0949			
Benzene	0.1300			0.0000	0.0001	0.0023
Toluene	0.0150			0.0000	0.0000	0.0003
Ethyl Benzene	0.0130			0.0000	0.0000	0.0002
Total Xylenes	0.0840			0.0000	0.0001	0.0015
TPH (C5+ hydrocarbons	0.6500			0.0001	0.0005	0.0117
				Total	**0.0007**	**0.02**

TNMOC	5.2			0.0005	**0.00**	**0.09**

Destruction Efficiency
0.9968

AERATOR DISCHARG	concentration	flowrate		rate		
	mg/m^3 (= µg/l)	(ft^3/min)	(m^3/sec)	(g/sec)	(lbs/hr)	(lbs/day)
		99	0.0467			
Benzene	0.008			0.0000	0.0000	0.0001
Toluene	0.009			0.0000	0.0000	0.0001
Ethyl Benzene	0.011			0.0000	0.0000	0.0001
Total Xylenes	0.013			0.0000	0.0000	0.0001
TPH (C5+ hydrocarbons	0.65			0.0001	0.0005	0.0117
				Total	**0.00**	**0.01**

TNMOC	0.42			0.0000	**0.00**	**0.01**

Based on:
- day's site visit data
- lab analytical results
- negligible combustion air
- inflow = outflow

HAFB - Building 828
SS-60

Extraction / Emission Calculations
Sample Date: 03 DECEMBER 97

INFLUENT	concentration	flowrate		rate		
	mg/m^3 (= µg/l)	(ft^3/min)	(m^3/sec)	(g/sec)	(lbs/hr)	(lbs/day)
		143	0.0675			
Benzene	2.2			0.0001	0.0012	0.0283
Toluene	6.5			0.0004	0.0035	0.0836
Ethyl Benzene	3.5			0.0002	0.0019	0.0450
Total Xylenes	22.0			0.0015	0.0118	0.2828
TPH (C5+ hydrocarbons	830			0.0560	0.4446	10.6698
				Total	**0.46**	**11.11**
TNMOC	240			0.0162	**0.13**	**3.09**

EFFLUENT	concentration	flowrate		rate		
	mg/m^3 (= µg/l)	(ft^3/min)	(m^3/sec)	(g/sec)	(lbs/hr)	(lbs/day)
		143	0.0675			
Benzene	0.1400			0.0000	0.0001	0.0018
Toluene	0.0000			0.0000	0.0000	0.0000
Ethyl Benzene	0.0000			0.0000	0.0000	0.0000
Total Xylenes	0.0000			0.0000	0.0000	0.0000
TPH (C5+ hydrocarbons	0.7600			0.0001	0.0004	0.0098
				Total	**0.0005**	**0.01**
TNMOC	4.9			0.0003	**0.00**	**0.06**

Destruction Efficiency
0.9990

AERATOR DISCHARG	concentration	flowrate		rate		
	mg/m^3 (= µg/l)	(ft^3/min)	(m^3/sec)	(g/sec)	(lbs/hr)	(lbs/day)
		84	0.0396			
Benzene	0.049			0.0000	0.0000	0.0004
Toluene	0.080			0.0000	0.0000	0.0006
Ethyl Benzene	0.022			0.0000	0.0000	0.0002
Total Xylenes	0.300			0.0000	0.0001	0.0023
TPH (C5+ hydrocarbons	4.3			0.0003	0.0023	0.0553
				Total	**0.00**	**0.06**
TNMOC	1.3			0.0001	**0.00**	**0.02**

Based on:
- day's site visit data
- lab analytical results
- negligible combustion air
- inflow = outflow

HAFB - Building 828
SS-60

Extraction / Emission Calculations
Sample Date: 23 January 98

INFLUENT	concentration	flowrate		rate		
	mg/m^3 (= µg/l)	(ft^3/min)	(m^3/sec)	(g/sec)	(lbs/hr)	(lbs/day)
		140	0.0661			
Benzene	0.2			0.0000	0.0001	0.0025
Toluene	0.4			0.0000	0.0002	0.0050
Ethyl Benzene	0.6			0.0000	0.0003	0.0076
Total Xylenes	2.7			0.0002	0.0014	0.0340
TPH (C5+ hydrocarbons	67			0.0044	0.0351	0.8432
				Total	**0.04**	**0.89**

TNMOC	18		0.0012	**0.01**	**0.23**

EFFLUENT	concentration	flowrate		rate		
	mg/m^3 (= µg/l)	(ft^3/min)	(m^3/sec)	(g/sec)	(lbs/hr)	(lbs/day)
		140	0.0661			
Benzene	0.0000			0.0000	0.0000	0.0000
Toluene	0.0270			0.0000	0.0000	0.0003
Ethyl Benzene	0.0000			0.0000	0.0000	0.0000
Total Xylenes	0.0000			0.0000	0.0000	0.0000
TPH (C5+ hydrocarbons	0.9800			0.0001	0.0005	0.0123
				Total	**0.0005**	**0.01**

TNMOC	0.3		0.0000	**0.00**	**0.00**

Destruction Efficiency
0.9858

AERATOR DISCHARG	concentration	flowrate		rate		
	mg/m^3 (= µg/l)	(ft^3/min)	(m^3/sec)	(g/sec)	(lbs/hr)	(lbs/day)
		75	0.0354			
Benzene	0.010			0.0000	0.0000	0.0001
Toluene	0.008			0.0000	0.0000	0.0001
Ethyl Benzene	0.018			0.0000	0.0000	0.0001
Total Xylenes	0.110			0.0000	0.0000	0.0007
TPH (C5+ hydrocarbons	2.6			0.0002	0.0014	0.0327
				Total	**0.00**	**0.03**

TNMOC	0.73		0.0000	**0.00**	**0.01**

Based on:
- day's site visit data
- lab analytical results
- negligible combustion air
- inflow = outflow

HAFB - Building 828
SS-60

Extraction / Emission Calculations
Sample Date: 17 February 98

INFLUENT	concentration	flowrate		rate		
	mg/m^3 (= µg/l)	(ft^3/min)	(m^3/sec)	(g/sec)	(lbs/hr)	(lbs/day)
		140	0.0661			
Benzene	0.3			0.0000	0.0002	0.0038
Toluene	1.1			0.0001	0.0006	0.0138
Ethyl Benzene	0.8			0.0001	0.0004	0.0101
Total Xylenes	4.4			0.0003	0.0023	0.0554
TPH (C5+ hydrocarbons	75			0.0050	0.0393	0.9439
				Total	**0.04**	**1.03**
TNMOC	27			0.0018	**0.01**	**0.34**

EFFLUENT	concentration	flowrate		rate		
	mg/m^3 (= µg/l)	(ft^3/min)	(m^3/sec)	(g/sec)	(lbs/hr)	(lbs/day)
		140	0.0661			
Benzene	0.1100			0.0000	0.0001	0.0014
Toluene	0.1800			0.0000	0.0001	0.0023
Ethyl Benzene	0.0620			0.0000	0.0000	0.0008
Total Xylenes	0.3000			0.0000	0.0002	0.0038
TPH (C5+ hydrocarbons	2.1000			0.0001	0.0011	0.0264
				Total	**0.0014**	**0.03**
TNMOC	30.0			0.0020	**0.02**	**0.38**

