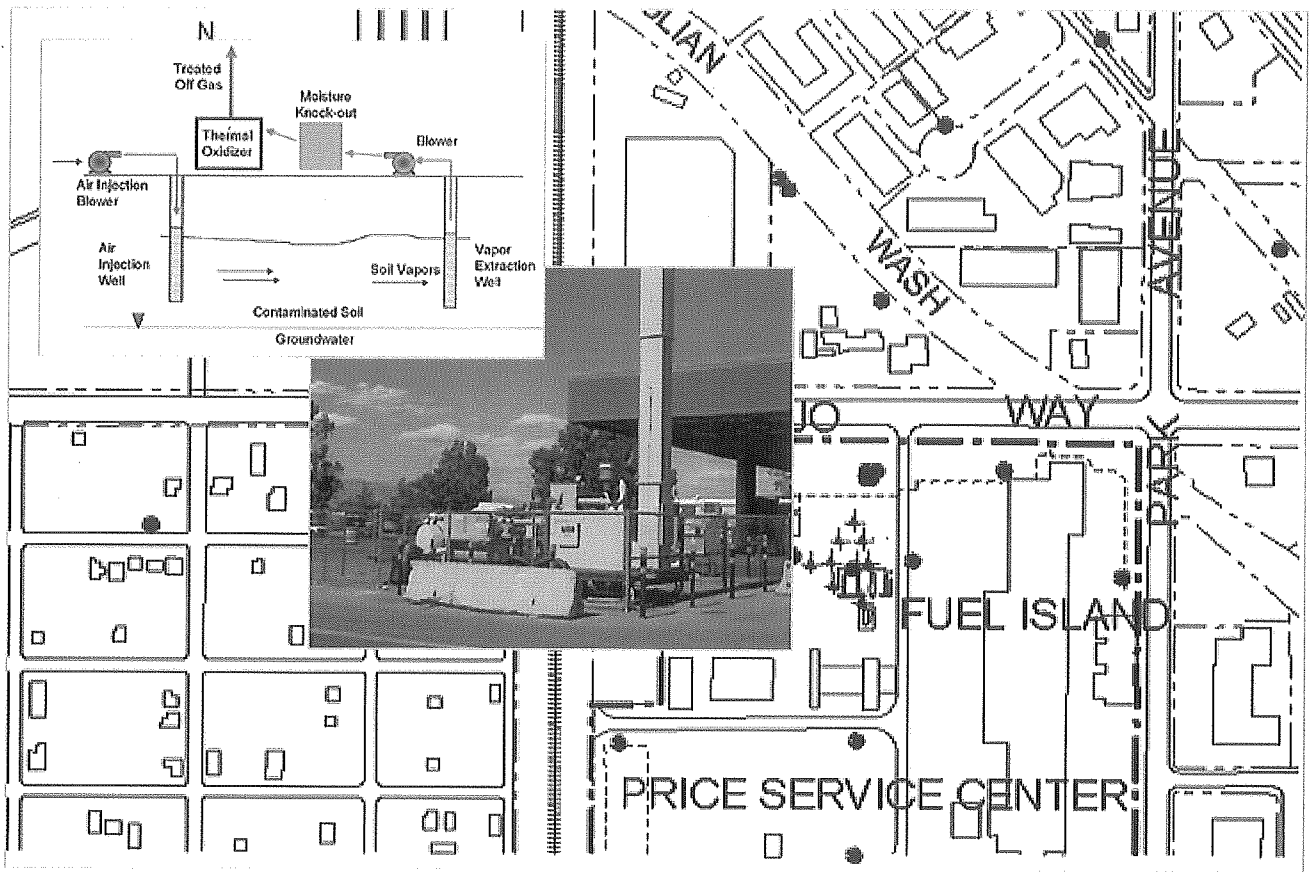
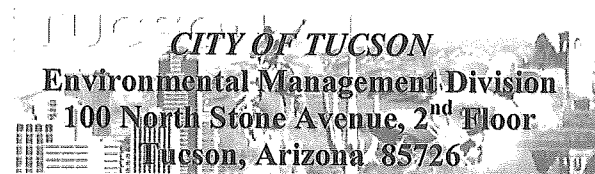


