VANCE AIR FORCE BASE

RESOURCE CONSERVATION AND RECOVERY ACT

POST CLOSURE CARE PERMIT

Permit No. 4571524095-PC

Oklahoma Department of Environmental Quality

September 30, 2010 through September 30, 2020

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SECTION I GENERAL PERMIT CONDITIONS

A. GENERAL

The Permittee shall operate, monitor, and maintain the corrective action programs described herein, in compliance with the provisions of the Oklahoma Hazardous Waste Management Act (OHWMA), 27A O.S. Sec. 2-7-101 *et. seq.,* as amended, the Oklahoma Administrative Code (OAC 252:205), the Federal Resource Conservation and Recovery Act (RCRA), including the Hazardous and Solid Waste Amendments of 1984 (HSWA), and the approved Permit application further modified through Permit conditions set herein.

B. BASIS OF PERMIT

This Permit requires the Permittee to perform post-closure care activities and remedial measures at Vance Air Force Base under the Special Conditions Pursuant to Hazardous and Solid Waste Amendments - Corrective Action Strategy presented in Section Ill of this Permit. Any inaccuracies found in this information could provide cause for the termination or modification of this Permit, and for enforcement action. The Permittee is to inform the Oklahoma Department of Environmental Quality (DEQ) of any deviation from or changes in the design or operation of the facility which could affect the Permittee's ability to comply with the applicable regulations or Permit conditions.

This Permit shall be reviewed by the DEQ five years after the date of Permit issuance and shall be modified as necessary, as provided in 40 CFR 270.41 and OHWMA § 2-7-127(8). Except as provided in condition l.F.3 (40 CFR 270.51), the term of this Permit shall not be extended by modification beyond the expiration date appearing on the face of this Permit (40 CFR 270.50(b)).

C. INCORPORATION BY REFERENCE

All the referenced Code of Federal Regulations (40 CFR) Parts 124, 260 through 266, 268, and 270 as specified in the Permit are, unless otherwise stated, incorporated in their entirety by OAC 252:205-3-1 through OAC 252:205-3-6 effective July 1, 2009.

D. DEFINITIONS

Except for the terms defined below, for purposes of this Permit, terms used herein shall have the same meaning as those in 40 CFR Parts 124, 260, 261, 264, 266, 268, and 270; and OAC 252:205- 1-2 through OAC 252:205-3-6; unless this Permit specifically provides otherwise. Where terms are not defined in OAC, RCRA regulations, or the Permit, the meaning associated with such terms shall be defined by a standard dictionary reference or the generally accepted scientific or industrial meaning of the term.

"Action Levels" means health and environmental-based levels of constituent concentrations determined by the DEQ to be indicators for protection of human health and the environment.

"Administrative Authority" means the Oklahoma Department of Environmental Quality or DEQ.

"Area of Concern" (AOC) means any discernable unit or area which, in the opinion of the DEQ, may have received solid or hazardous waste or waste containing hazardous constituents at any time. The DEQ may require investigation of the unit as if it were a SWMU. If shown to be a SWMU by the investigation, the AOC must be reported by the Permittee as a newly-identified SWMU. If the AOC is shown not to be a SWMU by the investigation, the DEQ may determine that no further action is necessary and notify the Permittee in writing.

"Constituents of Concern" (COC) means those chemical compounds which have been frequently encountered during sampling events and have been selected as having a reasonable likelihood of having been or might be released, are consistent with the conceptual site model, and pose an adverse hazard or risk to human health or the environment. The COCs are listed in Exhibit 4 of the Permit.

"DEQ" means the Oklahoma Department of Environmental Quality.

"Director" means the Executive Director of the Oklahoma Department of Environmental Quality, or his/her designee or authorized representative.

"Division Director" means the Director of the Land Protection Division of the Oklahoma Department of Environmental Quality, or his/her designee or authorized representative.

"EPA" means the United States Environmental Protection Agency.

"Facility" means all contiguous property under the control of the owner or operator seeking a permit under Subtitle C of RCRA

"HSWA" means the 1984 Hazardous and Solid Waste Amendments to RCRA

"Hazardous constituent" means any constituent identified in Appendix VIII of 40 CFR Part 261, or any constituent Identified in Appendix IX of 40 CFR Part 264.

"Hazardous waste" means a solid waste, or combination of solid wastes, which because of its quantity, concentration, or physical, chemical, or infectious characteristics may cause, or significantly contribute to., an increase in mortality or an increase in serious irreversible, or incapacitating reversible, illness; or pose a substantial present or potential hazard to human health. The term hazardous waste includes hazardous constituent.

"Land Protection Division" (LPD) means the Land Protection Division of the Oklahoma DEQ.

"Permit" means the full permit, the Oklahoma Hazardous Waste Management Act (OHWMA), 27A O.S. Sec. 2-7-101 *et. seq.,* as amended, the Oklahoma Administrative Code (OAC 252:205), the Resources Conservation and Recovery Act and special conditions pursuant to the 1984 Hazardous and Solid Waste Amendments to RCRA.

"Permittee" means Vance Air Force Base, Oklahoma, 73705. EPA ID# OK4571524095

"RCRA" means the Resource Conservation and Recovery Act of 1976, as amended by HSWA in 1984.

"RFA" means RCRA Facility Assessment.

"RFI" means RCRA Facility Investigation.

"Release" means any spilling, leaking, pouring, emitting, emptying, discharging, injecting, pumping, escaping, leaching, dumping, or disposing of hazardous wastes (including hazardous constituents) into the environment (Including the abandonment or discarding of barrels, containers, and other closed receptacles containing hazardous wastes or hazardous constituents). RCRA section 3004(u) corrective action authority does not routinely reevaluate permitted releases.

"Solid Waste Management Unit" (SWMU) means any discernible unit at which solid wastes have been placed at any time, irrespective of whether the unit was intended for the management of solid or hazardous waste. Such units include any area at a facility at which solid wastes have been routinely and systematically released. The definition includes regulated units (i.e., landfills, surface impoundments, waste piles and land treatment units) but does not include passive leakage or one-time spills from production areas and units in which wastes have not been managed (e.g., product storage areas).