Destruction Efficiency
0.9663

AERATOR DISCHARG	concentration	flowrate		rate		
	mg/m^3 (= µg/l)	(ft^3/min)	(m^3/sec)	(g/sec)	(lbs/hr)	(lbs/day)
		75	0.0354			
Benzene	0.000			0.0000	0.0000	0.0000
Toluene	0.023			0.0000	0.0000	0.0002
Ethyl Benzene	0.013			0.0000	0.0000	0.0001
Total Xylenes	0.150			0.0000	0.0000	0.0010
TPH (C5+ hydrocarbons	1.4			0.0001	0.0007	0.0176
				Total	**0.00**	**0.02**
TNMOC	0.52			0.0000	**0.00**	**0.01**

Based on:
- day's site visit data
- lab analytical results
- negligible combustion air
- inflow = outflow

HAFB - Building 828
SS-60

Extraction / Emission Calculations
Sample Date: 04 March 98

INFLUENT	concentration	flowrate		rate		
	mg/m^3 (= µg/l)	(ft^3/min)	(m^3/sec)	(g/sec)	(lbs/hr)	(lbs/day)
		139	0.0656			
Benzene	0.0			0.0000	0.0000	0.0000
Toluene	0.0			0.0000	0.0000	0.0000
Ethyl Benzene	0.0			0.0000	0.0000	0.0000
Total Xylenes	0.0			0.0000	0.0000	0.0000
TPH (C5+ hydrocarbons	0.45			0.0000	0.0002	0.0056
				Total	**0.00**	**0.01**

TNMOC	0.21		0.0000	**0.00**	**0.00**

EFFLUENT	concentration	flowrate		rate		
	mg/m^3 (= µg/l)	(ft^3/min)	(m^3/sec)	(g/sec)	(lbs/hr)	(lbs/day)
		139	0.0656			
Benzene	0.0000			0.0000	0.0000	0.0000
Toluene	0.0000			0.0000	0.0000	0.0000
Ethyl Benzene	0.0000			0.0000	0.0000	0.0000
Total Xylenes	0.0000			0.0000	0.0000	0.0000
TPH (C5+ hydrocarbons	1.2000			0.0001	0.0006	0.0150
				Total	**0.0006**	**0.01**

TNMOC	2.9		0.0002	**0.00**	**0.04**

Destruction Efficiency
-1.6667

AERATOR DISCHARG	concentration	flowrate		rate		
	mg/m^3 (= µg/l)	(ft^3/min)	(m^3/sec)	(g/sec)	(lbs/hr)	(lbs/day)
		75	0.0354			
Benzene	0.000			0.0000	0.0000	0.0000
Toluene	0.000			0.0000	0.0000	0.0000
Ethyl Benzene	0.000			0.0000	0.0000	0.0000
Total Xylenes	0.000			0.0000	0.0000	0.0000
TPH (C5+ hydrocarbons	0.38			0.0000	0.0002	0.0047
				Total	**0.00**	**0.00**

TNMOC	0.18		0.0000	**0.00**	**0.00**

Based on:
- day's site visit data
- lab analytical results
- negligible combustion air
- inflow = outflow

HAFB - Building 828
SS-60

Extraction / Emission Calculations
Sample Date: 06 April 98

INFLUENT	concentration	flowrate		rate		
	mg/m^3 (= µg/l)	(ft^3/min)	(m^3/sec)	(g/sec)	(lbs/hr)	(lbs/day)
		139	0.0656			
Benzene	0.1			0.0000	0.0001	0.0012
Toluene	0.7			0.0000	0.0004	0.0087
Ethyl Benzene	0.6			0.0000	0.0003	0.0075
Total Xylenes	3.0			0.0002	0.0016	0.0375
TPH (C5+ hydrocarbons	66			0.0043	0.0344	0.8247
				Total	**0.04**	**0.88**
TNMOC	29			0.0019	**0.02**	**0.36**

EFFLUENT	concentration	flowrate		rate		
	mg/m^3 (= µg/l)	(ft^3/min)	(m^3/sec)	(g/sec)	(lbs/hr)	(lbs/day)
		139	0.0656			
Benzene	0.0000			0.0000	0.0000	0.0000
Toluene	0.1700			0.0000	0.0001	0.0021
Ethyl Benzene	0.0000			0.0000	0.0000	0.0000
Total Xylenes	0.4300			0.0000	0.0002	0.0054
TPH (C5+ hydrocarbons	7.4000			0.0005	0.0039	0.0925
				Total	**0.0042**	**0.10**
TNMOC	4.8			0.0003	**0.00**	**0.06**

Destruction Efficiency
0.8864

AERATOR DISCHARG	concentration	flowrate		rate		
	mg/m^3 (= µg/l)	(ft^3/min)	(m^3/sec)	(g/sec)	(lbs/hr)	(lbs/day)
		75	0.0354			
Benzene	0.000			0.0000	0.0000	0.0000
Toluene	0.096			0.0000	0.0000	0.0006
Ethyl Benzene	0.000			0.0000	0.0000	0.0000
Total Xylenes	0.180			0.0000	0.0001	0.0012
TPH (C5+ hydrocarbons	3.2			0.0002	0.0017	0.0400
				Total	**0.00**	**0.04**
TNMOC	1.5			0.0001	**0.00**	**0.02**

Based on:
- day's site visit data
- lab analytical results
- negligible combustion air
- inflow = outflow

HAFB - Building 828
SS-60

Extraction / Emission Calculations
Sample Date: 20 May 98

INFLUENT	concentration	flowrate		rate		
	mg/m^3 (= µg/l)	(ft^3/min)	(m^3/sec)	(g/sec)	(lbs/hr)	(lbs/day)
		139	0.0656			
Benzene	0.2			0.0000	0.0001	0.0025
Toluene	0.3			0.0000	0.0002	0.0037
Ethyl Benzene	0.4			0.0000	0.0002	0.0050
Total Xylenes	2.0			0.0001	0.0010	0.0250
TPH (C5+ hydrocarbons	33			0.0022	0.0172	0.4124
				Total	**0.02**	**0.45**
TNMOC	37			0.0024	**0.02**	**0.46**

EFFLUENT	concentration	flowrate		rate		
	mg/m^3 (= µg/l)	(ft^3/min)	(m^3/sec)	(g/sec)	(lbs/hr)	(lbs/day)
		139	0.0656			
Benzene	0.0000			0.0000	0.0000	0.0000
Toluene	0.0000			0.0000	0.0000	0.0000
Ethyl Benzene	0.0000			0.0000	0.0000	0.0000
Total Xylenes	0.0000			0.0000	0.0000	0.0000
TPH (C5+ hydrocarbons	1.2000			0.0001	0.0006	0.0150
				Total	**0.0006**	**0.01**
TNMOC	18.0			0.0012	**0.01**	**0.22**