CORRECTIVE ACTION PLAN MODIFICATION

*PRICE SERVICE CENTER
FACILITY ID NO. 0-005160
LUST FILE NO. 0767.01 - .05*



Prepared for:



February 11, 2002

SCS ENGINEERS



CITY OF
TUCSON

OFFICE OF THE
CITY MANAGER

February 7, 2002

Mr. David Burchard, Hydrologist
Arizona Department of Environmental Quality
UST Site Investigation and Remediation Unit II
3003 N. Central Avenue, T4014A
Phoenix, Arizona 85012-2905

**RE: City of Tucson - Price Service Center Facility
Modification to Corrective Action Plan
Facility ID No. 0-005160, LUST File No. 4715.0767**

Dear Mr. Burchard:

Please find attached a copy of the "*Modification to Corrective Action Plan*" (MCAP) prepared by SCS Engineers for the City of Tucson, Price Service Center Facility. This document summarizes the City of Tucson's proposed plans for remediation at the Tucson Fire Station No. 10, and Price Service Center sites. The written comments you provided to the City in a facsimile dated January 7, 2002, were incorporated in the Final MCAP. An updated project schedule has also been included in the Final MCAP.

The City has received bids for construction of the Vacuum-Enhanced Liquid Phase Recovery (VELPHR) system. We will be awarding the construction contract to the successful bidder within the next two weeks. Construction on the VELPHR system is anticipated to begin by early March 2002.

If you have any questions regarding the Final MCAP or VELPHR construction plans, you may contact Brad Johnston (SCS Engineers) at (602) 840-2596 or David Barraza at (520) 791-5937, Ext. 1012.

Respectfully Submitted

Karen Masbruch
for Karen Masbruch
Director

CC: Brad Johnston, SCS
David Barraza, EM
File

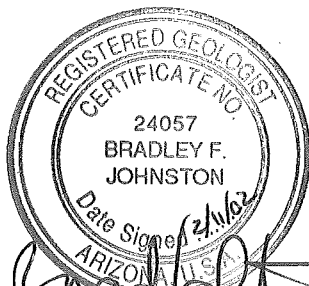
**CORRECTIVE ACTION PLAN MODIFICATION
PRICE SERVICE CENTER
FACILITY ID NO. 0-005160
LUST FILE NO. 0767.01-.05**

Prepared For:

CITY OF TUCSON
Environmental Management Division
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Bradley F. Johnston, P.G.
Vice President
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A handwritten signature in black ink, appearing to read "Brad Anderer".

Brad Anderer
Project Manager

FEBRUARY 11, 2002



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SECTION 1 BACKGROUND

The Thomas O. Price Service Center is a vehicle and equipment service and repair facility for the City of Tucson, located at 4004 South Park Avenue, Tucson, Arizona (Figure 1). This facility is the site of several releases from an underground fuel storage tank system (ADEQ LUST file numbers 0767.01 - .05).

The Price Service Center (PSC) contained underground storage tanks (USTs) and associated features, and is located on the south side of Ajo Way. The PSC appears to be the source of liquid-phase and dissolved petroleum groundwater contamination that extends beneath the City of Tucson Fire Station No. 10 (TFS) located directly north of the PSC on the north side of Ajo Way. The facility is considered to consist of two sites: the PSC and the TFS. These two sites are depicted on Figure 2. This document is intended to address groundwater remediation at the TFS site.

The original Corrective Action Plan (original CAP) for the site was prepared by Hydro Geo Chem, entitled Corrective Action Plan For Soil and Groundwater, Thomas O. Price Service Center, Tucson, Arizona, dated December 16, 1994. A Revised Corrective Action Plan (revised CAP) was prepared by Fluor Daniel GTI on March 13, 1997, and was entitled Revised Corrective Action Plan, Thomas O. Price Service Center, Tucson, Arizona.

