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LETTER TRANSMITTING THE REMEDIAL ACTION PLAN FOR RISK BASED REMEDIATION OF SOLID WASTE MANAGEMENT 64, 67, 68 AND AREA OF CONCERN 7 NAS FORT WORTH TX

9/17/1997

AIR FORCE CENTER FOR ENVIRONMENTAL EXCELLENCE

File: 17G
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NAVAL AIR STATION
FORT WORTH JRB
CARSWELL FIELD
TEXAS

ADMINISTRATIVE RECORD
COVER SHEET

AR File Number 339

File: 17A-39
A.F. 339

DEPARTMENT OF THE AIR FORCE
HEADQUARTERS AIR FORCE CENTER FOR ENVIRONMENTAL EXCELLENCE
BROOKS AIR FORCE BASE TEXAS

15 September 1997

MEMORANDUM FOR MR. MARK WEEGAR
Pollution Cleanup Division
Superfund Remediation Section
P.O. Box 13087, Mail Code 144
Austin, TX 78711-3087

FROM: HQ AFCEE/ERD
3207 North Road
Brooks AFB, TX 78235

SUBJECT: Final Remedial Action Plan for the Risk-Based Remediation of Site ST14 (SWMU 68), LPST ID 104819; the Former Base Refueling Area (AOC 7); the French Underdrain System (SWMU 64); and the North Oil/Water Separator (SWMU 67), NAS Ft. Worth JRB (Tarrant County), Texas, Facility ID No. 009696

Dear Mr. Weegar,

Enclosed please find one (1) copy of the two-volume RAP for the above-mentioned sites at NAS Fort Worth JRB. This final revision incorporates all comments received to date from the Texas Natural Resource Conservation Commission (TNRCC) with regard to developing a closure plan that also satisfies the requirements of 30 Texas Administrative Code (TAC) Chapter 335 (Industrial Solid Waste and Municipal Hazardous Waste, Subchapter S (Risk Reduction Standards)) for the solid waste management facilities and other areas that comprise Site SD13. The previous version of the RAP, issued in April 1996, was determined to be adequate to address proposed remediation activities to be conducted at Site ST14 in compliance with TNRCC's petroleum storage tank (PST) program requirements.

Also included in this transmittal is a response to comments package. Each comment received to date has been included, and the response (including required revision as incorporated into this latest version of the RAP) is presented.

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To facilitate your review of the revisions, following is a summary of where and how the RAP was expanded to address comments received on earlier versions.

- Only minor revisions were made to Section 1 of the RAP, to summarize the conclusions of the risk assessment completed for Site SD13 in compliance with 30 TAC Chapter 335, Section 335.

- Sections 2 and 3 were modified to include all characterization and monitoring data collected at the sites through January 1997. Section 2 also now summarizes the interim removal action completed at SWMU 64 and SWMU 67 in 1996 under the direction of TNRCC. This information had previously only been presented as proposed actions in the RAP, and summarized as completed in the November 1996 Field Activity Report (FAR) developed for TNRCC PST.

- Section 4 (the Plan A Assessment for Site ST14) was updated only to include fuel hydrocarbon characterization/monitoring data collected after 1995; no substantive change in conclusions was warranted by these data.

- Section 5 has been added to the RAP to satisfy the basic requirements of 30 TAC Chapter 335, Sections 335.554 through 335.559 for the areas comprising Site SD13. This section is functionally equivalent to a Plan A Assessment under the PST program, except that different "screening" criteria are applied (pursuant to the Risk Reduction Standards program). This section identifies the environmental media and chemicals of potential concern for Site SD13, inclusive of inorganics, chlorinated compounds, and fuel-related hydrocarbons.

- Section 6 (previously Section 5) has been expanded to review the natural chemical attenuation processes that appear to be affecting the fate and transport of inorganic compounds at Site SD13. In summary, the presence of organic contamination has resulted in a localized change in geochemical conditions at and downgradient from past release areas. These localized changes in reduction/oxidation potential (ORP) conditions have affected the mobility of several inorganic compounds (e.g., arsenic and manganese). There are clear patterns in site characterization data indicating that elevated dissolved metal concentrations coincide with areas with low ORP. A discussion of the chemical basis for these mechanisms has been included in this section, to explain the presence of inorganic compounds in groundwater at concentrations above preliminary background levels. Once localized ORP conditions are restored to pre-contamination levels (i.e., when significant organic mass removal has been completed),

concentrations of inorganic compounds in groundwater are expected to decrease to background levels. This section also describes data relevant to documenting no adverse impact to downgradient surface water from inorganic compounds in groundwater underlying Site SD13.

- Section 7 (previously Section 6) is the Plan B risk assessment for Site ST14. No substantive change in the conclusion of this evaluation has been made.

- Section 8 has been added to the RAP to present the results of a site-specific quantitative risk assessment prepared for Site SD13 in compliance with the requirements of Risk Reduction Standard Number 3. The risk assessment, which includes a recreator/trespasser exposure scenario, indicates that current levels of residual contamination in soil, groundwater, and surface water and remaining engineered components of SWMUs at Site SD13 do not result in cumulative risk estimates above the TNRCC target risk threshold. Consequently, no additional removal or active remediation is required to provide the desired level of risk reduction at these sites. Natural decontamination processes have been and will be sufficient to protect current and potential future receptors. However, pursuant to the requirements of Risk Reduction Standard Number 3, the site may only be deemed suitable for remediation with controls (i.e., continued monitoring of natural decontamination processes). A deed recordation will be required and will be submitted once the final RAP has been approved by TNRCC.

- Section 9 (previously Section 7) summarizes the source reduction treatability testing results for Site ST14. Updates on the progress of bioventing/biosparging at Site ST14A have been and should continue to be covered in FARs developed for TNRCC PST.

- Section 10 (previously Section 8) summarizes the remedial alternatives analysis for both Site ST14 and Site SD13. The alternatives have been slightly modified to (1) change the status of the abandonment activities associated with the french underdrain and the north oil/water separator from proposed to complete and (2) increase the frequency of monitoring from annual to quarterly, pursuant to the requirements of the Groundwater Sampling and Analysis Program (GSAP) that is currently being implemented basewide. Language relevant to satisfying the requirements of Risk Reduction Standard Number 3, which hinges on describing specific remedy evaluation factors, also has been added.

- Section 11 (previously Section 9) presents the implementation plan for the recommended remedial alternative for both sites. No substantive change in recommended approach has been included in the RAP. Modifications to this section were limited to updating the scope of proposed monitoring activities, elaborating on land use controls/deed recordation requirements, and revising the proposed implementation schedule.

- Section 12 (previously Section 10) describes the long-term monitoring plan for both Sites ST14 and SD13. This plan has been modified slightly to match the GSAP currently being implemented at these sites. These revisions resulted in the addition of 2 new wells per TNRCC request (to the 2 new wells previously proposed to be installed at the sites) and a monitoring network of 22 wells (in comparison to the previously-recommended 18 wells).