Destruction Efficiency
0.9666

AERATOR DISCHARG	concentration	flowrate		rate		
	mg/m^3 (= µg/l)	(ft^3/min)	(m^3/sec)	(g/sec)	(lbs/hr)	(lbs/day)
		75	0.0354			
Benzene	0.000			0.0000	0.0000	0.0000
Toluene	0.000			0.0000	0.0000	0.0000
Ethyl Benzene	0.000			0.0000	0.0000	0.0000
Total Xylenes	0.000			0.0000	0.0000	0.0000
TPH (C5+ hydrocarbons	1.1			0.0001	0.0006	0.0137
				Total	**0.00**	**0.01**
TNMOC	1.2			0.0001	**0.00**	**0.01**

Based on:
- day's site visit data
- lab analytical results
- negligible combustion air
- inflow = outflow

HAFB - Building 828
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Extraction / Emission Calculations
Sample Date: 17 June 98

INFLUENT	concentration	flowrate		rate		
	mg/m^3 (= µg/l)	(ft^3/min)	(m^3/sec)	(g/sec)	(lbs/hr)	(lbs/day)
		125	0.0590			
Benzene	0.2			0.0000	0.0001	0.0022
Toluene	0.9			0.0001	0.0004	0.0101
Ethyl Benzene	1.3			0.0001	0.0006	0.0146
Total Xylenes	5.6			0.0003	0.0026	0.0629
TPH (C5+ hydrocarbons	170			0.0100	0.0796	1.9103
				Total	**0.08**	**2.00**
TNMOC	70			0.0041	**0.03**	**0.79**

EFFLUENT	concentration	flowrate		rate		
	mg/m^3 (= µg/l)	(ft^3/min)	(m^3/sec)	(g/sec)	(lbs/hr)	(lbs/day)
		125	0.0590			
Benzene	0.9800			0.0001	0.0005	0.0110
Toluene	0.4600			0.0000	0.0002	0.0052
Ethyl Benzene	0.0590			0.0000	0.0000	0.0007
Total Xylenes	0.2100			0.0000	0.0001	0.0024
TPH (C5+ hydrocarbons	11.0000			0.0006	0.0052	0.1236
				Total	**0.0060**	**0.14**
TNMOC	16.0			0.0009	**0.01**	**0.18**

Destruction Efficiency
0.9286

AERATOR DISCHARG	concentration	flowrate		rate		
	mg/m^3 (= µg/l)	(ft^3/min)	(m^3/sec)	(g/sec)	(lbs/hr)	(lbs/day)
		80	0.0378			
Benzene	0.054			0.0000	0.0000	0.0004
Toluene	0.130			0.0000	0.0000	0.0009
Ethyl Benzene	0.160			0.0000	0.0000	0.0012
Total Xylenes	0.240			0.0000	0.0001	0.0017
TPH (C5+ hydrocarbons	5.7			0.0003	0.0027	0.0641
				Total	**0.00**	**0.07**
TNMOC	2.3			0.0001	**0.00**	**0.03**

Based on:
- day's site visit data
- lab analytical results
- negligible combustion air
- inflow = outflow

HAFB - Building 828
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Extraction / Emission Calculations
Sample Date: 03 August 98
For July

INFLUENT	concentration	flowrate		rate		
	mg/m^3 (= µg/l)	(ft^3/min)	(m^3/sec)	(g/sec)	(lbs/hr)	(lbs/day)
		125	0.0590			
Benzene	0.0			0.0000	0.0000	0.0000
Toluene	15.0			0.0009	0.0070	0.1686
Ethyl Benzene	0.0			0.0000	0.0000	0.0000
Total Xylenes	0.3			0.0000	0.0001	0.0034
TPH (C5+ hydrocarbons	20			0.0012	0.0094	0.2247
				Total	**0.02**	**0.40**

TNMOC	20			0.0012	**0.01**	**0.22**

EFFLUENT	concentration	flowrate		rate		
	mg/m^3 (= µg/l)	(ft^3/min)	(m^3/sec)	(g/sec)	(lbs/hr)	(lbs/day)
		125	0.0590			
Benzene	0.3500			0.0000	0.0002	0.0039
Toluene	0.1400			0.0000	0.0001	0.0016
Ethyl Benzene	0.0000			0.0000	0.0000	0.0000
Total Xylenes	0.0190			0.0000	0.0000	0.0002
TPH (C5+ hydrocarbons	0.8800			0.0001	0.0004	0.0099
				Total	**0.0007**	**0.02**

TNMOC	3.4			0.0002	**0.00**	**0.04**

Destruction Efficiency
0.9607

AERATOR DISCHARG	concentration	flowrate		rate		
	mg/m^3 (= µg/l)	(ft^3/min)	(m^3/sec)	(g/sec)	(lbs/hr)	(lbs/day)
		80	0.0378			
Benzene	0.000			0.0000	0.0000	0.0000
Toluene	0.024			0.0000	0.0000	0.0002
Ethyl Benzene	0.000			0.0000	0.0000	0.0000
Total Xylenes	0.000			0.0000	0.0000	0.0000
TPH (C5+ hydrocarbons	0.073			0.0000	0.0000	0.0008
				Total	**0.00**	**0.00**

TNMOC	0.094			0.0000	**0.00**	**0.00**

Based on:
- day's site visit data
- lab analytical results
- negligible combustion air
- inflow = outflow

HAFB - Building 828
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Extraction / Emission Calculations
Sample Date: 31 August 98

INFLUENT	concentration	flowrate		rate		
	mg/m^3 (= µg/l)	(ft^3/min)	(m^3/sec)	(g/sec)	(lbs/hr)	(lbs/day)
		140	0.0661			
Benzene	0.0			0.0000	0.0000	0.0000
Toluene	0.0			0.0000	0.0000	0.0000
Ethyl Benzene	0.0			0.0000	0.0000	0.0000
Total Xylenes	0.0			0.0000	0.0000	0.0000
TPH (C5+ hydrocarbons	0.23			0.0000	0.0001	0.0029
				Total	**0.00**	**0.00**
TNMOC	0.22			0.0000	**0.00**	**0.00**

EFFLUENT	concentration	flowrate		rate		
	mg/m^3 (= µg/l)	(ft^3/min)	(m^3/sec)	(g/sec)	(lbs/hr)	(lbs/day)
		140	0.0661			
Benzene	0.0000			0.0000	0.0000	0.0000
Toluene	0.0000			0.0000	0.0000	0.0000
Ethyl Benzene	0.0000			0.0000	0.0000	0.0000
Total Xylenes	0.0000			0.0000	0.0000	0.0000
TPH (C5+ hydrocarbons	0.1700			0.0000	0.0001	0.0021
				Total	**0.0001**	**0.00**
TNMOC	0.3			0.0000	**0.00**	**0.00**