An addendum to the CAP was prepared by the IT Group (IT) on February 14, 2001, and was entitled Corrective Action Plan Addendum, Thomas O. Price Service Center, Tucson, Arizona. The CAP Addendum addressed both the TFS and PSC sites, and discussed previous site assessment actions (Section 3), corrective actions (Section 4), and corrective action goals (Section 5). It also contained data regarding pilot-scale testing (Appendix 4) and groundwater monitoring (Appendices 5, 6, and 7).

SECTION 2 PURPOSE OF CAP MODIFICATION

This Corrective Action Plan Modification (CAP Modification) is a modification of the Corrective Action Plan approved in ADEQ's letter entitled Corrective Action Plan – Final Approval, (Ref. No. 79-0014135) dated August 28, 1997. The purpose of the CAP Modification is to achieve the corrective action goals approved in the corrective action plan as approved in ADEQ's above-referenced letter. This document is intended to describe the proposed remediation strategy for liquid-phase hydrocarbons (LPH) at the TFS site.

SECTION 3 CURRENT REMEDIAL ACTION STATUS

3.1 PARTIES CURRENTLY PERFORMING WORK

The consultant for this project was changed in Spring of 2001 from IT Corporation (IT) to SCS Engineers (SCS). The Verdad Group, L.L.C. is providing routine monitoring and maintenance services under contract with the City of Tucson.

3.2 TUCSON FIRE STATION SITE

3.2.1 Automated LPH Recovery

An automated LPH recovery system was installed on the eastern portion of the site in December 2000. The LPH recovery system connected five wells (R-032A, R-033A, R-034A, R-036A, and R-047A) to an aboveground 500-gallon storage tank. Three pneumatic pumps were placed in selected wells to remove LPH.

Due to low levels of LPH in most of the wells connected to the skimming system, the pneumatic pumps were deactivated for maintenance and repair in March 2001. On April 10, 2001, the automated LPH recovery system was re-activated in well R-032A. The other wells on the LPH recovery system have been temporarily disconnected from the automated skimmer system because the wells do not contain consistently recoverable amounts of LPH at this time. The most recent LPH measurements (July 10, 2001) were 0.02 foot for R-047, 0.05 foot for R-036, a sheen for R-034, and none for R-033.

3.1.1 Manual LPH Recovery

In March 2001, passive LPH recovery units (Keck PRC Passive Skimmers with a capacity of four liters) were installed in selected wells to recover LPH on a continuous basis. Wells equipped with these devices include R-029A, R-030A, R-027A, R-031A, R-048A, R-049A, R-050A, and R-051A. The passive recovery units are emptied approximately every two weeks into the LPH storage tank that is part of the automated system.

3.2 PRICE SERVICE CENTER SITE

3.2.1 Soil Vapor Extraction

The Catalytic/Thermal Oxidizer (CATOX) unit that was formerly operated by the IT Group at the Price Service Center was removed from the site and replaced with a Paragon ET-150 CATOX unit owned by the City of Tucson. The IT unit was removed from the site on March 14, 2001, and the City-owned Paragon unit was moved to the site on February 27, 2001. The City of

Tucson notified the Pima County Department of Environmental Quality on March 8, 2001, that the Paragon ET-150 unit had been relocated to the PSC.

The Paragon ET-150 was converted to use natural gas as supplemental fuel in May 2001, and hookup was completed and the unit started on June 22, 2001. The current operating parameters of the Paragon ET-150 unit are as follows:

- Catalytic Temperature: 700 ° F
- Thermal Temperature: 700 ° F
- Total Flow: 180 cfm
- Total Vacuum: 72 inches of WC
- Manual Dilution Valve: 100% closed

At the present time, only vapor extraction well SVE1 is connected to the system since it exhibited the highest vapor concentrations during field monitoring. Additional vapor extraction wells will be included as recovery trends are evaluated.