If, subsequent to the issuance of this Permit, regulations are promulgated which redefine any of the above terms, the DEQ, at its discretion, may apply the new definition to this Permit by modifying the Permit in accordance with 40 CFR Section 270.41.

E. EFFECT OF PERMIT

Any storage, treatment, or disposal of hazardous waste not authorized in this Permit is prohibited, unless exempted from Permit requirements. Subject to 40 CFR 270.4, compliance with this Permit generally constitutes compliance, for purposes of enforcement, with Subtitle C of RCRA. Issuance of this Permit does not convey any property rights of any sort or any exclusive privilege; nor does it authorize any injury to persons, animals, or property, any invasion of other private rights, or any infringement of state or local laws or regulations. Compliance with the terms of this Permit does not constitute a defense to any order issued or any action brought under the OHWMA; Sections 3008(a), 3008(h), 3013, or 7003 of RCRA; Sections 104, 106(a) or 107 of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (42 U.S.C. 9601 et seq., commonly known as CERCLA), or any other law providing for protection of public health or the environment from an imminent or substantial endangerment. [40 CFR 270.4 and 270.30(g)]

F. PERMIT ACTIONS

1. Permit Modification. Revocation and Reissuance, and Termination

This Permit may be modified, revoked and reissued, or terminated for cause, as specified in 40 CFR 270.41, 270.42, and 270.43. The filing of a request for a permit modification, revocation and reissuance, or termination, or the notification of planned changes or anticipated noncompliance on the part of the Permittee, does not stay the applicability or enforceability of any Permit condition. [40 CFR 270.4(a) and 270.30(f)]

2. Permit Renewal

This Permit may be renewed as specified in 40 CFR 270.30(b) and Permit condition I.H.2. Review of any application for a Permit renewal shall consider improvements in the state of control and measurement technology, as well as changes in applicable regulations. [40 CFR 270.30(b) and HSWA Sec. 212]

3. Permit Expiration

Pursuant to 40 CFR 270.50, this Permit shall be effective for a fixed term not to exceed ten years from its effective date. This Permit and all conditions herein will remain in effect beyond the Permit's expiration date, if the Permittee has submitted a timely, complete application (see 40 CFR 270.10, 270.13 through 270.29) and, through no fault of the Permittee, the DEQ has not issued a new Permit, as set forth in 40 CFR 270.51. Permits continued under this section remain fully effective and enforceable. When the Permittee is not in compliance with the conditions of the expiring or expired Permit, the DEQ may choose to do any one or more of the following:

a. Initiate enforcement action based upon the Permit which has been continued;
b. Issue a notice of intent to deny the new Permit under 40 CFR 124.6. If the Permit is denied, the owner or operator would then be required to cease the activities authorized by the continued Permit or be subject to enforcement action for operating without a Permit;
c. Issue a new Permit under Part 124 with appropriate conditions; or
d. Take other actions authorized by these regulations.

4. Transfer of Permits

This permit is not transferable, except after notice to the DEQ. The DEQ may require modification or revocation and reissuance of the permit pursuant to 40 CFR 270.40. Before transferring ownership or operation of the facility during its operating life, the Permittee shall notify the new owner or operator in writing of the requirements of 40 CFR Parts 264 and 270 and this permit. [40 CFR 270.30(1)(3) and 264.12(c)]

G. SEVERABILITY

The provisions of this Permit are severable, and if any provision of this Permit, or the application of any provision of this Permit to any circumstance is held invalid, the application of such provision to other circumstances and the remainder of this Permit shall not be affected thereby.

H. DUTIES AND REQUIREMENTS

1. Duty to Comply

The Permittee shall comply with the approved Permit application and all conditions of this Permit, except to the extent and for the duration that noncompliance is authorized by an emergency Permit. Any Permit noncompliance, other than noncompliance authorized by an emergency Permit, constitutes a violation of OHWMA and RCRA and is grounds for enforcement action; for Permit termination, revocation and reissuance, or modification; or for denial of a Permit renewal application. [40 CFR 270.30(a)]

2. Duty to Reapply

If the Permittee intends to continue an activity allowed or required by this Permit after the expiration date of this Permit, the Permittee shall submit a complete application for a new Permit at least 180 days prior to Permit expiration. [40 CFR 270.30(b)]

3. Quarterly Reports

The Permittee shall submit quarterly reports in accordance with OAC 252:205-5-3(a).

4. Biennial Report

The Permittee shall comply with the biennial reporting requirements of 40 CFR 262.41.

5. Need to Halt or Reduce Activity Not a Defense

It shall not be a defense for the Permittee, in an enforcement action, that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this Permit. [40 CFR 270.30(c)]

6. Duty to Mitigate

In the event of noncompliance with this Permit, the Permittee shall take all reasonable steps to minimize releases to the environment and shall carry out such measures as are reasonable to prevent significant adverse Impacts on human health or the environment. [40 CFR 270.30(d)]

7. Proper Operation and Maintenance

The Permittee shall at all times properly operate and maintain all facilities and systems of treatment and control (and related appurtenances) which are installed or used by the Permittee to achieve compliance with the conditions of this Permit. Proper operation and maintenance includes effective performance, adequate funding, adequate operator staffing and training, and adequate laboratory and process controls, including appropriate quality assurance/quality control procedures. This provision requires the operation of back-up or auxiliary facilities or similar systems only when necessary to achieve compliance with the conditions of this Permit. [40 CFR 270.30(e)]

8. Duty to Provide Information

The Permittee shall furnish to the DEQ, within a reasonable time, any relevant information which the DEQ may request to determine whether cause exists for modifying, revoking and reissuing, or terminating this Permit, or to determine compliance with this Permit. The Permittee shall also furnish to the DEQ, upon request, copies of records required to be kept by this Permit. [40 CFR 270.30(h)]

9. Inspection and Entry

Pursuant to 40 CFR 270.30(i), the Permittee shall allow the DEQ, upon the presentation of credentials and other documents to meet the security and confidence requirements of

the United States Air Force and Vance Air Force Base Security, and accompanied by Base personnel, as may be required by law, to:

a. Enter at reasonable times upon the Permittee's premises where a regulated facility or activity is located or conducted, or where records must be kept under the conditions of this Permit;

b. Have access to and copy, at reasonable times, any records that must be kept under the conditions of this Permit;

c. Inspect at reasonable times any facilities, equipment (including monitoring and control equipment), practices, or operations regulated or required under this Permit; and

d. Sample or monitor, at reasonable times, any substances or parameters at any location for the purposes of assuring Permit compliance or as otherwise authorized by RCRA.