- Section 13 (previously Section 11) presents the list of updated references used to prepare this final RAP.

I believe that this RAP adequately addresses all TNRCC comments. There should be no further issues on this plan between the AFCEE and TNRCC, except that I will keep you (and TNRCC PST) apprised of results from ongoing monitoring activities completed pursuant to the RAP. The Air Force has expended significant resources to revise this RAP and no additional funds are available for further revisions. Therefore any questions or comments you have will be addressed in letter format by AFCEE.

The Air Force will immediately implement the remedial actions outlined in the RAP. Please respond with any comments and/or approval of the document no later than 21 November 1997. Should you have any questions or wish to discuss this letter, please contact me at (210) 536-5290.

Sincerely,

Joseph R. Dunkle
Remedial Program Manager
NAS Ft. Worth JRB

cc:
Tim Sewell (TNRCC Region 4 Field Office)
Antonio Pena (TNRCC PST)
Rafael Casanova (EPA Region 6)
Jim Costello (Hydrogeologic)
Alan Flolo (AFBCA-OL/H - for administrative record)

SUMMARY OF IMPLEMENTED RESPONSES TO COMMENTS
REMEDIAL ACTION PLAN FOR RISK-BASED REMEDIATION OF SITE ST14 (SMWU 68), LPST ID 104819;
THE FORMER BASE REFUELING AREA (AOC7); THE FRENCH UNDERDRAIN SYSTEM (SWMU 64); AND THE NORTH OIL/WATER SEPARATOR (SWMU 67), CARSWELL AFB/NAS FORT WORTH JRB, TEXAS

Author/Date of Comment	Internal Number	Comment	Proposed Response
Joseph R. Dunkle, Environmental Restoration Division Contracting Officer's Representative, Brooks AFB, TX (5/6/97)	1	Provided is new guidance for closure of LPST [from TNRCC]. Please refer to it when working on projects of this sort at AFCEE.	This guidance specifically sets forth TNRCC's new technical direction for expediting closure at PST sites. The guidance emphasizes the need for an exposure pathways evaluation and how to delineate site contamination. A brief review of this infomation indicates that the current version of the RAP for Site ST14 substantively meets all the requirements set forth by TNRCC in these guidance materials. The Air Force may want to eventually consider presenting the CSM using the soils and groundwater exposure pathways figures specified by TNRCC. This information will need to be included in the *Site Closure Request*, which needs to be prepared by a registered Corrective Action Specialist (CAS) once the appropriate cleanup criteria have been achieved via bioventing and/or natural attenuation. The main revisions to the RAP are prompted by the need to meet the requirements of the Industrial and Hazardous Waste Division (IHW), specifically 30 Texas Administrative Code (TAC) Chapter 335, Subchapter S. It is our understanding that the RAP for Site ST14 has been approved by TNRCC PST, and subsequent revisions of the RAP that are prepared to address TNRCC IHW concerns will not be submitted to the PST group for additional review. The only remaining steps to be taken at the site to meet the current requirements of the PST program are (1) submission of a *Monitoring Event Summary and Status Report form*, as required, (2) submission of a *Product Recovery Report form*, as necessary, (3) submission of a *Field Activity Report form* to document completion of non-monitoring activities at the site, and (4) submission of a *Site Closure Request*, as appropriate (e.g., must be supported by results from at least 4 monitoring events).

Paul S. Lewis, Corrective Action Section, Industrial and Hazardous Waste Division, TNRCC (4/28/97)	1	The groundwater at site SD-13 will be protected for residential use and high aquatic life habitat in the nearby surface waters of Farmers Branch and the Trinity River. The use of cleanup levels based on idustrial groundwater use and/or PST Beneficial Use II standards off-site are not acceptable. As a result, the list of COPCs for soil and groundwater should be reevaluated for compliance with 30 TAC 335, Subchapter S.	The original intent of the AFCEE risk-based demonstration program at Carswell was to pursue a risk-based remedy for Site ST14 (SWMU 68), which is under jurisdictional authority of TNRCC PST. Since the RAP has slowly evolved to also include the former base refueling area (AOC 7), the french underdrain system (SWMU 64), and the north oil/water separator (SWMU 67), AFCEE understands the need to augment/modify the RAP to meet the substantive requirements of 30 TAC Chapter 335, Subchapter S. Consequently, the list of COPCs for Site SD13 have been re-evaluated using the cleanup criteria for Risk Reduction Standard Number 2 (residential exposure scenario). It was not necessary to further refine the list of COPCs to comply with the requirements of Risk Reduction Standard Number 3, as appropriate.
	2	We appreciate the discussion in Item 4 of AFCEE's letter concerning the toxicity of fuel products.	Comment acknowledged.
	3	Please include monitor well OT12-MW15C in the groundwater monitoring program proposed in AFCEE's April 1996 Remedial Action Plan (Figure 10-1). OT12-MW15C was the well that contained chlorinated solvents.	The RAP will be revised to reflect the current monitoring program being implemented in the East Area under the currently-approved groundwater sampling and analysis program (GSAP). The cited well has been included in the monitoring network for this area, and is now being sampled quarterly. However, the revised RAP recommends that this particular well be replaced by the installation of a new well drilled about 50 feet downgradient from existing well OT12-MW15C. This new well can then be used to better assess the potential for downgradient migration of compounds historically detected at OT12-MW15C.
	4	Final closure of site SD-13 cannot occur until the groundwater plume in that area has demonstrated compliance with 30 TAC, Subchapter S. However, transfer of the property may occur upon demonstrating that the remedial action system is fully functional.	The RAP now focuses on demonstrating that, given available information, the appropriate remedial actions have been taken or are being taken at AOC 7, SWMU 64, and SWMU 67 to adequately protect human health and the

			environment from potential exposure to contaminants associated with past releases. The short-term objective of this demonstration is to support timely transfer of the property. As discussed in the next response, final closure of these areas may pend upon additional sampling results that are not available at this time.
	5a	We cannot respond to AFCEE's contention that the proposed remedy is adequate to protect human health and the environment until all Appendix IX constituents are compared to 30 TAC 33 Subchapter S cleanup levels. At this time, it appears that AFCEE's fate and transport model only addresses those soil and groundwater contaminants that exceed PST's Benficial Use Category II for an industrial site, i.e., benzene. This opinion is based upon information contained in Section 1.1.2, Table 4.1 and Table 4.2 of the April 1996 Remedial Action Plan for the Risk-Based Remediation of Site ST-14.	As discussed previously, the initial objective of this RAP was to secure a risk-based remedy for Site ST14 (SWMU 68), which is under the jurisdictional authority of TNRCC PST. Consequently, the RAP had initially been completed to satisfy these requirements; TNRCC PST concurs with the conclusions with regard to this specific site. However, the scope of the RAP has slowly expanded, at TNRCC's request, to also include areas downgradient from Site ST14. These areas have remained under jurisdictional authority of TNRCC IHW. Consequently, the RAP has been modified to evaluate available site characterization data in the context of 30 TAC 33 Subchapter S cleanup levels as well. The list of COPCs for Site SD13 has expanded to include several inorganic compounds and a few halogenated compounds (see new Section 5). No fate and transport modeling has been completed for these compounds to predict future exposure-point concentrations. Rather, all compounds detected in site media at Site SD13 above established background levels are quantitatively evaluated in a site-specific risk assessment, pusuant to the requirements of Risk Reduction Standard Number 3 (see new Section 8). Existing concentrations of chemicals in onsite media and associated with in-place engineered components of the SWMUs do not result in cumulative risks near or above the upperbound lifetime target risk threshold of 1×10^{-4} for carcinogens and unity (1) for noncarcinogens. Available data now presented in the RAP indicate that all SWMUs associated with Site SD13 may be amenable to continued remediation/monitoring with controls (i.e., planned land