3.2.2 Enhanced Intrinsic Bioremediation

As proposed in Section 6.2 of the March 13, 1997 Revised CAP and described in Section 4.2.1 of the February 14, 2001 CAP Addendum, IT implemented enhanced intrinsic bioremediation (EIB) on the Price Service Center, and nutrient injection was discontinued in the second quarter of 1999. The progress of EIB continues to be monitored during groundwater monitoring events, and no additional injection of nutrients has occurred.

SECTION 4 REMEDIAL ACTION AND REMEDIAL DESIGN

4.1 REMEDIAL ACTION

Proposed remedial actions include the following:

- Source removal from the vadose zone at the PSC site by soil vapor extraction;
- Enhanced intrinsic bioremediation;
- Mitigation of LPH through implementation of Vacuum-Enhanced Liquid Phase Hydrocarbon Recovery (VELPHR)

The first two actions are currently being performed at the site as described above. VELPHR is proposed to more effectively remove LPH from the TFS site.

VELPHR will consist of pumping groundwater and LPH from one total fluids recovery well (designated as TFW-01), and vapor extraction from other multi-purpose wells on the site. The

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existing automated LPH recovery system and passive LPH recovery units will also continue to be utilized to remove LPH from site wells.

Due to low well yields on the western portion of the site, total fluids will not be pumped from this area. To recover LPH on the western portion of the site, soil vapor extraction will be used to accelerate volatilization of LPH and recover LPH in the vapor phase.

4.2 REMEDIAL DESIGN

4.2.1 Overview

To develop the Remedial Design for the TFS, SCS evaluated the results of the VELPHR pilot test performed by IT on the eastern portion of the TFS. Because the VELPHR pilot test addressed only the eastern portion of the site (where the vadose zone and the shallow groundwater zone appear to have greater transmissivity than the western portion of the site), SCS performed a second pilot test (identified herein as the Soil Vapor Extraction (SVE) Pilot Test). The SVE Pilot Test was performed in May 2001 to evaluate vapor and LPH recovery potential on the western portion of the site. Data obtained from the SVE Pilot Test, and the VELPHR pilot test were used to establish the basis-of-design for the Remedial Design contained herein.

4.2.2 VELPHR Pilot Test

The VELPHR pilot test was conducted at the TFS by IT in March 1999. The VELPHR pilot test was structured to determine the following:

- Recovery of total liquids under aquifer pumping conditions only;
- Recovery of total fluids by the addition of vacuum to the pumping well;
- Performance of a soil vapor extraction test without pumping water from the aquifer; and,
- Analysis of aquifer response in the surrounding wells to determine preliminary aquifer characteristics.

The VELPHR pilot test, which is described in detail in Sections 4.3 and Appendix 3 of the IT CAP Addendum, determined that VELPHR was a technically feasible and appropriate corrective action alternative for recovery of LPH from the TFS site.

Based on these findings, a conceptual Remedial Design was presented in Section 6.3 of the CAP Addendum. This conceptual design indicated that the radius of influence for the vapor extraction wells was assumed to be 32 feet. Although the VELPHR pilot test data was provided in the CAP Addendum, the calculations used to establish this preliminary radius of influence were not provided.

To verify the preliminary radius of influence, SCS evaluated the VELPHR pilot test data. This evaluation indicated that the radius of influence for the SVE system may be on the order of 80 feet, rather than 32 feet as originally stated. Radius-of-influence calculations are provided in Appendix A, and are shown on Figure C3A in Appendix C.

4.2.3 SVE Pilot Test

The SVE Pilot Test was performed to evaluate vapor and LPH recovery potential on the western portion of the site. The SVE Pilot Test was conducted by SCS from May 16 through May 22, 2001. The SVE Pilot Test was performed using wells R-049A and R-030A, which are located on the western edge of the site. These wells were selected for testing test because they had historically contained at least 0.5 feet of LPH, and were accessible to pilot test equipment without interfering with fire station activities.

The objectives of the SVE Pilot Test included evaluation of the following:

- Potential changes in LPH accumulation rate between static and vacuum conditions;
- Potential contaminant recovery rates from the SVE system;
- The relationship between applied vacuum and flow rate in multi-purpose wells on the western portion of the TFS site; and
- The potential radius of influence for multi-purpose wells on the western portion of the TFS site.