10. Monitoring and Records

a. Samples and measurements taken for the purpose of monitoring shall be representative of the monitored activity. The method used to obtain a representative sample of the waste and/or contaminated media to be analyzed must be the appropriate method from Appendix I of 40 CFR Part 261 or an equivalent method approved by the DEQ. Laboratory methods must be those specified in Test Methods for Evaluating Solid Waste: Physical/Chemical Methods, EPA Method SW-846, or an equivalent method approved by DEQ. [40 CFR 270.30(j) (1)]

b. The Permittee shall retain all pertinent records of all monitoring information, including maintenance records and recordings for monitoring instrumentation, copies of reports and records required by this Permit, as required under 40 CFR 264.73(b) (9), and records of all data used to complete the application for this Permit for a period of at least 3 years from the date of the pertinent sample, measurement, report, record, certification, or application. These periods may be extended by request of the DEQ at any time and will be automatically extended during the course of any unresolved enforcement action regarding this facility. [40 CFR 270.30(j) (2)]

c. Pursuant to 40 CFR 270.30(j)(3), records of monitoring information shall specify:

1) The date(s), exact place, and times of sampling or measurements;

2) The individual(s) who performed the sampling or measurements;

3) The date(s) analyses were performed;

4) The individual(s) who performed the analyses;

5) The analytical techniques or methods used; and

6) The results of such analyses.

11. Reporting Planned Changes

The Permitted shall give notice to the DEQ, as soon as possible, of any planned physical alterations or additions to the permitted facility, only if such changes relate to hazardous waste management or corrective action operations. [40 CFR 270.30(1) (1)]

12. Reporting Anticipated Noncompliance

The Permittee shall give advance notice to the DEQ of any planned changes In the RCRA- related permitted facility or activity which may result in noncompliance with Permit requirements. [40 CFR 270.30(1) (2)]

13. Twenty-Four Hour Reporting [40 CFR 270.30(1)(6)]

a. The Permittee shall report to the DEQ any noncompliance which may endanger health or the environment. Any such information shall be reported orally within 24 hours from the time the Permittee becomes aware of the circumstances. The report shall include the following:

   1) Information concerning release of any hazardous waste that may cause an endangerment to Base personnel or drinking water supplies;
   2) Any information of a release or discharge of contaminated groundwater, or of a compromise to remedial operations which could threaten the environment or human health on-Base or outside the facility.

b. The description of the occurrence and its cause shall include:

   1) Name, address, and telephone number of the person reporting the incident;
   2) Date, time, and type of incident;
   3) Location of the incident;
   4) Name and quantity of materials involved;
   5) The extent of injuries, if any;
   6) An assessment of actual or potential hazards to the environment and human health on-Base and/or outside the facility, where this is applicable; and
   7) Estimated quantity and disposition of recovered material that resulted from the incident.

c. A written submission shall also be provided within five days of the time Permittee becomes aware of the circumstances. The written submission shall contain a description of the noncompliance and its cause; the period(s) of noncompliance (including exact dates and times); whether the noncompliance has been corrected; and, if not, the anticipated time it is expected to continue; and steps taken or planned to reduce, eliminate, and prevent recurrence of the noncompliance. The DEQ may waive the five-day written notice requirement in favor of a written report within 15 days.

14. Other Noncompliance

The Permittee shall report all other instances of noncompliance not otherwise required to be reported above at the time monitoring reports are submitted. [40 CFR 270.30(1) (1O)]

15. Other Information

Whenever the Permittee becomes aware that it failed to submit any relevant facts in the Permit application, or submitted incorrect information in a Permit application or in any report to the DEQ, the Permittee shall promptly submit such facts or information. [40 CFR 270.30(1) (11)]

I. SIGNATORY REQUIREMENT

All applications, reports, or information submitted to the DEQ, shall be signed and certified in accordance with 40 CFR 270.11 and 270.30(k}.

J. REPORTS, NOTIFICATIONS, AND SUBMISSIONS TO THE DEQ

All reports, notifications, or submissions required by this Permit, should be sent by hard copy or on compact disc (CD) electronic storage devices by certified mail or given to:

~~Scott Thompson~~Kelly Dixon, Director
Land Protection Division
Oklahoma Department of Environmental Quality
707 N. Robinson, P.O. Box 1677
Oklahoma City, Oklahoma 73101-1677

All maps or drawings larger than 11.5 by 17 inches and all signature pages should be mailed or delivered in hard-copy form.

K. CONFIDENTIAL INFORMATION

In accordance with 40 CFR 270.12, OAC 252:4-1-5(d), and OAC 252:205-1-4, the Permittee may claim confidential any information required to be submitted by this Permit. Any such claim must be asserted at the time of submission in the manner prescribed on the application form or instructions, or in the case of other submissions, by stamping the words "confidential business information" on each page containing such information. If no claim is made at the time of the submission, DEQ may make the information available to the public without further notice. If a claim is asserted, the information will be treated in accordance with the procedures in 40 CFR Part 2 (Public Information). Claims of confidentiality for the name and address of any permit applicant or Permittee will be denied.