			use and deed recordation); the Air Force intends to pursue use of this area as outlined in the land reuse plan for Carswell AFB/NAS Ft. Worth JRB.
	5b	In addition, we would like to note that the reason chlorinated solvents are diminishing in monitor well OT12-MW15C may be the result of the conatmination moving donwgradient past the well. As such, we are still concerned that the fate and tranpsort model (Bioplume II) does not formally address the attentuation of the chlorinated solvents. AFCEE must adequately demonatrate that the chlorinated solvents will attentuate to acceptable levels before reaching a point of exposure established at the potential facility boundary (excessed property) and/or the surface streams.	The maximum concentration of chlorinated solvent compounds measured in monitor well OT12-MW15C was only 150 ug/L of pentachlorophenol; lower concentrations of other halogenated compounds have been sporadically detected at this well, but not at concentrations which would suggest the presence of a significant source of these compounds in this area. Estimated cumulative risks to both current and hypothetical future receptors (i.e., intrusive workers and child/adult recreators) due to exposure to all chemicals detected above background were below the target upperbound lifetime risk levels established by 30 TAC Chapter 335, Section 335.561. To address TNRCC's concern about the short- and long-term fate of these compounds in groundwater in this area, the long-term monitoring plan presented in the RAP has been modified to include installation of a well downgradient from OT12-MW15C to track the migration of any chlorinated compounds toward the facility boundary. Although geochemical conditions are suitable for reductive dehalogenation processes, it was not possible to develop a defensible mathematical model based on sporadic analytical results from a single sampling location. It is important to note that no chlorinated compounds have been reported in groundwater samples collected from monitor well SD13-MW07 or any surface water samples collected at the unnamed stream and/or Farmers Branch.
	6	We acknowledge that the ferric iron precipitate at the shore line of Farmers Branch is probably resulting from oxidation of ferrous iron in the groundwater. We continue to ask that the revised RAP address potential surface water impacts from the groundwater contaminanats that reduced the iron, the chlorinated solvents seen in monitor well OT12-MW15C, and the free	The RAP has been revised to examine available groundwater and surface water quality data to assess the potential for surface water impacts. Although several inorganic compounds have been measured in site monitor wells at concentrations above established background levels and/or Risk Reduction Standard Number 2 cleanup

		product observed in monitor well SD13-MW07.	levels, recent surface water sampling data indicate that these compounds are not having a measurable impact on surface water at or immediately downgradient from the site. The quantitative risk assessment prepared in partial compliance with Risk Reduction Standard Number 3 requirements indicates that existing maximum concentrations of compounds detected in surface water do not present an unacceptable threat to current or potential future receptors. With regard to the sporadic detections of halogenated compounds at monitor well OT12-MW15C, the RAP recommends installation of an additional well about 50 feet downgradient from this sampling location to track the progress/migration of any compound toward the facility boundary. Finally, in February 1997, the Air Force began a monthly free product removal program at Sites SD13. Skimming socks have been placed in wells characterized by measurable thicknesses of free product. The RAP recommends continuing use of these low-cost free product recovery techniques to remove any recoverable free product from the soils/groundwater. Use of these techniques has been incorporated into the continued remediation (natural attenuation & free product recovery) aspect of the proposed approach for Site SD13.
Geof Meyer, Corrective Action Section, Industrial and Hazardous Waste Division, TNRCC (email dated 1/17/97)	1	I talked with Charles Bayre in our Watershed Management Division about Kings Branch and the West Fork of the Trinity River. Farmers Branch probably is not included in segment 806 of the West Fork of the Trinity River. However, the aquatic life designation would still be "high" for this perennial stream. You'll need to account for high aquatic life habitat (chronic doses) and human health as it relates to fish consumption. If there is a public drinking water supply within 3 miles of Farmers Branch, then Farmers Branch also is protected for human consumption. I understand Fort Worth drinks the West Fork water, but I don't know where the intake is. Assume it must be protected for human consumption and submit arguments to the contrary as you see fit.	The target Risk Reduction Standard Number 2 cleanup levels used to identify COPCs for surface water in this revision of the RAP include high aquatic life habitat and human health considerations (e.g., drinking and fish ingestion). New Section 5 of the RAP identifies those chemicals present in surface water at concentrations above these protective levels. Only inorganic compounds were detected in recent surface water samples at concentrations above these levels. Exceedances were measured only in samples collected upgradient from Site SD13, which suggests this area is not contributing measurable chemical mass to surface water.

Meeting between AFCEE (Joseph Dunkle and Sam Taffinder) and TNRCC (Geof Meyer) (12/16/96)	1	AFCEE needs to investigate the re-use plans for the open area next to the unnamed stream. AFCEE will determine if the land will be under the control of the DoD or turned over for public use. If the land is to be re-used, the AFBCA will need to coordinate with the Carswell Redevelopment Authority.	The RAP now includes the potential for recreator/trespasser use of the open space/recreational area in the future. The AFBCA will coordinate with the Carswell Redevelopment Authority to determine what type of controls and deed recordation language will be necessary to allow timely transfer of this land for its intended use, given the residual levels of contamination known to be present at the site. The RAP indicates that these residual levels are sufficiently protective of human receptors, provided the land is to be used as assumed in the future exposure scenarios.
	2	An exposure scenario examining the impact of groundwater on Farmers Branch will need to be evaluated in the revised RAP, particularly with regard to metals from upgradient flow. The Air Force will look at the occurrence of metals in wells upgradient from Farmers Branch and perform an analysis to determine if they are naturally occurring. Existing data will be used to the extent possible to examine the occurrence of metals in the groundwater. Data from Jacobs Engineering's recent background sampling event as well as recent metal sampling during the January 1997 basewide groundwater sampling event will also be used in the analysis.	In keeping with the approach presented in the recent background groundwater metals data report prepared by Jacobs Engineering (1997), an upper tolerance limit (UTL) approach was used to determine the potential for anthropogenic inorganic contaminants. AFCEE first verified the background UTLs to ensure that these values could be obtained from the reported sampling data using the data evaluation strategy presented in the Jacobs report. AFCEE then compiled available inorganic site characterization data for both soil and groundwater. Armed with these data, AFCEE calculated the number of times the background UTL would be expected *statistically* to be exceeded given a certain population size (e.g., size of the site population). Finally, the background UTLs were compared to each site sampling result to determine if any statistically significant exceedances were present. All inorganic analytes determined to be statistically above established background levels were retained as chemicals of potential concern (COPC). Representative concentrations of these compounds were then compared to risk-based cleanup levels (e.g., Subchapter S) to determine if further evaluation was warranted. Several inorganic compounds in soil, groundwater, and