A description of the SVE Pilot Test, including the test methodologies, equipment used, data collected, laboratory analysis, and conclusions are presented in a Technical Memorandum provided in Appendix B.

4.2.4 Basis of Design

Based on the results of this SVE Pilot Test, SVE appears to be a viable means for recovery of LPH on the western portion of the site. Measured vapor concentrations during the pilot test ranged from 98 ppmv to 1,834 ppmv of total fuel hydrocarbons (TVHC). Because the source of contamination is not on the TFS site and is beyond the radii of influence of the test wells, these vapors were associated with LPH on the shallow groundwater zone. Conservative assumptions indicate that the initial recovery rate for all 19 extraction wells may be over 1,000 pounds per day of gasoline equivalent.

This Pilot Test did not provide information regarding radius of influence for extraction wells. As stated in Section 4.2.2, the proposed radius of influence is based on calculations provided in Appendix A.

The following basis of design has been established for the VELPHR system:

LPH and Total Fluids

- Install one total fluids recovery well located east of the existing treatment facility. Equip the well with a 5 gpm pneumatic pump to withdraw LPH and groundwater;
- Treat the LPH and groundwater extracted from the total fluids well through an oil/water separator and granular activated carbon;
- Containerize and dispose or re-use separated LPH;
- Discharge treated water from the carbon vessels into the storm sewer system; and
- Utilize the existing automated skimmer system, passive recovery bailers, and manual bailing methods to remove LPH from other site wells.

Vacuum Enhanced LPH Removal (Soil Vapor Extraction)

- Radius of Influence for vapor extraction recovery is assumed to be 80 feet;
- Utilize 18 existing multi-purpose wells as SVE wells;
- Based on the assumed radius of influence, recent LPH distribution trends, and surface access considerations, install one new multi-purpose well (R-052) near the western boundary of the site that will serve as an SVE well;
- Extract vapors from the 19 multi-purpose wells at an average flow rate in the 5 to 15 scfm range; and
- Treat extracted vapors with a 250-scfm thermal oxidizer.

4.2.5 VELPHR Design Drawings

The Permit Drawings (reduced to 11" by 17") for the VELPHR system are provided in Appendix C. Construction Drawings for the VELPHR system will be issued to the City of Tucson Development Services Department for plan review and issuance of construction permits. A summary of the VELPHR components is listed below.

The following existing components will be used in the VELPHR system:

- Multi-purpose wells: R-027A, R-028A, R-029A, R-030A, R-031A, R-032A, R-033A, R-034A, R-035A, R-036A, R-037A, R-047A, R-048A, R-049A, R-050A, R-051A, R-052A (proposed well), WR-212, and WR-224;
- 500-gallon dual-walled aboveground storage tank for separated LPH;
- Air compressor to operate pumps;
- Automatic LPH skimmers in wells R-032A, R-033A, R-034A, R-036A, R-047A, and R-051A;
- A fenced area to securely house the treatment system.

The following new components will be used in the VELPHR system:

- Total Fluids Well (TFW-01) equipped with a 5 gpm pneumatic pump;
- Oil water separator with coalescing media;
- 250-gallon equalization tank with a 20 gpm electric submersible transfer pump;
- (2) 1,200-pound granular activated carbon vessels;
- Multi-purpose well (R-052A);
- 250-scfm thermal oxidizer.

Permits required for installation of the VELPHR system include the following:

- Arizona Department of Water Quality well drilling permits for installation of the total fluids well and the additional multi-purpose well (approved August 2001).
- National Pollutant Discharge Elimination System (NPDES) Permit for discharge of treated water to the Julian Wash (submitted to ADEQ May 8, 2001, pending).