Destruction Efficiency
0.2609

AERATOR DISCHARG	concentration	flowrate		rate		
	mg/m^3 (= µg/l)	(ft^3/min)	(m^3/sec)	(g/sec)	(lbs/hr)	(lbs/day)
		80	0.0378			
Benzene	0.100			0.0000	0.0000	0.0007
Toluene	0.190			0.0000	0.0001	0.0014
Ethyl Benzene	0.260			0.0000	0.0001	0.0019
Total Xylenes	0.220			0.0000	0.0001	0.0016
TPH (C5+ hydrocarbons	2.4			0.0002	0.0013	0.0302
				Total	**0.00**	**0.04**
TNMOC	2.3			0.0002	**0.00**	**0.03**

Based on:
- day's site visit data
- lab analytical results
- negligible combustion air
- inflow = outflow

HAFB - Building 828
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Extraction / Emission Calculations
Sample Date: 15 September 98

INFLUENT	concentration	flowrate		rate		
	mg/m^3 (= µg/l)	(ft^3/min)	(m^3/sec)	(g/sec)	(lbs/hr)	(lbs/day)
		140	0.0661			
Benzene	0.0			0.0000	0.0000	0.0000
Toluene	0.1			0.0000	0.0001	0.0013
Ethyl Benzene	0.0			0.0000	0.0000	0.0000
Total Xylenes	0.0			0.0000	0.0000	0.0000
TPH (C5+ hydrocarbons	0.76			0.0001	0.0004	0.0096
				Total	**0.00**	**0.01**
TNMOC	0.87			0.0001	**0.00**	**0.01**

EFFLUENT	concentration	flowrate		rate		
	mg/m^3 (= µg/l)	(ft^3/min)	(m^3/sec)	(g/sec)	(lbs/hr)	(lbs/day)
		140	0.0661			
Benzene	0.0000			0.0000	0.0000	0.0000
Toluene	0.1000			0.0000	0.0001	0.0013
Ethyl Benzene	0.0000			0.0000	0.0000	0.0000
Total Xylenes	0.0000			0.0000	0.0000	0.0000
TPH (C5+ hydrocarbons	0.7500			0.0000	0.0004	0.0094
				Total	**0.0004**	**0.01**
TNMOC	1.1			0.0001	**0.00**	**0.01**

Destruction Efficiency
0.0116

AERATOR DISCHARG	concentration	flowrate		rate		
	mg/m^3 (= µg/l)	(ft^3/min)	(m^3/sec)	(g/sec)	(lbs/hr)	(lbs/day)
		0	0.0000			
Benzene	0.000			0.0000	0.0000	0.0000
Toluene	0.000			0.0000	0.0000	0.0000
Ethyl Benzene	0.000			0.0000	0.0000	0.0000
Total Xylenes	0.000			0.0000	0.0000	0.0000
TPH (C5+ hydrocarbons	0			0.0000	0.0000	0.0000
				Total	**0.00**	**0.00**
TNMOC	0			0.0000	**0.00**	**0.00**

Based on:
- day's site visit data
- lab analytical results
- negligible combustion air
- inflow = outflow

HAFB - Building 828
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Extraction / Emission Calculations
Sample Date: 06 October 98

INFLUENT	concentration	flowrate		rate		
	mg/m^3 (= µg/l)	(ft^3/min)	(m^3/sec)	(g/sec)	(lbs/hr)	(lbs/day)
		140	0.0661			
Benzene	0.0			0.0000	0.0000	0.0000
Toluene	0.1			0.0000	0.0001	0.0013
Ethyl Benzene	0.0			0.0000	0.0000	0.0000
Total Xylenes	0.0			0.0000	0.0000	0.0000
TPH (C5+ hydrocarbons	0.36			0.0000	0.0002	0.0045
				Total	**0.0002**	**0.01**
TNMOC	0.35			0.0000	**0.0002**	**0.00**

EFFLUENT	concentration	flowrate		rate		
	mg/m^3 (= µg/l)	(ft^3/min)	(m^3/sec)	(g/sec)	(lbs/hr)	(lbs/day)
		140	0.0661			
Benzene	0.0000			0.0000	0.0000	0.0000
Toluene	0.0110			0.0000	0.0000	0.0001
Ethyl Benzene	0.0000			0.0000	0.0000	0.0000
Total Xylenes	0.0000			0.0000	0.0000	0.0000
TPH (C5+ hydrocarbons	0.2200			0.0000	0.0001	0.0028
				Total	**0.0001**	**0.00**
TNMOC	0.3			0.0000	**0.0002**	**0.00**

Destruction Efficiency
0.4978

AERATOR DISCHARGE	concentration	flowrate		rate		
	mg/m^3 (= µg/l)	(ft^3/min)	(m^3/sec)	(g/sec)	(lbs/hr)	(lbs/day)
		0	0.0000			
Benzene	0.000			0.0000	0.0000	0.0000
Toluene	0.000			0.0000	0.0000	0.0000
Ethyl Benzene	0.000			0.0000	0.0000	0.0000
Total Xylenes	0.000			0.0000	0.0000	0.0000
TPH (C5+ hydrocarbons	0			0.0000	0.0000	0.0000
				Total	**0.00**	**0.00**
TNMOC	0			0.0000	**0.00**	**0.00**

Based on:
- day's site visit data
- lab analytical results
- negligible combustion air
- inflow = outflow

HAFB - Building 828
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Extraction / Emission Calculations
Sample Date: 09 December 98

INFLUENT	concentration	flowrate		rate		
	mg/m^3 (= µg/l)	(ft^3/min)	(m^3/sec)	(g/sec)	(lbs/hr)	(lbs/day)
		140	0.0661			
Benzene	0.0			0.0000	0.0000	0.0000
Toluene	0.1			0.0000	0.0001	0.0013
Ethyl Benzene	0.0			0.0000	0.0000	0.0000
Total Xylenes	0.0			0.0000	0.0000	0.0000
TPH (C5+ hydrocarbons	0.14			0.0000	0.0001	0.0018
				Total	**0.0001**	**0.00**
TNMOC	0.16			0.0000	**0.0001**	**0.00**

EFFLUENT	concentration	flowrate		rate		
	mg/m^3 (= µg/l)	(ft^3/min)	(m^3/sec)	(g/sec)	(lbs/hr)	(lbs/day)
		140	0.0661			
Benzene	0.0140			0.0000	0.0000	0.0002
Toluene	0.0420			0.0000	0.0000	0.0005
Ethyl Benzene	0.0000			0.0000	0.0000	0.0000
Total Xylenes	0.0000			0.0000	0.0000	0.0000
TPH (C5+ hydrocarbons	0.2800			0.0000	0.0001	0.0035
				Total	**0.0002**	**0.00**
TNMOC	0.6			0.0000	**0.0003**	**0.01**