			surface water were determined to be above the residential Risk Reduction Standard Number 3 levels. All of these compounds and all detected organics were then included in a quantitative, site-specific risk assessment that included a surface water pathway to determine what, if any, additional removal and/or remediation activities were necessary to protect potential receptors. As discussed previously, the resulting risk estimates do not indicate the potential for unacceptable threats to human receptors. The Air Force would note that the exceedances of background inorganic concentrations were observed at sampling locations upgradient from the Site SD13 area, which suggests another potential source of inorganics in surface water. Other than preventing exposure by instituting controls (which is not necessary given the conclusion of the risk assessment), no action can be taken at Site SD13 to mitigate/eliminate these other off-site sources. These data are relevant only in establishing the source of these chemicals, which apparently is not Site SD13.
	3	AFCEE will review the degree to which historical data (1993 and before) was used in determining contaminants of potential concern (COPCs). Dichlorobenzene hits from prior Radian work was cited by Mr. Meyer as an example of contaminants of concern which may have been excluded from the risk assessment. Additionally, per Table A-6, Vol 2 of the RAP, tetramethylbenzene in surface water (sample ST14-SW3) was 33 ug/L. The concentration is less than 10 times the blank concentration, which apparently makes this a valid value. Mr. Meyer's review of related documents also identifies methylene chloride, TCE, PCE, and possibly 1,2,3,4-tetramethylbenzene, 1,3,5-trimethylbenzene, and 1,2,4-trimethylbenzene as COPCs. The constituents were compared to available MCLs consistent with Beneficial Use I groundwater and IHW's Risk Reduction Rules for treatment of groundwater. The Beneficial Use I determination comes from the fact that groundwater is moving toward Farmers Branch, and this pathway needs to be evaluated.	The chemicals 1,3-dichlorobenzene, 1,4-dichlorobenzene, toluene, chlorobenzene, xylenes and ethylbenzene (Radian, 1990), which are all associated with fuel hydrocarbon contamination, were detected in surface and groundwater samples in the Radian 1990 sampling event. All of the 1990 and 1993 detected compounds are included in the RAP. The chemicals 1,3-dichlorobenzene and 1,4-dichlorobenzene were not presented in Table 4.1, because they had not been detected during the 1993 sampling event or subsequent sampling events. Only the most recent sampling data for each detected chemical were used to identify COPCs. No other omissions were found. The RAP has been significantly revised to address residual contamination at Site SD13 in accordance with 30 TAC Chapter 335, Subchapter S. All detected organic compounds and all inorganic compounds measured above

		AFCEE will review available analytical data (including pre-1993 data) and determine if all chemicals of potential concern were included in the risk assessment	established background concentrations were initially compared to residential Risk Reduction Standard Number 2 levels. These levels are equivalent to a Beneficial Use 1 determination, as a means to protect downgradient surface water resources. The list of COPCs for Site SD13 is based upon this comparison. The quantitative risk assessment prepared for Site SD13 includes all compounds detected in site media at concentrations above background. The COPC list is not used to narrow the list of chemicals included in the risk assessment; rather, it just identifies those chemicals that may need to be targeted should additional removal/remediation be warranted. As a side note, the Plan B risk assessment prepared for Site ST14 also included all detected organic compounds. Although benzene was the only compound detected above the target Plan A industrial levels, all detected organics were quantitatively factored into the risk assessment (per TNRCC guidance). The conclusions of the Plan B risk assessment do not reflect the risk associated with benzene alone (but all other fuel- and nonfuel related organics).
	4	With regard to impact of upgradient flow on Farmers Branch, the two proposed compliance wells will initially need to be sampled for Appendix IX constituents. The Air Force will also add a third compliance well west of well OT15B.	The three proposed compliance wells will be sampled for Appendix IX constituents when the GSAP has been so amended.
	5	The Air Force will determine whether Appendix IX constituents were sampled for during investigation of the area. If so, this needs to be stated in the RAP.	The 1994 RFI did not include all Appendix IX constituents as target analytes, based on a review of available data and suspected nature of contamination. However, with some general category exceptions, all Appendix IX constituents were sampled for by Parsons ES in 1994/1995. Based upon available data, Parsons ES sampled for constituents likely to be associated with the source of contamination. The full range of Appendix IX constituents was not included because the sampling effort targeted the most likely source of contamination (i.e., fuel

			and related compounds). As noted earlier, the POC wells will be sampled for the Appendix IX constituents upon revision of the GSAP.
	6	TNRCC believes that some of the MCLs in Table 4.2 may be incorrect. The Air Force will look at those levels, as well as aquatic life levels to make sure a proper comparison was made.	The MCLs in Table 4.2 were reviewed and found to be consistent with values obtained from the Texas Final Regulations, Section 290.103, Standards of Chemical Quality and the federal MCLs as listed in EPA (1996) Drinking Water Regulations and Health Advisories.
	7	The Air Force will check calculations used to determine the rate of groundwater movement. The speed of groundwater movement near Farmers Branch may be faster than that upgradient.	The rate of groundwater movement near Farmers Branch is indeed faster than upgradient rates. This increased rate has already been incorporated into the Bioplume model included in the RAP (see Appendix E; higher transmissivity = faster groundwater velocity).
	8	The Air Force will determine if the suspected underground storage tanks (USTs) associated with site SD13 have been removed. Any tanks will need to be decontaminated or removed in order to meet Risk Reduction Standard 2 regulations.	The Air Force has determined that the geophysical investigation of the supposed tank area conducted by Law Environmental was inconclusive. Subsequent discussions have led some people familiar with the program to believe that the investigation conclusively determined that tanks were in fact in the area of Site SD13. This is not the case. If there was information pointing to the existence of tanks in the area, the Air Force would have investigated and removed the tanks. The Air Force has revised the RAP to include a more complete discussion of the results of previous geophysical investigations in the area of Site SD-13.
	9	The Air Force will install a well to the west of OT15 to act as a compliance well for Farmers Branch.	The long-term monitoring plan in the RAP has been so amended.
Paul S. Lewis, Corrective Action Section, Industrial and Hazardous Waste Division,		This letter is written in conjunction with Mr. Raymond Hillis' November 4, 1996, letter concerning above referenced Remedial Action Plan (RAP). Mr Hillis is a coordinator for the Petroleum Storage Tank Division's Responsible Party Remediation Section (PST). As noted in Mr. Hillis' letter, it is the opinion of PST and	(Per Letter from Joseph R. Dunkle to M. Weegar, TNRCC, 3/3/97) - This letter addresses recent comments ... received on the RAP for Site ST14 (SWMU 68), the former base refueling area (AOC 7), the french underdrain system (SWMU 64), and the north oil/water separator