L. DOCUMENTS TO BE MAINTAINED AT THE FACILITY

The Permittee shall maintain at the facility, until all corrective measures and monitoring are complete and closure is completed and certified by an independent, registered professional engineer, the following documents and all amendments, revisions and modifications to these documents:

1. Inspection schedules, as required by 40 CFR 264.15(b) (2) and this Permit;
2. Personnel training documents and records, as required by 40 CFR 264.16{d) and this Permit;
3. Contingency Plan, as required by 40 CFR 264.53(a) and this Permit;
4. Operating record, as required by 40 CFR 264.73 and this Permit;
5. Post-Closure Plan, as required by 40 CFR 264.118{a) and this Permit.

SECTION II GENERAL FACILITY CONDITIONS

A. DESIGN AND OPERATION OF FACILITY

The Permittee shall maintain and operate the facility to minimize the possibility of a fire, explosion, or any unplanned, sudden or nonstudent release of hazardous waste constituents to air, soil, ground water, or surface water which could threaten human health or the environment, as required by 40 CFR 264.31.

B. REQUIRED NOTICES

1. Hazardous Waste Imports

The Permittee may not receive hazardous waste from a foreign source.

2. Hazardous Waste from Off-Site Sources

The Permittee may not receive hazardous waste from off-site sources. [40 CFR 264.12(b)]

C. SECURITY

The Permittee is a closed, high-security Department of Defense installation, and therefore has 24-hour armed patrols. These security conditions are not anticipated to change during the term of this Permit. Therefore, as long as these conditions remain, the Permittee meets the requirements of 40 CFR 264.14(b)(2) and (c).

D. GENERAL INSPECTION REQUIREMENTS

The Permittee shall inspect the operating groundwater remediation systems and appurtenant equipment on a weekly basis. The Permittee shall remedy any deterioration or malfunction discovered by an inspection, as required by 40 CFR 264.15(c). Records of inspections shall be kept, as required by 40 CFR 264.15(d).

E. PERSONNEL TRAINING

The Permittee shall be responsible for assuring that adequate training is provided for all personnel performing hazardous waste management practices and operating the remedial systems.

F. SPECIAL PROVISIONS FOR IGNITABLE, REACTIVE, OR INCOMPATIBLE WASTE

The Permittee shall comply with the requirements of 40 CFR 264.17(a).

G. PREPAREDNESS AND PREVENTION

Required Equipment

At a minimum, the Permittee shall maintain at the facility the equipment required by 40 CFR 264.32.

1. Testing and Maintenance of Equipment

The Permittee shall test and maintain the equipment specified in Permit Condition II.H.1, as necessary, to assure its proper operation in time of emergency, as required by 40 CFR 264.33.

2. Access to Communications or Alarm System

The Permittee shall maintain access to the communications or alarm system, as required by 40 CFR 264.34.

3. Arrangements with Local Authorities

The Permittee shall maintain arrangements with state and local authorities, as required by 40 CFR 264.37. If state or local officials refuse to enter into preparedness and prevention arrangements with the Permittee, the Permittee must document this refusal in the operating record.

H. CONTINGENCY PLAN

1. Implementation of Plan

The Permittee shall immediately carry out the prov1s1ons of the Base-wide Spill Prevention, Control, and Countermeasures (SPCC) Plan, whenever there is a fire, explosion, or release of hazardous waste or constituents which could threaten human health or the environment.

2. Copies of Plan

The Permittee shall comply with the requirements of 40 CFR 264.53.

3. Amendments to Plan

The Permittee shall review and immediately amend, if necessary, the Contingency Plan, as required by 40 CFR 264.54. Such an amendment may require a Permit modification in accordance with 40 CFR 270.42.

4. Emergency Coordinator

A trained emergency coordinator shall be available at all times in case of an emergency, as required by 40 CFR 264.55.

I. AIR EMISSION STANDARDS

The Permittee shall follow the 40 CFR 264 Subparts BB and CC requirements for remediation operations and systems, as applicable.

J. GENERAL CLOSURE REQUIREMENTS

This facility has no operating RCRA waste management units which will require closure as anticipated by 40 CFR 264 Subpart G. All clean-up, remediation, and post-closure activities are subject to the corrective action measures specified in Section Ill of this Permit.

K. COST ESTIMATE FOR FACILITY CLOSURE; FINANCIAL ASSURANCE; LIABILITY INSURANCE REQUIREMENTS

As a federally owned and operated facility, financial assurance for closure and post- closure, and accompanying cost estimates, are not required. Should the facility change ownership to a non-federal entity, .both cost estimates and financial assurances will be required prior to approval of a permit transfer.

SECTION III POST-CLOSURE CARE

A. SECTION HIGHLIGHTS

The Environmental Restoration Program (ERP) sites at Vance Air Force Base covered under this Permit consist of ten units. Each site has contamination from either chlorinated solvents or fuel or both. The first ERP site to be included was ST008, part of a tank farm that contained chlorinated solvents and fuel. The second ERP site was ST- 12, the former paint stripping equalization tank (PSET) which was a below-grade concrete vault. Both tanks were removed from service and excavated.

B. UNIT IDENTIFICATION

Site ST008 (UST No. 106 at Bldg. 110)
Site ST012 (Paint Stripping Equalization Tank)

ERP Site 8 is the physical location of Underground Storage Tank (UST) No. 106 that was used to manage waste solvents and contaminated fuels during the 1970's and early 1980's. UST No. 106, a 12,000-gallon steel tank, was excavated and removed in 1989 as part of the closure process. ERP Site 12, the Paint Stripping Equalization Tank (PSET), was a reinforced concrete UST with a capacity of approximately 10,000 gallons. The PSET was installed in 1967 and had been used solely to hold paint stripping waste; it was taken out of service in 1988, and removed in June 1995. There is groundwater and soil contamination associated with releases from both these ERP Sites. Groundwater monitoring is required. The Permittee has undertaken corrective action to remediate the permitted sites.