Destruction Efficiency
-0.4000

AERATOR DISCHARG	concentration	flowrate		rate		
	mg/m^3 (= µg/l)	(ft^3/min)	(m^3/sec)	(g/sec)	(lbs/hr)	(lbs/day)
		0	0.0000			
Benzene	0.000			0.0000	0.0000	0.0000
Toluene	0.000			0.0000	0.0000	0.0000
Ethyl Benzene	0.000			0.0000	0.0000	0.0000
Total Xylenes	0.000			0.0000	0.0000	0.0000
TPH (C5+ hydrocarbons	0			0.0000	0.0000	0.0000
				Total	**0.00**	**0.00**
TNMOC	0			0.0000	**0.00**	**0.00**

Based on:
- day's site visit data
- lab analytical results
- negligible combustion air
- inflow = outflow

HAFB - Building 828
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Extraction / Emission Calculations
Sample Date: 05 JANUARY 99

INFLUENT	*concentration*	*flowrate*		*rate*	
	mg/m^3 (= µg/l)	(ft^3/min)	(m^3/sec)	(g/sec)	(lbs/hr)
		169	0.0798		
Benzene	3.3			0.0003	0.0021
Toluene	0.2			0.0000	0.0001
Ethyl Benzene	1.3			0.0001	0.0008
Total Xylenes	0.4			0.0000	0.0003
TPH (C5+ hydrocarbons	4			0.0003	0.0025
				Total	**0.0058**
TNMOC	4.2			0.0003	**0.0027**

EFFLUENT	*concentration*	*flowrate*		*rate*	
	mg/m^3 (= µg/l)	(ft^3/min)	(m^3/sec)	(g/sec)	(lbs/hr)
		169	0.0798		
Benzene	0.0000			0.0000	0.0000
Toluene	0.0980			0.0000	0.0001
Ethyl Benzene	0.0000			0.0000	0.0000
Total Xylenes	0.0000			0.0000	0.0000
TPH (C5+ hydrocarbons	0.1300			0.0000	0.0001
				Total	**0.0001**
TNMOC	0.2			0.0000	**0.0001**

Destruction Efficiency
0.9752

AERATOR DISCHARG	*concentration*	*flowrate*		*rate*	
	mg/m^3 (= µg/l)	(ft^3/min)	(m^3/sec)	(g/sec)	(lbs/hr)
		0	0.0000		
Benzene	0.000			0.0000	0.0000
Toluene	0.000			0.0000	0.0000
Ethyl Benzene	0.000			0.0000	0.0000
Total Xylenes	0.000			0.0000	0.0000
TPH (C5+ hydrocarbons	0			0.0000	0.0000
				Total	**0.00**
TNMOC	0			0.0000	**0.00**

Based on:
- day's site visit data
- lab analytical results
- negligible combustion air
- inflow = outflow

HAFB - Building 828
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Extraction / Emission Calculations
Sample Date: 24 FEBRUARY 99

INFLUENT	*concentration*	*flowrate*		*rate*	
	mg/m^3 (= µg/l)	(ft^3/min)	(m^3/sec)	(g/sec)	(lbs/hr)
		190	0.0897		
Benzene	0.1			0.0000	0.0000
Toluene	0.0			0.0000	0.0000
Ethyl Benzene	0.2			0.0000	0.0001
Total Xylenes	0.1			0.0000	0.0001
TPH (C5+ hydrocarbons	1.2			0.0001	0.0009
				Total	**0.0011**
TNMOC	1.1			0.0001	**0.0008**

EFFLUENT	*concentration*	*flowrate*		*rate*	
	mg/m^3 (= µg/l)	(ft^3/min)	(m^3/sec)	(g/sec)	(lbs/hr)
		190	0.0897		
Benzene	0.0000			0.0000	0.0000
Toluene	0.0520			0.0000	0.0000
Ethyl Benzene	0.0000			0.0000	0.0000
Total Xylenes	0.0000			0.0000	0.0000
TPH (C5+ hydrocarbons	0.1800			0.0000	0.0001
				Total	**0.0002**
TNMOC	0.2			0.0000	**0.0001**

Destruction Efficiency
0.8531

AERATOR DISCHARG	*concentration*	*flowrate*		*rate*	
	mg/m^3 (= µg/l)	(ft^3/min)	(m^3/sec)	(g/sec)	(lbs/hr)
		0	0.0000		
Benzene	0.000			0.0000	0.0000
Toluene	0.000			0.0000	0.0000
Ethyl Benzene	0.000			0.0000	0.0000
Total Xylenes	0.000			0.0000	0.0000
TPH (C5+ hydrocarbons	0			0.0000	0.0000
				Total	**0.00**
TNMOC	0			0.0000	**0.00**

Based on:
- day's site visit data
- lab analytical results
- negligible combustion air
- inflow = outflow

HAFB - Building 828
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Extraction / Emission Calculations
Sample Date: 24 March 99

INFLUENT	*concentration*	*flowrate*		*rate*	
	mg/m^3 (= µg/l)	(ft^3/min)	(m^3/sec)	(g/sec)	(lbs/hr)
		170	0.0802		
Benzene	0.3			0.0000	0.0002
Toluene	0.3			0.0000	0.0002
Ethyl Benzene	0.0			0.0000	0.0000
Total Xylenes	0.1			0.0000	0.0001
TPH (C5+ hydrocarbons	4.5			0.0004	0.0029
				Total	**0.0033**

TNMOC	7.6		0.0006	**0.0048**

EFFLUENT	*concentration*	*flowrate*		*rate*	
	mg/m^3 (= µg/l)	(ft^3/min)	(m^3/sec)	(g/sec)	(lbs/hr)
		170	0.0802		
Benzene	0.0000			0.0000	0.0000
Toluene	0.0180			0.0000	0.0000
Ethyl Benzene	0.0000			0.0000	0.0000
Total Xylenes	0.0000			0.0000	0.0000
TPH (C5+ hydrocarbons	0.0120			0.0000	0.0000
				Total	**0.0000**

TNMOC	0.0		0.0000	**0.0000**

Destruction Efficiency
0.9942

AERATOR DISCHARG	*concentration*	*flowrate*		*rate*	
	mg/m^3 (= µg/l)	(ft^3/min)	(m^3/sec)	(g/sec)	(lbs/hr)
		0	0.0000		
Benzene	0.000			0.0000	0.0000
Toluene	0.000			0.0000	0.0000
Ethyl Benzene	0.000			0.0000	0.0000
Total Xylenes	0.000			0.0000	0.0000
TPH (C5+ hydrocarbons	0			0.0000	0.0000
				Total	**0.00**

TNMOC	0		0.0000	**0.00**

Based on:
- day's site visit data
- lab analytical results
- negligible combustion air
- inflow = outflow

HAFB - Building 828
SS-60

Extraction / Emission Calculations
Sample Date: 28 April 99

INFLUENT	*concentration*	*flowrate*		*rate*	
	mg/m^3 (= µg/l)	(ft^3/min)	(m^3/sec)	(g/sec)	(lbs/hr)
		170	0.0802		
Benzene	0.0290			0.0000	0.0000
Toluene	0.1000			0.0000	0.0001
Ethyl Benzene	0.0130			0.0000	0.0000
Total Xylenes	0.0390			0.0000	0.0000
TPH (C5+ hydrocarbons	0.4000			0.0000	0.0003
				Total	**0.0004**