TNRCC (11/8/96)		the Industrial and Hazardous Waste Division's (IHW) Corrective Action Section that the remedial system proposed for the petroleum hydrocarbon spill at site ST14 (Solid Waste Management Unit (SWMU) 68) would not adequately manage the commingled groundwater contamination observed at site SD13. Site SD13 covers the soil and groundwater contamination associated with three SWMUs, including SWMU 64 (the French Drain), SWMU 67 (the Oil/Water Separator), and SWMU 64 (the Unnamed Stream, also known as part of SWMU 53, the Storm Water Drainage System). Of particular concern is the apparent impact on monitor wells near the Unnamed Stream and water quality in Farmers Branch.	(SWMU 67). This letter also incorporates the agreements reached during a meeting held between Geof Meyer, Sam Taffinder (AFCEE/ERT), and me. Please note that the above referenced RAP is not intended to address the unnamed stream (AOC 14); proposed remedial plans for this SWMU are being conducted as part of a separate, ongoing project. The Petroleum Storage Tank Division's Responsible Party Remediation Section (PST) and the Industrial and Hazardous Waste Division's Corrective Action Section (IHW) express in the letter the opinion that the remedy proposed in the April 1996 RAP would not adequately manage the co-mingled groundwater contamination observed at Site SD13 (i.e., AOC 7 and SWMUs 64 and 67). Several apparent deficiencies were identified by TNRCC to help guide subsequent revisions to the RAP. The following paragraphs present the Air Force's proposed resolution to each of the identified issues.
	1	In light of the above PST and IHW opinion, we request that the Air Force submit a revised RAP for site SD13. The RAP will expand upon the Air Force's interim corrective actions by addressing removal of the groundwater free product as evidenced by monitor well SD13-07.	The April 1996 RAP has been revised to describe the Air Force's ongoing efforts to remove (by hand bailing) any groundwater free product that is encountered in any wells sampled as part of the current quarterly GSAP. Free product in wells in the area of Site SD13 (AOC 7) also was removed monthly (as of January 1997) for six months. At the end of that time, AFCEE recommend that free-product in area wells be checked quarterly during groundwater monitoring activities and removed if it exists (Letter dated 21 August 1997 from J. Dunkle to M. Weegar).
	2	In light of the above PST and IHW opinion, we request that the Air Force submit a revised RAP for site SD13. The RAP will expand upon the Air Force's interim corrective actions by assessing risk posed by the Volatile Organic Carbons (VOCs) in the groundwater as evidenced by the groundwater contaminant	The April 1996 RAP incorporates sampling data collected as part of several field investigations, including the 1985-1990 IRP RI sampling events, the 1993 bioventing pilot test, the 1994 Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI), 1994-1995 Air

		observed in monitor wells OT12-MW15B and OT12-MW15C, and proposing appropriate corrective action.	Force Center for Environmental Excellence (AFCEE)-sponsored sampling events conducted to support determination and implementation of a risk-based remedy for SWMU 64, SWMU 67, SWMU 68, and AOC 7. The RAP originally focused on fuel hydrocarbon compounds, the only organic chemical compounds then detected at the subject SWMUs at concentrations above appropriate screening-level comparison criteria (see Section 4 of the RAP). The first draft of the RAP was submitted for review on 20 November 1995; two briefings on the findings and recommendations of the RAP were presented at Base Realignment and Closure (BRAC) Cleanup Team (BCT) meetings on 14 September 1995 and 14 December 1995. No sampling data collected subsequent to the 1994-1995 AFCEE-sponsored field investigation events were initially incorporated into the RAP. Consequently, detections of low concentrations of trichloroethene (TCE) and tetrachloroethene (PCE) at monitoring well OT15C, as reported in the June 1996 IRP Basewide Quarterly Groundwater Monitoring Second Semi-Annual Report, were not incorporated into the RAP. However, these data were described in the 12 November 1996 FAR, particularly as they relate to long-term monitoring plans for the site. Available sampling data from this well indicate that concentrations of these compounds have been steadily decreasing over time. Specifically, PCE was detected in April 1995 at 2.45 ug/L. In July 1995, PCE was detected at 6.44 ug/L, which is slightly above its maximum contaminant level (MCL) of 5 ug/L; at the same time TCE was detected at 3.64 ug/L, which is still below its MCL of 5 ug/L. However, by October 1995, neither compound was detected in well OT15C. Neither compound has been detected in subsequent sampling events, although quarterly monitoring will continue as part of the GSAP.

			The Air Force has updated the RAP, including the risk assessment, to include GSAP analytical results through early 1997 and modified the proposed long-term monitoring plan to include installation of a new downgradient of well OT12-MW15C to track the progress of any chlorinated compounds toward the facility boundary.
	3	In light of the above PST and IHW opinion, we request that the Air Force submit a revised RAP for site SD13. The RAP will expand upon the Air Force's interim corrective actions by addressing removal and decontamination of what remains of the French Drain system components, in accordance with 30 Texas Administrative Code (TAC) 335.555.	The April 1996 RAP (p. 9-2) prescribes the basic plans for partially removing the french underdrain system (SWMU 64) and abandoning the north oil/water separator (SWMU 67). As stipulated in the RAP, all corrective actions undertaken to remove/abandon these structures would be implemented in concert with IHW and documented in a FAR (dated 12 November 1996). The revised RAP also now briefly describes these activities in the context of compliance with 30 Texas Administrative Code (TAC) Section 335.555 to facilitate IHW review of all actions taken at this site toward closure. Additionally, the April 1996 RAP includes an assessment of natural chemical attenuation processes that will effectively decontaminate residual chemical contamination and SWMU 64 components. As explained in Section 5.6 of the RAP, the model is inclusive of residual contamination at AOC 7. The conservative fate and transport model results indicated that removal of the french underdrain system may be warranted to interrupt potential preferential chemical migration pathways to downgradient surface water. Once the migration was interrupted, natural chemical attenuation processes (that have been documented to be occurring at the site) are expected to be sufficient to reduce COPC concentrations below Risk Reduction Standard Number 2 cleanup levels by the year 2007. These conservative model simulations are based on a single detection of 59 ug/L of benzene at