C. FACILITY AND FUNCTIONS AUTHORIZED

1. The Permittee is authorized to monitor and maintain the corrective action units, subject to the terms and conditions of this Permit and Exhibits 4, 5, and 6.

2. The above units are identified in the Post-Closure Permit Application received on February 28, 2006.

D. POST-CLOSURE CARE AND USE OF PROPERTY

1. The Permittee shall conduct post-closure care for the units listed in Permit Condition III.B. and comply with all applicable post-closure requirements contained in 40 CFR 264.117 through 264.120. The post-closure care period of 30 years after the certification of closure may be shortened or extended if necessary, as per 40 CFR 264.117(a) in accordance with the permit modification procedures in 40 CFR Parts 124 and 270.

2. The Permittee shall not allow any use of the closed units which will disturb the integrity of the final cover or the function of the monitoring systems unless the DEQ finds the disturbance: (1) is necessary for the proposed use of the property, and will not increase the potential hazard to human health or the environment; or (2) is necessary to reduce a threat to human health or the environment.

3. The Permittee shall comply with all applicable requirements of 40 CFR 264.310 and shall at least:

a. Continue all applicable operations necessary to provide long-term minimization of liquids though the closed corrective action units. [40 CFR 264.310(a)(1)]

b. Maintain the integrity and effectiveness of the final cover, including making repairs to the cap as necessary to correct the effects of settling, subsidence, erosion, or other events. [40 CFR 264.310(b)(1)]

c. Maintain and monitor the groundwater monitoring system and comply with all other applicable requirements of 40 CFR 264 Subpart F. [40 CFR 264.310(b)(4)]

d. Prevent run-on and run-off from eroding or otherwise damaging the final cover. [40 CFR264.310(b)(5)]

e. Protect and maintain surveyed benchmarks or markers used in complying with 40 CFR 264.309. [40 CFR 264.310(b)(6)]

4. No later than sixty (60) days after completion of the established post-closure care period, the Permittee shall submit a certification that the post-closure care for the units was performed in accordance· with the specifications in the approved post-closure plans as required by 40 CFR 264.120.

E. POST-CLOSURE PERMIT MODIFICATIONS

The Permittee must request a permit modification to authorize a change in the approved post-closure plan(s). This request must be in accordance with applicable requirements of 40 CFR Parts 124 and 270, for approval by the DEQ.

SECTION IV GROUNDWATER MONITORING

A. HIGHLIGHTS

1. The Permittee shall sample one time for 1-4-dioxane at all monitoring wells in 2011 to determine if the constituent is present at Vance AFB. If 1-4-dioxane is present at concentrations above the Environmental Protection Agency screening level for tap water (6.10 µg/L), the Permittee must continue to include this constituent in the scheduled sampling events at each monitoring well in which this constituent was detected. If the levels are below this screening level, no additional sampling for 1-4 dioxane will be required.

2. Groundwater monitoring is required for ten Environmental Restoration Program (ERP) sites located in different areas at Vance AFB listed below. One area, the Corrective Measures Implementation or CMI area is comprised of groundwater monitoring wells from Environmental Restoration Program sites ST012, WP023, SS024, and SS025. Site WP023 currently has no contamination present that originated at the site. The monitoring wells previously assigned to Site WP023 and the areas which they monitor are being assigned to the sites where the contamination they monitor actually originated from. Sites ST012 and SS024 have been identified as source areas for contaminants. The Industrial Zone consists of five sites: Tank Farm Landfill (Site LF003); Hazardous Waste Accumulation Point (SS007); Underground Storage Tank No. 106 at Building 110 (Site ST008); AQUA/AVGAS Fuel Distribution System (ST011); and the Quartermaster Service Station (Site ST013). Site~~s ST011 and~~ ST013 require~~s~~ no further corrective action. Site ST011 is currently in the process of undergoing investigation and is not subject to compliance monitoring at this time. Site DP005, the sludge disposal area, includes a network of nine designated monitoring wells. Former Fire Training Area 2 (FT002) has a two designated wells, while the jet fuel storage area (SS026) network is comprised of four designated wells. Site SS028 is a new site, located immediately upgradient of Site ST008 and is not subject to compliance monitoring at this time with the exception of MW8-18, which is part of the current compliance program. Monitoring Well MW8-18 has been assigned to Site SS028 in this permit modification. Additional Site SS028 monitoring wells may be added to the compliance monitoring program through a permit modification when the remedial facility investigation has been completed. The following are the ten ERP sites requiring groundwater monitoring:

<u>Units permitted for post-closure care activities:</u>

- Site ST008 (UST No. 106 at Bldg. 110)
- Site ST012 (Paint Stripping Equalization Tank)

<u>Solid Waste Management Units:</u>

- FT002 (Fire Training Area)
- LF003 (Tank Farm Landfill)
- DP005 (Sludge Disposal Area)
- SS007 (Hazardous Waste Accumulation Point)

- ~~WP023 (Industrial Waste Pit)~~
- SS024 (Jet Engine Cleaning Shop)
- SS025 (COMBS Warehouse)
- SS026 (Jet Fuel Storage Area)
- SS028 (Solvent Spill Site)

The groundwater monitoring program is comprised of four major components: 1) ERP Sites DP005 and FT002; 2) the Industrial Zone (ERP Sites LF003, SS007, and ST008); 3) the Corrective Measures Implementation (CMI) Area (ERP Sites ST012, ~~WP023~~, SS024, and SS025); and 4) ERP Site SS026. In general, the groundwater monitoring wells for these components are screened in three different transmissive zones present at the facility. The three zones are: the 10 to 30-foot below ground surface interval (Shallow), the 35 to 50-foot interval (Intermediate), and the 55 to 75-foot interval (Deep).