TNMOC	0.58		0.0000	**0.0004**

EFFLUENT	*concentration*	*flowrate*		*rate*	
	mg/m^3 (= µg/l)	(ft^3/min)	(m^3/sec)	(g/sec)	(lbs/hr)
		170	0.0802		
Benzene	0.0083			0.0000	0.0000
Toluene	0.0390			0.0000	0.0000
Ethyl Benzene	0.0100			0.0000	0.0000
Total Xylenes	0.0270			0.0000	0.0000
TPH (C5+ hydrocarbons	0.1900			0.0000	0.0001
				Total	**0.0002**

TNMOC	0.3		0.0000	**0.0002**

Destruction Efficiency
0.5279

AERATOR DISCHARG	*concentration*	*flowrate*		*rate*	
	mg/m^3 (= µg/l)	(ft^3/min)	(m^3/sec)	(g/sec)	(lbs/hr)
		0	0.0000		
Benzene	0.000			0.0000	0.0000
Toluene	0.000			0.0000	0.0000
Ethyl Benzene	0.000			0.0000	0.0000
Total Xylenes	0.000			0.0000	0.0000
TPH (C5+ hydrocarbons	0			0.0000	0.0000
				Total	**0.00**

TNMOC	0		0.0000	**0.00**

Based on:
- day's site visit data
- lab analytical results
- negligible combustion air
- inflow = outflow

SECTION 5. SWMU 230 [SITE SS-60: BUILDING 828] (Continued)

4) **A comparison of the 1997 sampling event (Table 5-4, Figure 5-7) and the plume delineated in Figure 5-2 indicates that these sampling locations are located at the margins of the contamination, with correlation to the centroid of the contaminated areas (Table 5-2). Please provide information on the analytical samples taken at the center of the impacted area.**

Response:

The long-term monitoring program at Holloman AFB has included several soil sampling events at site SS-60 (SWMU 230), including two events during the past two years. All soil sampling events at site SS-60 (1996, 1997, and 1999) have been summarized on one figure, included in Attachment 1. Attachment 1, Figure 4A-1 shows the past soil sample locations from the 1999 sampling event. The soil sample location figure has been generated to confirm adequate coverage, including the centroid of the impacted area, has been achieved.

No additional sampling events/locations were determined to be appropriate for site SS-60 (SWMU 230) during the February 2, 2000 partnering meeting. The issue of lead contamination in soil was investigated during the February 2 meeting. Review of the RFI analytical data results indicated lead concentrations in soil ranged from 1 milligrams per kilogram (mg/kg) to a maximum of 19 mg/kg (Woodward-Clyde, 1993) in 27 borings across the site, and were found not to be of concern.

Three sampling events and eight sample locations (collected within the estimated TPH-impacted area) have been performed at the relatively small site SS-60. Laboratory analytical results for soil samples collected over the past two years confirm soil concentrations are below the action levels of 1,000 ppm and 25 ppm for TPH and benzene, respectively. A copy of the soil sample laboratory analytical results not included in the subject March 1998 NFA Report (performed in 1999) is contained in Attachment 2.

Action Taken:

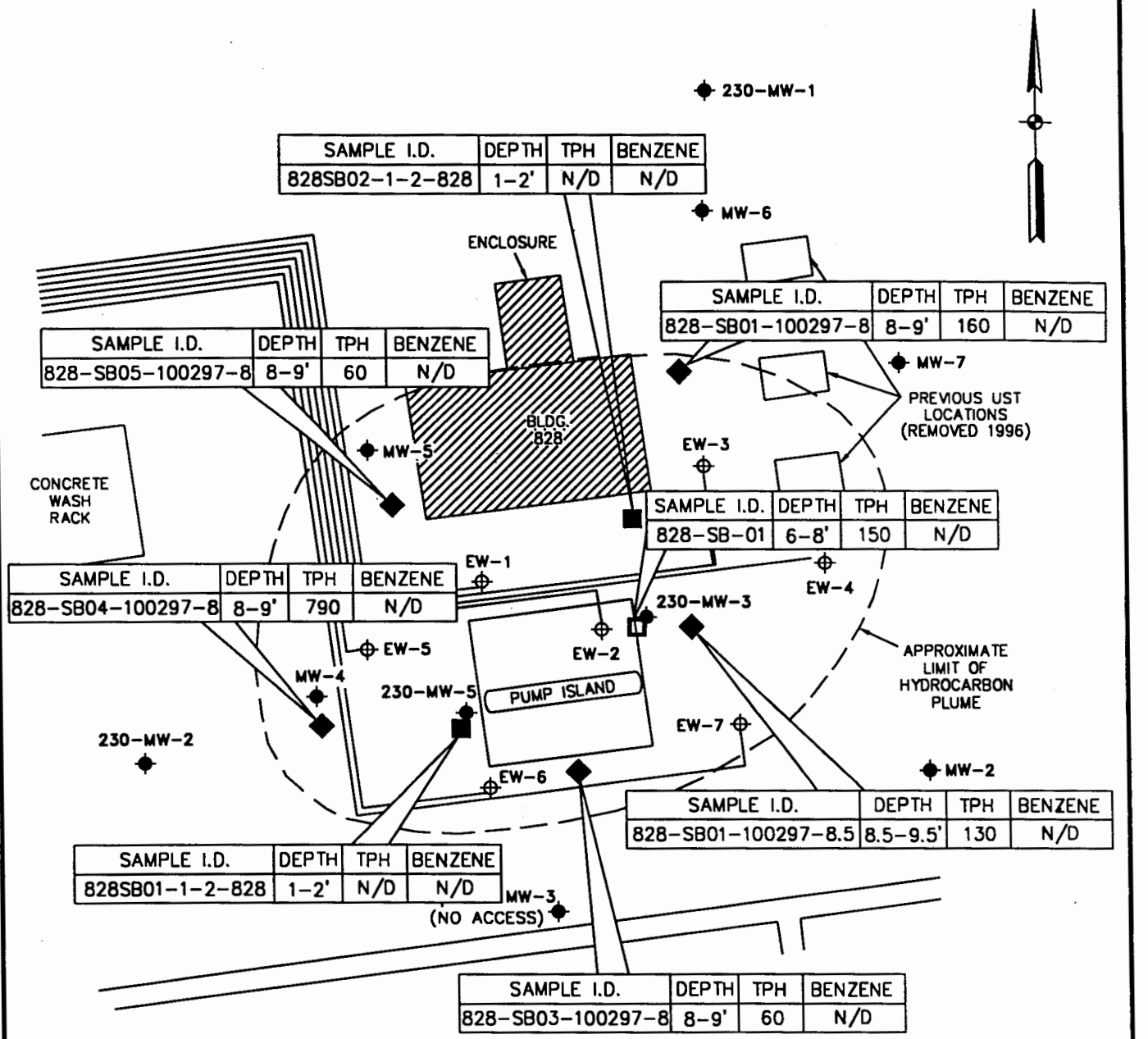
A new figure was generated detailing the additional soil sample locations and analytical results collected following the submittal of the subject March 1998 NFA Report.