			AOC 7 during the 1994 RFI; this detection has never been duplicated in subsequent sampling events. Field data described in the 12 November 1996 FAR indicate that partial removal and clay backfilling of the french underdrain system has successfully minimized discharges to surface water and increased groundwater residence time (which will enahnce the effectiveness of natural attenuation processes). The revised RAP also recaps these findings and summarizes recent analytical groundwater results for AOC 7 to demonstrate that natural chemical attenuation processes are reliably decontaminating residual chemical contamination and SWMU 64 components. The aerial extent of the plume originating from SWMU 68 encompasses SWMU 68, SWMU 64, SWMU 67, and AOC 7. The groundwater monitoring program presented in the April 1996 RAP (p. 10-1) provides groundwater monitoring coverage for all four of these sites. The Air Force intends the revised RAP to serve as the basis for implementing long-term monitoring to demonstrate compliance with closure requirements at SWMU 64, SWMU 67, and 68, and AOC 7.
	4	In light of the above PST and IHW opinion, we request that the Air Force submit a revised RAP for site SD13. The RAP will expand upon the Air Force's interim corrective actions by assessing risk and proposing appropriate corrective action to address the groundwater contamination observed as free product and/or as a degraded hydrocarbon plume.	As described in the July 1994 RAP Work Plan and subsequent briefings to the Carswell BCT, the risk-based corrective actions developed for SWMU 64, SWMU 67, SWMU 68, and AOC 7 were based on an assessment of the risks to potential human and eoclogical receptors due to exposure to specific organic chemicals detected in site environmental media. The risk-based corrective action process developed by the TNRCC PST prior to May 1996 was followed to develop the RAP. The April 1996 RAP summarizes (p. 4-15; p. 5-26) how residual chemical contamination in the form of contaminated soils and free product will serve as a long-term source of specific chemicals to potential exposure media (i.e., groundwater

			and soil). The Bioplume II model developed to predict the fate and transport of the only fuel hydrocarbon compound COPC (benzene) in groundwater underlying the area includes a continuing but diminishing source term that accounts for the effects of free product weathering and leaching from soils. Consequently, the remedy proposed in the April 1996 RAP is inclusive of free product and residual soil contamination that could act as a source of groundwater contamination. Oxidation of fuel hydrocarbons such as BTEX is assumed to result in complete mineralization to carbon dioxide and water (see Section 5 of the RAP). As a side note, both the fuel products JP-4 jet fuel and/or gasoline, which are the sources of contamination at the site in question, exhibit low acute toxicity by the oral and dermal routes of exposure. Furthermore, available data indicate that there are no neurotoxic concerns associated with exposure to JP-4 jet fuel or gasoline. JP-4 jet fuel and gasoline are not mutagenic, and are not developmental or reproductive toxicants. USEPA (1992) has assigned diesel and related middle distillates (e.g., JP-4 jet fuel) to the weight-of-evidence Group D: Not Classifiable as to Human Carcinogenicity. The analytical sampling data used in the quantitative risk assessment in the April 1996 RAP reflect the chemical nature of the two source fuels, and is inclusive of the known carcinogens that comprise the parent, unweathered fuel sources. In general, these two types of fuels are typically enriched with aromatics and isoalkanes to give superior performance. More specifically, single-ring monoaromatics such as BTEX usually represent a significant fraction of the aromatics in JP-4 jet fuel and gasoline. In gasoline, these single-ring monoaromatics such as BTEX accounted for more than 98% the total aromatic fraction. BTEX usually accounts for more than

			20% by weight of the product. Consequently, analytical data for aromatics such as benzene and naphthalene represent the majority of petroleum constituents dissolved in groundwater that are part of the parent fuel.
	5	In light of the above PST and IHW opinion, we request that the Air Force submit a revised RAP for site SD13. The RAP will expand upon the Air Force's interim corrective actions by addressing degradation of the water quality in Farmers Branch (as evidenced by iron staining along the northern shore of Farmers Branch) and an assessment of the risks to human health and the environment. Risks to human health should at least consider direct contact exposure resulting from recreational contact as well as impacts on public drinking water supplies in the West Fork of the Trinity River. Risks to environmental impacts should consider aquatic life exposure. Remedial action should be included in the closure plan to address any unacceptable risks.	HQ AFCEE/ER is responsible for the cleanup of on-base sites. AFBCA is responsible for off-base sites. The unnamed stream (AOC 14) is an off-base site and therefore managed by AFBCA. The explanation of contamination at AOC 14 provided here is HQ AFCEE/ERD's current understanding of site activities. Contamination at AOC 14 is documented in a 1994 Law Environmental RFI report. The report contains surface water and sediment data for AOC 14. Metals analysis was conducted only on stream sediments; VOC, oil and grease, and total petroleum hydrocarbon (TPH) analyses were conducted on surface water. Results of surface water sampling did not identify contamination above surface water criteria. TPH and oil and grease contamination did exist, but at levels that did not indicate a significant contmaination of AOC 14. Further contamination of AOC 14 has been drastically reduced since the north oil/water separator (SWMU 67) was removed, effectively eliminating flow and hence potential contamination of AOC 14. Results of sediment data indicated that arsenic exceeded National Oceanic and Atmospheric Administration (NOAA) guidance values. Iron did not exceed NOAA guidance values for sediment. However, elevated concentrations of ferrous iron in groundwater are chemical indicators of bio-oxidation of fuel hydrocarbons. Once this ferrous iron-rich groundwater is exposed to air (i.e., at the exit of the now-removed oil/water separator, SWMU 67), the ferrous iron oxidizes to ferric iron again. Ferric

			iron usually precipitates, resulting in the observed "iron staining." By precipitating at the groundwater discharge point, the iron is no longer available to migrate within surface water or impact downstream potable water quality. AFBCA is currently in the prcess of remediating the unnamed stream by removing arsenic-contaminated and iron-stained soils and sediments. This action will eliminate contaminated sediments, and therefore further possible downstream contamination. This project is being monitored by IHW so that project goals will be met. The April 1996 RAP includes a comprehensive screening evaluation to identify COPCs (see Section 4). The exposure algorithms developed by TNRCC PST for Plan A Assessments were used to generate screening-level criteria for all detected chemicals in soil and groundwater. Iron was included in this evaluation (Tables 4.1 and 4.2). Because iron is considered an essential human nutrient, it is usually eliminated early in the COPC process. Using a provisional toxicity value (RfD-oral) developed by USEPA-NCEA, a residential ingestion-based soil screening level of 23,000 mg/kg can be developed. The maximum concentration of iron measured in soils at the site was 5,300 mg/kg. Consequently, no potential adverse threat to industrial or residential receptors is expected from iron in soil .he April 1996 RAP does not quantitatively incorporate iron (or any other inorganic constituent) into the risk assessment, which includes industrial worker but not recreator contact with surface water impacted by groundwater. Recreators were eliminated from the conceptual site model (CSM) as a reasonable receptor group (p. 6-5) due to the industrial use of the Site ST14 area. As a result of the meeting held on 16 December 1996, the Air Force revised the CSM for Site SD13 to include recreators and use available historical data to further