- City of Tucson Development Services Department construction permit (approved August 21, 2001)

4.3 VELPHR SYSTEM IMPLEMENTATION

4.3.1 SVE System

The 19 multi-purpose wells connected to the thermal oxidizer are partitioned into five operating zones as shown on Sheet C-3 of the permit drawings provided in Appendix C. Each zone contains 3 to 5 wells. The zones are intended to group wells based on their location on the site (wells distant from the vacuum blower versus close to the blower), and subsurface conditions (wells in “tight” lithology separate from those in more permeable materials). The zones can be operated at separately or together, and solenoid-actuated valves for each zone will provide the ability to automatically cycle between zones during routine operation. Individual wells within each zone can be adjusted manually.

Flow and vacuum adjustments will be made to the system during the startup phase based on the vapor concentrations being extracted and observed changes in groundwater depth (if any). If initial vapor concentrations are elevated such that all zones cannot be run simultaneously, it is anticipated that each zone will be operated separately. A clock timer will be used to cycle the system between selected zones. It is anticipated that initial remedial efforts will be focused on the western and eastern margins of the site to minimize the possible off-site migration of LPH.

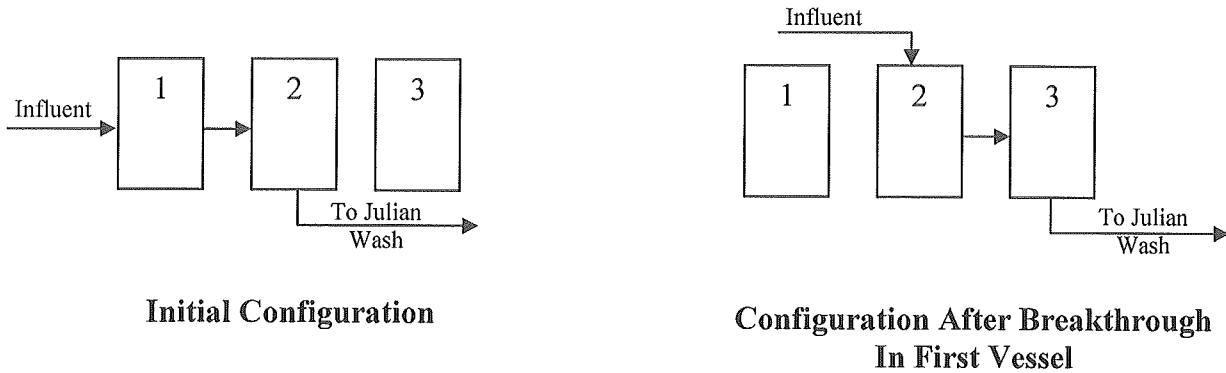
Long-term vapor concentration, flow rate, and vacuum trends will be analyzed to evaluate whether system modifications (such as additional SVE wells, flow-rate changes, zone reconfiguration, etc.) are necessary.

4.3.2 Total Fluids Extraction System

Based on the VELPHR pilot test performed by IT, it is anticipated that LPH and groundwater will be extracted from the total fluids extraction well at a rate of approximately 5 gallons per minute. Adjustments may be made to this flow rate as necessary to achieve the optimal amount of drawdown of the groundwater table for LPH capture.

Effluent samples will be collected from the groundwater treatment system to verify that effluent concentrations discharged to the Julian Wash are below the Maximum Daily Values in Section V of the NPDES Application for Permit to Discharge Process Wastewater Form 2D. This permit application was submitted to ADEQ on May 8, 2001, and approval is pending. The methodology described below may change if changes are made to the NPDES permit application during the approval process.

During each sampling event, three samples will be collected: one sample will be collected from the influent to the first vessel, and one sample will be collected from the effluent of each of the two vessels. When this sampling indicates that “breakthrough” occurs in the first vessel, it will be removed from the system for regeneration, the second vessel will take its place, and a third vessel will be added to replace the second. This approach will ensure that breakthrough will not occur in the final vessel.



For the first four weeks of operation, influent and effluent samples will be collected weekly from the groundwater treatment system. For the next six months, influent and effluent samples will be collected on a monthly basis. The sampling frequency for the remainder of the operation will be based on the sampling results from the first six months of operation (i.e. how soon breakthrough occurs in the first vessel), but will be no less than quarterly.