Attachment 1

Soil Sampling Locations, 1996 and 1999, SS-60 (SWMU 230).

Attachment 2

1999 Soil Sample Laboratory Analytical Results, SS-60 (SWMU 230).



SAMPLE I.D.	DEPTH	TPH	BENZENE
828SB02-1-2-828	1-2'	N/D	N/D

SAMPLE I.D.	DEPTH	TPH	BENZENE
828-SB01-100297-8	8-9'	160	N/D

SAMPLE I.D.	DEPTH	TPH	BENZENE
828-SB05-100297-8	8-9'	60	N/D

SAMPLE I.D.	DEPTH	TPH	BENZENE
828-SB-01	6-8'	150	N/D

SAMPLE I.D.	DEPTH	TPH	BENZENE
828-SB04-100297-8	8-9'	790	N/D

SAMPLE I.D.	DEPTH	TPH	BENZENE
828-SB01-100297-8.5	8.5-9.5'	130	N/D

SAMPLE I.D.	DEPTH	TPH	BENZENE
828SB01-1-2-828	1-2'	N/D	N/D

SAMPLE I.D.	DEPTH	TPH	BENZENE
828-SB03-100297-8	8-9'	60	N/D

LEGEND

- 1996 SOIL SAMPLING EVENT
- 1997 SOIL SAMPLING EVENT
- 1999 SOIL SAMPLING EVENT
- MONITORING WELL
- EXTRACTION WELL
- FENCE
- N/D NON DETECT

NOTES:
- ANALYTICAL RESULTS PRESENTED IN mg/kg

0 30 60 120
SCALE IN FEET

FOSTER WHEELER ENVIRONMENTAL CORPORATION

HOLLOMAN AIR FORCE BASE
ALAMOGORDO, NEW MEXICO

FIGURE 4A-1

SITE SS-60 (SWMU 230)
1996, 1997 & 1999
SAMPLING LOCATION MAP

Date: 3-14-00	Project No: 5155.0027
Drawn By: L.GAMBLE	File Name: EB828FG1

Section 5 Comment 4
Attachment 1

ASSOCIATED LABORATORIES

806 North Batavia - Orange, California 92868 - 714/771-6900 *FAX 714/538-1209*

CLIENT Foster Wheeler Environmental Corp. (7935)
ATTN: James Morning
241 Arkansas St.
BH / RV Storage
HAFB, NM 88330

LAB REQUEST 36209

REPORTED 4/30/99

RECEIVED 4/16/99

PROJECT LTO-DPT

SUBMITTER Client

COMMENTS

This laboratory request covers the following listed samples which were analyzed for the parameters indicated on the attached Analytical Result Report. All analyses were conducted using the appropriate methods as indicated on the report. This cover letter is an integral part of the final report.

Order No.	Client Sample Identification
117263	828SB01-1-2-828
117264	828SB02-1-2-828

RECEIVED MAY 12 1999

Thank you for the opportunity to be of service to your company. Please feel free to call if there are any questions regarding this report or if we can be of further service.

ASSOCIATED LABORATORIES by,

Edward S. Behare, Ph.D.
Vice President

NOTE: Unless notified in writing, all samples will be discarded by appropriate disposal protocol 30 days from date reported.

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TESTING & CONSULTING
Chemical
Microbiological
Environmental

Section 5 Comment 4
Attachment 2

Order #: 117263
Matrix: SOLID
Date Sampled: 4/13/99
Time Sampled: 07:35
Sampled By:

Client: Foster Wheeler Environmental Corp.
Client Sample ID: 828SB01-1-2-828

Analyte	Result	DF	DLR	Units	Date/Analyst	
418.1 Total Recoverable Petroleum Hydrocarbons						
Total Recoverable Petroleum Hydrocarbons	ND	1	10	mg/Kg	4/20/99	THU
8021 BTEX + MTBE						
Benzene	ND	1	0.005	mg/Kg	4/29/99	PP
Ethyl benzene	ND	1	0.005	mg/Kg	4/29/99	PP
Methyl t - butyl ether	ND	1	0.035	mg/Kg	4/29/99	PP
Toluene	ND	1	0.005	mg/Kg	4/29/99	PP
Xylene (total)	ND	1	0.015	mg/Kg	4/29/99	PP

DLR = Detection limit for reporting purposes, ND = Not Detected below indicated detection limit, DF = Dilution Factor

Order #: 117264
Matrix: SOLID
Date Sampled: 4/13/99
Time Sampled: 07:45
Sampled By:

Client: Foster Wheeler Environmental Corp.
Client Sample ID: 828SB02-1-2-828

Analyte	Result	DF	DLR	Units	Date/Analyst	
418.1 Total Recoverable Petroleum Hydrocarbons						
Total Recoverable Petroleum Hydrocarbons	ND	1	10	mg/Kg	4/20/99	THU
8021 BTEX + MTBE						
Benzene	ND	1	0.005	mg/Kg	4/29/99	PP
Ethyl benzene	ND	1	0.005	mg/Kg	4/29/99	PP
Methyl t - butyl ether	ND	1	0.035	mg/Kg	4/29/99	PP
Toluene	ND	1	0.005	mg/Kg	4/29/99	PP
Xylene (total)	ND	1	0.015	mg/Kg	4/29/99	PP

DLR = Detection limit for reporting purposes, ND = Not Detected below indicated detection limit, DF = Dilution Factor

SECTION 5. SWMU 230 [SITE SS-60: BUILDING 828] (Continued)

5) **Page 5-5, Paragraph 1, Section 5.3.1, Third sentence: "*... the LNAPL thickness was removed in September of 1996 and field observations indicate there is no free-phase LNAPL at Site SS-60.*"**

Has HAFB conducted any confirmatory sampling of LNAPL besides field observations? IF not, HAFB should carry out soil sampling and provide confirmation sample results instead of field observation, to show that the LNAPL plume has indeed been removed.

Response:

Additional confirmatory soil sampling, covering the relatively small hydrocarbon-impacted area, has been performed (see comment 4 above). During each long-term monitoring event, the direct push technology (DPT) sample boreholes were allowed to recharge prior to backfilling at each location. Fluid level measurements were taken every 2 and 12 hours after the soil sample was collected, using an interface probe. At the DPT locations, only water was detected in the boreholes, with no evidence of light nonaqueous phase liquid (LNAPL).

All confirmatory analytical results from the laboratory indicate soil concentrations were below the action levels of 1,000 ppm and 25 ppm for TPH and benzene, respectively. Groundwater level measurements have been taken periodically in on-site monitoring wells, using an interface probe and clear bailers, with results indicating no LNAPL has been observed. Monitoring well observations were made prior to and following the remedial system operational change to bioventing.