			evaluate the effect on human health and aquatic life of metals in Farmers Branch. In addition, metals data collected during the January 1997 round of monitoring were used to assess current site conditions. Two new sections have been added to the RAP to satisfy the compliance requirements of 30 TAC Chapter 335, Subchapter S. Section 5 compares the most recently measured concentrations of each detected compound to residential Risk Reduction Standard Number 2 levels. Section 8 presents a site-specific quantitative risk assessment prepared for Site SD13. This risk assessment includes a recreator/trespasser receptor group. will be used to enhance the risk assessment.
	6	In light of the above PST and IHW opinion, we request that the Air Force submit a revised RAP for site SD13. The RAP will expand upon the Air Force's interim corrective actions by addressing future land use (we understand a portion of this area will be excessed tot he public by the Air Force).	Future land use is discussed in Section 3.8 of the April 1996 RAP. Color-coded maps of the proposed land re-use plans to be implemented across the base are presented in the RAP. Site ST14 (SWMU 68) is to be maintained for base refueling operations (military use). Site SD13 (AOC 7, SWMU 64, and SWMU 67) are to be part of an open space area associated with the flood-prone areas along Farmers Branch. As a result of the meeting held on 16 December 1996, the Air Force further evaluated land-use plans to ensure that exposure scenarios matched current land use plans. If this land will be excessed as part of BRAC plans the Air Force will coordinate that action with the Carswell Redevelopment Authority. The risk assessment for Site SD13, as described previously, has been updated to include a recreator/trespasser exposure scenario.
	7	The issues listed above are for guidance only and are not meant to be comprehensive. It is the responsibility of the Air Force to address all relevant issues required by Hazardous Waste Permit HW-50289 and 30 TAC Section 335, Subchapters A and S.	Comment acknowledged.
Joseph Dunkle,	1	During a 14 November 1996 teleconference, Mr. Meyer noted a	No action required.

AFCEE/ERD to Geof Meyer, TNRCC/IHW (email dated 11/26/96)		concern about the co-mingling of TCE and hydrocarbons in the site SD13 area. Mr. Meyer specified his concern targeted wells OT15B and OT15C, which had previously shown detections of VOCs. We discussed the fact that we have four separate SWMUs/AOCs to deal with in this general area. SWMU 68 is upgradient from AOC 7, which is upgradient from SWMUs 64 and 67, which are upgradient from wells OT15B and OT15C. We agreed that there is no comingling of contamination at AOC (site SD13) since VOCs have only been found in soil and not in groundwater there. Mr. Dunkle requested that AOC 7 be closed as a site and incorporated into the cleanup of SWMU 68, which is the "regional" groundwater hydrocarbon plume. Mr. Meyer concurred.	
	2	During the 14 November 1996 teleconference, we discussed Mr. Meyer's concern that natural attenuation of SWMU 64 (the french underdrain) was not adequately presented to support closure of the site. Mr. Dunkle noted that the RAP focused on the hydrocarbon plume, but includes SWMU 68 (site ST14), AOC 7 (the former base refueling area), SWMU 64 (the french underdrain), and SWMU 67 (the north oil/water separator). Mr. Meyer stated that the discussion in the RAP that deals with the hydrocarbon plume, as long as it includes SWMU 67, would be adequate to address this concern. He specifically requested that the RAP include an argument supporting natural decontamination of the piping in SWMU 64. This argument needs to include a discussion of natural attenuation of the groundwater in the area (which Mr. Dunkle noted was already in the RAP) and a discussion of how specifically the french underdrain pipe will be decontaminated by the action of natural attenuation through groundwater flow by the pipe, etc. The RAP needs to clearly state that the french underdrain system is not a source of contamination, but is included within the larger hydrocarbon plume. Mr. Meyer agreed that this approach would provide a mechanism to close SWMU 64 as part of the remediation activities targeting the groundwater plume from SWMU 68 (site ST14).	The RAP has been revised to include a more specific discussion of the effects of natural decontamination processes on the remaining elements of the french underdrain system. Section 6 and Section 10 of the revised RAP describe how these processes are expected to be equally as effective at decontaminating engineered components, as they are at decontaminating residual contamination associated with site media.

	3	Mr. Meyer noted that the VOC contamination in wells OT15B and OT15C had not been adequately addressed by the Air Force. Mr. Dunkle stated that a risk analysis of the Law groundwater monitoring VOC data would be prepared to address this concern.	The RAP has been amended to include a site-specific quantitative risk assessment for Site SD13 which includes all sampling data collected for specific compounds through January 1997. See earlier responses for summary of approach and conclusions.
	4	We discussed the free product measured in monitor well SD13-07. Mr. Dunkle stated that the Air Force would examine the contents of the well during each quarterly groundwater monitoring event and hand bail any detected free product. Mr. Dunkle also noted that the Air Force would install a passive skimmer in the well is sufficient free product were measured during the first sampling event. Mr. Meyer concurred with this approach.	These actions have been incorporated into the revised RAP.
	5	We discussed the water quality in Farmers Branch (re: iron staining). Mr. Dunkle agreed to include a discussion about the ongoing remedial action in that area, as well as an assessment of human health risks, in the RAP. Part of this discussion will include an examination of the regional occurrence of iron in soil as a possible source of staining (i.e., background assessment).	The RAP has been revised to identify inorganic compounds above established background levels, as well as to present data relevant to understanding the distribution of these compounds in groundwater affected by fuel hydrocarbon contamination. Iron staining is a reflection of the regional occurrence of iron in soil. The iron has been mobilized due to the change in reduction-oxidation conditions brought about the presence of fuel hydrocarbon compounds (and possibly other organics). Iron staining will be eliminated once sufficient bioattenuation processes have been completed to restore localized geochemical conditions to pre-release conditions. As note previously, iron staining is an indication that iron is not being released as a dissolved compound to surface water.
Raymond H. Hillis, Coordinator, Remediation Unit III, Responsible Party Remediation	1	We have completed our review of all available file information for the above referenced incident pertaining to the Remedial Action Plan for the Risk Based Remediation of Site ST14 report submitted on May 7, 1996. After careful review of all data provided and pursuant to Title 30, Texas Administrative Code	The Air Force acknowledges this approval, and has focused remaining revision efforts on addressing comments specific to TNRCC IHW concerns at Site SD13.