The facility-wide Groundwater Monitoring System has been and shall continue to be designed, constructed, operated, and maintained to enable evaluation of groundwater resources at the facility Point-of-Compliance (including interaction with surface water). The monitoring system will be maintained in accordance with the detailed plans and specifications presented in this Section. The monitoring system consists of 55~~4070~~ compliance wells~~; of~~ which ~~57~~ are monitored on an annual basis ~~and13 are monitored on a semi-annual basis~~. Monitoring will continue until such time as the requirements of this Permit are met. The monitoring well network has been modified using a conceptual site model approach that realigns all monitoring wells to the site where the groundwater contamination originated from, regardless of the previous well designation. To keep the integrity of the historical data intact, the individual monitoring well names will not change.

B. WELL LOCATION, INSTALLATION, AND CONSTRUCTION

The Permittee shall maintain the existing groundwater monitoring system to comply with the requirements of 40 CFR 264.100(d).

1. The Permittee shall maintain a groundwater monitoring system with monitoring wells at the locations specified on the map presented in Permit Exhibit 1, and in compliance with the following table for the duration of this Permit unless modified:

ERP Site	Area	Monitoring Well	Monitoring Parameter
FT002	Fire Training Area	2-04 ~~and 2-05~~	~~VOCs, SVOCs,~~ TPH~~, 8 RCRA metals (arsenic, barium, cadmium, total chromium, lead, mercury, selenium, and silver), and pesticides~~ TCE, Cis 1,2 DCE, VC, OK-DRO and Selenium
		2-05	TCE, Cis 1,2 DCE, and VC

LF003	Industrial Zone	~~3-06, 3-07, &~~ 3-09	~~VOCs and 8 RCRA metals~~ Benzene, Ethylbenzene, Arsenic and Lead
		OB-02	Benzene
		7-15	Benzene, Ethylbenzene, Toluene, m&p Xylene, o-Xylene, Arsenic and Lead
DP005		5-1, ~~5-3, 5-4, 5-6, 5-7, 5-8, 5-9, 5-18, and 5-19~~	~~8 RCRA metals, TPH, VOCs, and SVOCs~~ Benzene TCE, Cis 1,2 DCE, VC, bis(2-Ethylhexyl)Phalate and OK-GRO
		5-3	TCE, Cis 1,2 DCE and VC
		5-4	Benzene, PCE, TCE, Cis 1,2 DCE, VC, 1,1,1 TCE, 1,1,2- TCA, 1,1- DCA, 1,1- DCE, Chloroform, Methylene, Chloride, Toluene, trans-1,2-DCE, Naphthalene, Arsenic, OK-DRO, OK-GRO
		5-6 and 5-7	TCE, Cis 1,2 DCE, VC, Arsenic, and OK-DRO
		5-8	TCE, Cis 1,2 DCE, VC and OK-GRO
		5-18	TCE, Cis 1,2 DCE and VC
		5-19	Benzene, TCE, Cis 1,2 DCE, VC, bis(2-Ethylhexyl) Phthalate, Naphthalene, OK-DRO and OK-GRO
SS007	Industrial Zone	7-04~~, 7-15 ; OB-02, OB-03, OB-04, OB-05, OB-06, OB-09, OB-13, OB-16, 0B-18, OB-19, OB-21; N7-38, N7-40, N7-41, N7-48, N7-50, N7-51, N7-52, N7-53, N7-65, and N7-69~~	TCE, Cis 1,2 DCE, VC and Arsenic and Lead
		OB-04, OB-05, OB-06, OB-13, OB-16, OB-19, N7-41, N7-48, N7-50 and N7-52	TCE, Cis 1,2 DCE, and VC

		OB-21	TCE, Cis 1,2 DCE, VC and Arsenic
ST008	Industrial Zone	8-5, ~~8-9, 8-12, 8-16, and 8-18~~	~~VOCs and 8 RCRA metals~~ Benzene, TCE, Cis 1,2 DCE, VC, Naphthalene and Arsenic
		~~8-9, 8-12, 8-16, and 8-18~~	~~VOCs and 8 RCRA metals~~ 1,1,2-TCA, 1,1,2,2-PCA, Benzene, TCE, Cis 1,2 DCE, VC and Naphthalene
SS028	Industrial Zone	MW8-18	VOCs, 8 RCRA Metals
ST012	CMI Area	12-09,~~12-13, 12-20, 12-21, 12-30, 12-33, 12-34, 12-35, 12-37, 12-38, 12-43, and 12-45~~	~~VOCs and SVOCs~~ PCE, TCE, Cis 1,2 DCE, and VC
		12-13	PCE, TCE, Cis 1,2 DCE, VC, and Naphthalene
		~~12-21, 12-34, 12-38~~, 12-34, 12-38, 23-05, 23-21, 23-22, 25-1 and 25-2	TCE, Cis 1,2 DCE and VC
		12-30	1,1-DCTCE, Cis 1,2 DCE,VC and 1,1 DCE
		25-4	TCE, Cis 1,2 DCE, VC and Carbon tetrachloride
~~WP023~~	~~CMI Area~~	~~23-05,23-14, 23-21, and 23-22~~	~~VOCs and SVOCs~~
SS024	CMI Area	~~24-05~~12-33~~, 12-35, and 12-37~~	~~VOCs and SVOCs~~ 1,1-DCE, TCE, Cis 1,2 DCE, VC and 1,4 Dioxane
		12-35	TCE, Cis 1,2 DCE, VC and bis(2-Ethylhexyl)Phthalate
		12-37	TCE, Cis 1,2 DCE and VC

SS025	CMI Area	~~25-01, 25-02, 25-04~~, 25-07, ~~25-08 and 25-09, and 25-15~~	~~VOCs and SVOCs~~1,4 Dioxane
		12-43 and 24-5	TCE, Cis 1,2 DCE, and Trans, 1,2-DCEand VC
		12-45	TCE, Cis 1,2 DCE, and trans 1,2-DCE and VC
		23-14	TCE, Cis 1,2 DCE, and VC and bis(2-Ethylhexyl)Phthalate
SS026		26-1, 26-2, 26-3, 26-4	~~VOCs and SVOCs~~ Naphthalene and OK-GRO

2. **The Permittee shall maintain the monitoring wells identified In Pe**rmit Condition IV.B.1. to assure the wells remain in working order.