Samples will be analyzed as shown on Table 1 below. The discharge limits are under review by the ADEQ Water Permits Unit. If the discharge limits are exceeded by the system effluent, the system will first be shut down and tested to evaluate carbon effectiveness, and if necessary, reconfigured for different flow rate, or to operate with fewer or less contaminated wells.

| CONSTITUENT | ANALYTICAL METHOD (or equivalent) |
|-------------------------------------|---------------------------------------|
| Biochemical Oxygen Demand | EPA Method 405.1 |
| Chemical Oxygen Demand | HACH 8000 |
| Total Organic Carbon | SM 5310C |
| Ammonia | EPA Method 350.1 |
| Total Suspended Solids | EPA Method 160.2 |
| Temperature | Field measurement |
| pH | Field measurement or EPA Method 150.1 |
| Flow | Field measurement |
| Benzene, Toluene, Ethylbenzene, and | EPA Method 8021B |

| CONSTITUENT | ANALYTICAL METHOD (or equivalent) |
|-------------|-----------------------------------|
| Xylenes | |
| Sulfate | EPA Method 375.4 |

4.3.3 LPH Skimming System

Five wells on the eastern portion of the site near the total fluids extraction well will be connected to the automated LPH skimming system. These wells were selected for inclusion in the automated skimming system based on historical accumulation of LPH, and their locations near the total fluids extraction well. It is anticipated that, as the groundwater table is lowered by the total fluids extraction well, LPH accumulation will increase in these wells. If the VELPHR system increases the rate of LPH accumulation in other wells, the automated LPH skimming system may be expanded to those wells. LPH will be recovered as necessary from other wells on the site using passive recovery bailers or hand bailing.

4.3.4 Status Reporting

Status reports will be provided on a semi-annual monthly basis. Reports will describe the operational record of the 19 wells and 5 zones, the amount of total fluids processed, LPH recovered, and other operating parameters as applicable. One of the semi-annual reports will be combined with the annual groundwater monitoring report, and the other semi-annual report will be a stand-alone document.

4.4 OTHER REMEDIAL ACTIONS

4.4.1 Manual LPH Recovery

Manual recovery of LPH will continue on the TFS site until the VELPHR system is implemented. After the system is implemented, wells not equipped with automated skimmers will be checked and hand bailing will be performed or passive recovery device will be emptied as necessary every other week. Status reports will be provided on a monthly basis describing the amount of LPH recovered.

4.4.2 Price Service Center SVE System

The soil vapor extraction system on the Price Service Center site will continue operation. Changes in extraction well configuration may be periodically made to optimize recovery rates. Vapor monitoring and system adjustments, if applicable, will be performed every other week (alternating with manual LPH recovery). Status reports will be provided on a monthly basis

describing the operating parameters, vapor monitoring results, and estimated amount of hydrocarbons recovered.

4.4.3 Enhanced Intrinsic Bioremediation

Enhanced Intrinsic Bioremediation (EIB) will continue in its current monitoring mode. Addition of nutrients to groundwater as part of EIB has been temporarily suspended until nitrate concentrations stabilize at background levels. When existing nitrate levels decrease and pH increases to approximate background levels, nutrient injection may be resumed if necessary.

4.4.4 Groundwater Monitoring

As stated in Section 7.2 of the February 14, 2001 CAP Addendum, the frequency of groundwater monitoring was changed from quarterly to annual. The first annual sampling event was performed in April through August 2001 and was described in the Annual 2001 Shallow Groundwater Zone Monitoring Report, dated August 31, 2001. Table 1 in Appendix E identifies wells to be sampled and sampling parameters. Future groundwater sampling events will be described in annual groundwater monitoring reports.

4.5 SCHEDULE

The proposed schedule for remedial actions is provided in Appendix D. As shown on the schedule, Enhanced Intrinsic Bioremediation (EIB) will continue in its current monitoring mode. Addition of nutrients to groundwater as part of EIB has been temporarily suspended until nitrate concentrations stabilize at background levels. When existing nitrate levels decrease and pH increases to approximate background levels, nutrient injection may be resumed if necessary.