Section, Petroleum Storage Tank Division, TNRCC (11/4/96)		(TAC), Section 334.78 - 334.81, this Office concurs with your proposed remedial action plan.	
	2	This Office is in agreement that site SD13 (the area east of Roger Drive) should be addressed under Title 31, TAC Chapter 335, the RCRA rules, which is regulated by the TNRCC's Industrial and Hazardous Waste (IHW) Division. Consequently, the proposed remedial action plan does not apply to site SD13. In addition, although this Office agrees that the french drain should be removed, as it may be a pathway for upgradient contamination associated with site ST14, the removal of the drain should be coordinated with the IHW Division. Removal/abandonment of the oil/water separator should also be coordinated with the IHW Division of the TNRCC. Although it is agreed that the oil/water separator may be continuing source of contamination, it's location on site SD13 and the contaminants of concern warrant that the IHW Division coordinate removal/abandonment activities.	The Air Force acknowledges this decision, and has revised the RAP to address these specific concerns as articulated by TNRCC IHW. The french underdrain was partially removed in 1996 under the direction of TNRCC IHW. These actions are now described in the RAP. The Bioplume II model presented in the RAP (unchanged from earlier versions) clearly indicates that fuel hydrocarbon compounds originating from Site ST14 are not expected to migrate to and impact Site SD13. Recent sampling data support these model predictions, particularly for benzene. The oil/water separator also was abandoned in 1996 under the direction of TNRCC IHW. The completed actions are described in the RAP.
	3	This Office agrees that both biosparging and bioventing, working congruently, is an effective method to address subsurface contamination at the above referenced site. Although bioventing is mentioned as part of the remedial system, it does not appear that bioventing is an active part of the remedial system. Therfore, please provide an explanation of the role that bioventing plays in the remediation of subsurface contamination at the above referenced site.	As described in the April 1996 RAP (p. 8-5), the now-installed bioventing and biosparging system at site ST14A will enhance aerobic degradation of fuel hydrocarbons in both vadose zone soils and shallow groundwater. Simultaneous bioventing and biosparging is being performed at each of the air injection vent wells. Air is being supplied to each vent well through a 1-inch-diameter PVC air injection pioe placed inside a 4-inch-diameter well. When the groundwater level in the injection well is above the bottom of the air injection pioe, the air first bubbles through the water (increasing the DO concentration), then exts through the well screen into the unsaturated soils. When the water level in the vent well is near or above the top of the screen, the air is vented from the injection well through a small-diameter stopcock. This venting allows air to continue bubbling through the water

			even though there is little or no flow through the well screen. The pressure in the injection wells forces air into the surrounding unsaturated soils as the water level drops or as a result of pressure-induced groundwater level depression. As the length of screen above the water level increases, air flow to the injection well and into the vadose zone soil increases proportionately. As described in Section 7 of the April 1996 RAP (p. 7-4), initial respiration test results from bioventing vadose zone soils at site ST14A indicate that an estimate 1,800 to 14,000 milligrams per fuel per kilogram of soil (mg/kg) could be degraded each year. Bioventing test results from two nearby sites illustrate how respiration rates ranged from 300 mg/kg to 1,600 mg/kg. After 6 months, however, the biodegradation rate had decreased to an average of 265 mg/kg. Because residual concentrations of soil COPCs (contaminants of potential concern) at site ST14 exceeded calculated Plan B and Plan A soil leaching criteria (see Table 6.3, p. 6-20), the Air Force proposed in the RAP to implement bioventing to reduce the concentration of soil COPCs to below at least Plan B concentrations. Conservatively assuming an estimated average biodegradation rate of 100 mg/kg could be sustained by the full-scale system, bioventing was proposed to be used to reduce soil COPCs in vadose zone soils below at least Plan B criteria within a 2-year period at site ST14A. The predicted reduction in contaminant mass which is available to leach into underlying groundwater is incorporated into the Bioplume II model described in the RAP. Implementation of bioventing at the site will reduce soil COPCs to below at least Plan B (and possibly Plan A category II) soil leaching concentrations within 2 years, and reduce the cumulative carcinogenic risk to hypothetical intrusive workers below the TNRCC-defined 1×10^{-6} target risk level by the year 1998. As described in the 12 November 1996 Field

			Activity Report (FAR), the full-scale bioventing system was operational as of 17 April 1996. A 6-month system check, including a respiration test was completed in October 1996; a 12-month system check was completed in April 1997. Based on available field data, aerobic degradation of residual fuel hydrocarbon compounds continues at rates comparable to those discussed in the April 1996 RAP.
	3	Please provide well construction details for a typical bioventing well. Also, provide a system flow process diagram that includes ports for the collection of samples (CO_2 and DO) and the measurement of flow and spaarge pressure at each well head.	The April 1996 RAP includes well construction details for a typical bioventing well (Figure 9.2, p. 9-4). The 12 November 1996 FAR also includes vent well and monitoring point standard details, as well as system flow process diagrams (as-builts) that include sample collection ports and the measurement of flow and pressure. Such detail was not included in the April 1996 RAP since the bioventing system was only being proposed as a component of the remedial action to take at site ST14. After verbal approval of this approach from TNRCC at the 14 December 1995 BCT meeting and in draft comments from Mr. Ray Newby in February 1996, the Air Force elected to construct and implement the full-scale bioventing system. These implemented actions are fully described in the FAR, as noted in the April 1996 RAP.
	4	This Office concurs with the proposed monitoring and system performance of the remedial system. In addition to monitoring DO levels, CO_2 levels should also be monitored as an indicator of biodegradation activity.	The Air Force concurs with this technical guidance and has been collecting such data during all feasibility tests associated with this bioventing system. Although no specifically described in Section 9 of the April 1996 RAP, the site-specific sampling and analysis plan included in Appendix H notes that both oxygen utilization and carbon dioxide production will be measured at existing monitoring points to assess contaminant removal rates. Collection of such samples are consistent with the AFCEE technical documents on evaluating the long-term effectiveness of bioventing systems.

Paul S. Lewis, Corrective Action Section, Industrial and Hazardous Waste Division, TNRCC (7/19/96)	1	In order to maintain proper surveillance of the groundwater plume impacting the Unnamed Stream and Kings Branch, the TNRCC requests that AFCEE add monitor wells SD13-04 and ST14-MW31 and possibly ST14-MW32 to the quarterly monitoring program. Monitor well ST14-MW31 should be included in case the plume changes to an easterly direction after removal of the oil/water separator and portions of the French Drain. This is not an unlikely scenario if the Air Force's partial removal of the French Drain really did cut off flow through the French Drain. Free product and contaminated groundwater shuld be removed from wells nearest the Unnamed Stream(SD13-06 and SD13-07) until a permanent action plan is submitted and approved.	The requested changes have been implemented as part of the ongoing GSAP, and have been incorporated into this revised RAP.
	2	Closure of this SWMU[i.e., french underdrain system] under the Risk Reduction Rules (30 Texas Administrative Code 335 Subchapter S) requires removal and/or decontamination of all associated SWMU components, i.e. the pipe and the oil/water separator, and contaminated media. As a result, we request that AFCEE submit a written plan to complete the corrective action started at this SWMU with a schedule for implementation. We consider partial removal of the french underdrain system to be an interim corrective measure (ICM) taken to mitigate impacts of a contaminant plume on the Unnamed Stream.	Pursuant to later discussion with TNRCC IHW, the RAP has been revised to include a discussion of how natural chemical attenuation processes are effectively decontaminating those engineered components left in place after completion of the 1996 interim removal action. Water flow to the unnamed stream has been halted by removal of the oil/water separator and portions of the french underdrain system. Available monitoring data are used in the RAP to illustrate that no measurable impact to surface water from specific compounds is now occurring. Free product recovery at SD13-MW07 continues using a passive skimming (sock) technology.
	3	We request that the closure plan provide a summary of recent events including field observations, maps and drawings, and the current condition of the french drain.	This information has been included in new Section 5 of the RAP to document the current conditions of the area comprising Site SD13.

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