3. Deletion of wells from the monitoring program shall require a Permit modification in accordance with 40 CFR 270.42. Deleted wells shall be plugged and abandoned in accordance with Oklahoma Water Resources Board guidelines.

C. GROUNDWATER PROTECTION STANDARD

1. The Permittee has implemented a corrective action program to ensure that regulated units achieve compliance with the Groundwater Protection Standard. [40 CFR 264.100(d)] The Permittee shall achieve compliance with the National Drinking Water Standards, Maximum Contaminant Levels (MCLs) for contaminated groundwater at the Base boundaries (Point-of Compliance).

2. The Permittee shall monitor the wells described in Permit Condition IV.B., and as specified in Permit Exhibits 4, 5, and 6.

   The Permittee shall monitor for the following hazardous constituents during the compliance period. [40 CFR 264.96]. The compliance period is defined as the interval the Permittee can demonstrate that the Groundwater Protection Standard has not been exceeded for a period of three consecutive years. The monitoring shall be conducted at frequencies in accordance with the tables beginning on page IV-6 at the end of this Permit Section. At ERP Sites ST008 and ST012, the monitoring shall be conducted for the 30-year post-closure care period. If the Groundwater Protection Standard has not been exceeded for a period of three consecutive years a petition will be made to remove the 30 year requirement. Data summary reports containing the groundwater analytical results shall be produced annually. Parameters sampled at each site are noted in section B. Analytical methods are presented below.

   ERP Site FT002
   Volatile Organics EPA method 8260B or approved equivalent method
   ~~Semi-volatile Organics EPA Method 8270 or approved equivalent method~~

TPH	EPA Method 8015 modified or approved equivalent method
~~Eight~~ RCRA metals	EPA Method 6017/7470 or approved equivalent method
~~Pesticides~~	~~EPA Office of Prevention, Pesticides, and Toxic Substances (OPPTS) or approved equivalent methods~~

ERP Site DP-05

Volatile Organics	EPA method 8260B or approved equivalent method
Semi-volatile Organics	EPA Method 8270 or approved equivalent method
TPH	EPA Method 8015 modified or approved equivalent method
~~Eight~~ RCRA metals	EPA Method 6017/7470 or approved equivalent method

ERP Site 3, ~~and 7, and 8~~ (industrial Zone)

Volatile Organics	EPA method 8260B or approved equivalent method
~~Eight~~ RCRA metals	EPA Method 6017/7470 or approved equivalent method

ERP Site ~~3, and~~ 7, ~~and~~ 8 (industrial Zone)

Volatile Organics	EPA method 8260B or approved equivalent method

ERP Site 28 ~~3, and 7, and 8~~

Volatile Organics, Metals	EPA method 8260B or approved equivalent method

IRP Site 12~~. 23~~. 24. 25. and 26

Volatile Organics	EPA method 8260B or approved equivalent method
Semi-volatile Organics	EPA Method 8270 or approved equivalent method

IRP Site ~~12. 23~~. 24~~. 25. and 26~~

Volatile Organics	EPA method 8260B or approved equivalent method
Semi-volatile Organics	EPA Method 8270 or approved equivalent method

IRP Site ~~12. 23. 24.~~ 25~~. and 26~~

Volatile Organics	EPA method 8260B or approved equivalent method
Semi-volatile Organics	EPA Method 8270 or approved equivalent method

IRP Site ~~12. 23. 24. 25~~. and 26

Semi-volatile Organics	EPA Method 8270 or approved equivalent method
Semi-volatile Organics	EPA Method 8270 or approved equivalent method

D. CORRECTIVE ACTION PROGRAM

1. The Permittee has implemented a corrective action program intended to prevent hazardous constituents in groundwater from exceeding their respective concentration limits (as provided under Permit Condition IV.C.3) at the compliance point by removing the hazardous constituents or by treating them in place. [40 CFR 264.100(b)]

   Contaminated groundwater shall be remediated such that the Maximum Contaminant Levels (MCLs) are not exceeded at the Point of Compliance.

2. The specifications and schedules of the corrective action measures shall be in accordance with the requirements of Section V of this Permit.

3. The Permittee shall continue corrective action to the extent necessary to ensure that

the groundwater protection standard is not exceeded, or until the groundwater protection standard has not been exceeded for three consecutive years. [40 CFR 264.100(f)]. Once all monitoring wells at a site have achieved MCLS or other agreed upon standard for the required three year LTM period they will be considered to have achieved NFA status.

E. SAMPLING AND ANALYSIS PROCEDURES

The Permittee shall use the following techniques and procedures when obtaining and analyzing samples from the groundwater monitoring wells described in Permit Condition IV.B. [40 CFR 264.97(d) and (e)]

1. Samples shall be collected, preserved, and analyzed by the techniques described in the Sampling and Analysis Plan, as specified in Permit Exhibit 4.
2. Samples shall be tracked and controlled using the chain-of-custody procedures specified in the Sampling and Analysis Plan (Permit Exhibit 4).

F. GROUNDWATER SURFACE ELEVATIONS

1. The Permittee shall determine the groundwater surface elevation at each well each time groundwater is sampled, in accordance with Permit Condition IV.G. [40 CFR 264.97(f)]
2. The Permittee shall measure total well depths at least annually.

G. MONITORING PROGRAM AND DATA EVALUATION

The Permittee has implemented a groundwater monitoring program to demonstrate the effectiveness of the corrective action program. Groundwater monitoring shall be conducted and shall be as effective as the program for compliance monitoring under 40 CFR 264.97 and 40 CFR 264.99. The Permittee shall determine groundwater quality as follows:

1. The Permittee shall collect, preserve, and analyze samples in accordance with Permit Condition IV.E;

2. The Permittee shall determine the concentrations of the hazardous constituents specified in Permit Condition IV.C., throughout the compliance period and any extensions due to corrective action implementation, to demonstrate conformance with the groundwater protection standard. [40 CFR 264.96];

3. The Permittee shall determine the groundwater flow rate and direction in the uppermost aquifer at least annually. [40 CFR 264.99(e)];

4. The Permittee shall submit to the DEQ, on an annual basis, summary tables and maps of concentrations of the parameters listed in IV.C.3. This information must be submitted no later than March 1 following each calendar year.