Action Taken:

A new figure was generated that summarizes all sample locations at SS-60 (see comment 4, Attachment 1 above) and analytical results indicated soil concentrations were below 1,000 ppm and 25 ppm for TPH and benzene, respectively.

SECTION 5. SWMU 230 [SITE SS-60: BUILDING 828] (Continued)

6) **Page 5-5, Paragraph 1, Section 5.3.1, Last sentence:** ***"Additionally, measurements taken in various groundwater monitoring wells across the site show no evidence of LNAPL on the groundwater table."***

The results of groundwater monitoring wells across the site can be used as evidence of the removal of LNAPL. HAFB should submit the analytical results that support the claim given above.

Response:

The "measurements taken" from various groundwater monitoring wells across the site refer only to water level measurements (see comment response 5). Given the nonpotable condition of the groundwater at site SS-60 (SWMU 230), which contains greater than 10,000 mg/L TDS (average 10,192 mg/L [Woodward-Clyde, 1993]), groundwater sampling and analysis has not been required, nor would sampling and laboratory analysis aid in the determination of whether measurable LNAPL is present.

The combination of the following factors provide the evidence to support that removal of any LNAPL thickness has been achieved and remedial action objectives for site SS-60 (SWMU 230) have been met:

- Visual observations of the extracted fluid prior to system conversion to a SVE operational mode,
- Asymptotic extracted soil gas TPH concentrations prior to system conversion to a biovent operational mode, and
- Depth to water measurements and clear-bailer observations performed in on-site monitoring wells (each indicating the absence of LNAPL).

Action Taken:

Figure 4A-1 (comment 4, Attachment 1 above) has been generated and includes the location of the groundwater monitoring wells at site SS-60. Summary tables, including the timeframe in which the measurements were taken, have also been included as Attachment 1.

Attachment 1

Fluid level measurement summary tables and timeframe, SS-60 (SWMU 230).

SS-60 FLUID LEVEL MEASUREMENTS
01-18-00

WELL	DTP	DTW	PT	BAILER	
230-MW1-E	N/A	7.41	0	NONE	
MW1-N	N/A	N/A	N/A	N/A	
230-MW2-E	N/A	4.39	0	NONE	
MW2-N	N/A	8.07	0	NONE	
230-MW3-N	N/A	6.96	0	NONE	
MW3-N	N/A	N/A	N/A	N/A	Covered (asphalt) and cannot access.
230-MW5-N	N/A	6.51	0	NONE	clear water/some biofouling on probe.
MW5-N	N/A	6.93	0	NONE	
MW6-N	N/A	7.28	0	NONE	
MW4-N	N/A	5.73	0	NONE	

SS-60 FLUID LEVEL MEASUREMENTS
2-26-99

WELL	DTP	DTW	PT	BAILER	
230-MW1-E	N/A	6.99	0	NONE	
MW1-N	N/A	N/A	N/A	N/A	
230-MW2-E	N/A	6.53	0	NONE	
MW2-N	N/A	7.88	0	NONE	
230-MW3-N	N/A	5.1	0	NONE	
MW3-N	N/A	0	0	N/A	No Access / Asphalt
230-MW5-N	N/A	4.65	0	NONE	
MW5-N	N/A	4.65	0	NONE	
MW6-N	N/A	6.78	0	NONE	
MW4-N	N/A	5.64	0	NONE	

SS-60 FLUID LEVEL MEASURMENTS
3-24-99

WELL	DTP	DTW	PT	BAILER
EW-1	N/A	4.39	0	NONE
EW-2	N/A	4.35	0	NONE
EW-3	N/A	5.09	0	NONE
EW-4	N/A	6.63	0	NONE
EW-5	N/A	3.56	0	NONE
EW-6	N/A	3.81	0	NONE
EW-7	N/A	5.84	0	NONE

SS-60 FLUID LEVEL MEASURMENTS
4-19-99

WELL	DTP	DTW	PT	BAILER
EW-1	N/A	4.77	0	NONE
EW-2	N/A	4.92	0	NONE
EW-3	N/A	5.3	0	NONE
EW-4	N/A	6.7	0	NONE
EW-5	N/A	4.12	0	NONE
EW-6	N/A	4.34	0	NONE
EW-7	N/A	6.1	0	NONE

SS-60 FLUID LEVEL MEASURMENTS
8-23-99

WELL	DTP	DTW	PT	BAILER
EW-1	N/A	6.71	0	NONE
EW-2	N/A	6.88	0	NONE
EW-3	N/A	6.91	0	NONE
EW-4	N/A	7.49	0	NONE
EW-5	N/A	6.5	0	NONE
EW-6	N/A	6.86	0	NONE
EW-7	N/A	7.24	0	NONE

MISCELLANEOUS COMMENTS ON AOC-T, SWMUs 133 (SD-47) AND 230 (SS-60):

Miscellaneous comments were discussed and resolved during the NMED/Holloman AFB/USACE Partnering Meeting on February 2, 2000. Comment resolutions, if applicable, were incorporated into the site-specific RSI responses presented above.

1) **The concentrations of benzene in soil do not equate to concentrations of benzene in water. i.e., Base-specific standards do not equate well to the protection of the environment and human health with respect to water contamination.**

Response:

Agreed. Given the conversation that developed during the review meeting, NMED will issue a letter of clarification regarding two issues:

- Remedial action levels for new remediation sites at Holloman AFB relative to TPH and benzene concentrations in soil
- Groundwater beneath/across Holloman AFB is nonpotable given the existing high TDS concentrations greater than 10,000 mg/L

2) **The extent of contamination in each of these sites does not appear to be based on soil and groundwater monitoring, or measurements sufficient to define boundaries as indicated, either by direct verification or extrapolation of existing data.**

Response:

Original contaminant plumes at sites SD-47 (SWMU 133) and SS-60 (SWMU 230) were agreed to have been adequately characterized through rapid response actions, RFIs, numerous soil sampling events, monitoring well data (when applicable), and new/additional data obtained to determine nature and extent of contamination. Investigation out to "action levels" in all directions has been performed and risk analyses have determined there is no unacceptable risk present to human health or the environment.

3) **The copy of Fax transmittal to Diana Spence from Pam Moss (Foster Wheeler header) included in the appendices specifically asks that tests for alkalinity, pH, iron, phosphorous, TKN, etc., be omitted from analysis. All of this information should be used as the basis for supporting microbial activity with respect to TPH degradation. Provide information on the above parameters at all the sites in question.**

Response:

Agreed, this information should be and was used as the basis for supporting microbial activity with respect to TPH degradation. The requested information was already obtained from previous site sampling events, and as a cost-savings measure, was performed every other sampling event. However, the comment was disregarded. As

discussed in Section 4, comment 4, site-specific comment responses, explicit confirmation soil sample laboratory analytical results were more heavily weighted than implicit respiration tests in determining that remedial action goals have been achieved.

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