5. The Permittee shall submit recommended modifications to the groundwater compliance program, in the Annual Groundwater Compliance Monitoring Report with supporting technical data. A formal letter requesting modification of the groundwater compliance document will be submitted to ODEQ for approval under separate cover.

Criteria for modifying the groundwater compliance sampling program is outlined in the Sampling and Analysis Plan, as specified in Permit Exhibit 4.

H. RECORDKEEPING AND REPORTING

The Permittee shall report on a semi-annual basis, in writing, to the DEQ on the effectiveness of the corrective action program. These reports shall provide a chronology of the events during the preceding six months and provide a summary of the planned activities for the following six months. These reports shall be submitted no later than April 1 and October 1 of each year until the corrective action program has been completed. [40 CFR 264.100(g)]

List of Monitoring Wells
Industrial Zone
Vance Air Force Base, Oklahoma

Well ID	Well Type	Monitoring Frequency
Site LF003		
~~3-6~~	~~Shallow~~	~~Annual~~
~~3-7~~	~~Deep~~	~~Annual~~
3-9	Shallow	~~Semiannual~~Annual
OB-2	Shallow	~~Semiannual~~Annual
7-15	Shallow	Annual
Site SS007 (including North Site SS007)		
7-4	Shallow	Annual
~~7-7~~	~~Deep~~	~~Annual~~
~~OB-2~~	~~Shallow~~	~~Semiannual~~
~~OB-3~~	~~Shallow~~	~~Semiannual~~
OB-4	Shallow	~~Semiannual~~Annual
OB-5	Shallow	Annual
OB-6	Shallow	Annual
~~OB-9~~	~~Shallow~~	~~Semiannual~~
OB-13	Shallow	Annual
OB-16	Shallow	Annual
~~OB-18~~	~~Shallow~~	~~Semiannual~~
OB-19	Shallow	Annual
OB-21	Shallow	~~Semiannual~~Annual
N7-38	Intermediate	~~Semiannual~~Annual
~~N7-40~~	~~Shallow~~	~~Semiannual~~
N7-41	Shallow	~~Semiannual~~Annual
N7-48	Intermediate	Annual
N7-50	Intermediate	Annual
~~N7-51~~	~~Deep~~	~~Annual~~
N7-52	Intermediate	~~Semiannual~~Annual
~~N7-53~~	~~Deep~~	~~Semiannual~~
~~N7-69~~	~~Shallow~~	~~Semiannual~~
Site ST008		
8-5	Shallow	Annual
8-9	Shallow	Annual
~~8-12~~	~~Shallow~~	~~Annual~~
~~8-16~~	~~Shallow~~	~~Annual~~
~~8-18~~	~~Intermediate~~	~~Annual~~
Site SS028		
8-18	Intermediate	Annual

List of Monitoring Wells
CMI Area
Vance Air Force Base, Oklahoma

Well ID	Well Type	Monitoring Frequency
Site ST012		
12-9	Shallow	Annual
12-13	Deep	Annual
~~12-20~~	~~Deep~~	~~Annual~~
~~12-21~~	~~Deep~~	~~Annual~~
12-30	Intermediate	Annual
~~12-33~~	~~Shallow~~	~~Annual~~
12-34	Intermediate	Annual
~~12-35~~	~~Shallow~~	~~Annual~~
~~12-37~~	~~Shallow~~	~~Annual~~
12-38	Intermediate	Annual
~~12-43~~	~~Shallow~~	~~Annual~~
~~12-45~~	~~Shallow~~	~~Annual~~
~~**Site WP023**~~		
23-5	Shallow	Annual
~~23-14~~	~~Shallow~~	~~Annual~~
23-21	Intermediate	Annual
23-22	Intermediate	Annual
25-1	Shallow	Annual
25-2	Shallow	Annual
25-4	Shallow	Annual
Site SS024		
~~24-5~~	~~Shallow~~	~~Annual~~
12-33	Shallow	Annual
12-35	Shallow	Annual
12-37	Shallow	Annual
Site SS025		
~~25-1~~	~~Shallow~~	~~Annual~~
~~25-2~~	~~Shallow~~	~~Annual~~
~~25-4~~	~~Shallow~~	~~Annual~~
25-7	Shallow	Annual
~~25-8~~	~~Shallow~~	~~Annual~~
~~25-9~~	~~Shallow~~	~~Annual~~
~~25-15~~	~~Shallow~~	~~Annual~~
12-43	Shallow	Annual
12-45	Shallow	Annual
23-14	Shallow	Annual
24-5	Shallow	Annual

List of Monitoring Wells
ERP Site SS026
Vance Air Force Base, Oklahoma

Well ID	Well Type	Monitoring Frequency
26-1	Shallow	Annual
26-2	Intermediate	Annual
26-3	Shallow	Annual
26-4	Shallow	Annual

List of Monitoring Wells
ERP Site DP005
Vance Air Force Base, Oklahoma

Well ID	Well Type	Monitoring Frequency
5-1	Shallow	Annual
5-3	Shallow	Annual
5-4	Shallow	Annual
5-6	Shallow	Annual
5-7	Shallow	Annual
5-8	Shallow	Annual
~~5-9~~	~~Deep~~	~~Annual~~
5-18	Intermediate	Annual
5-19	Shallow	Annual

List of Monitoring Wells
ERP Site FT002
Vance Air Force Base, Oklahoma

Well ID	Well Type	Monitoring Frequency
2-04	Shallow	Annual
2-05	Shallow	Annual

SECTION V SPECIAL CONDITIONS PURSUANT TO THE 1984 HAZARDOUS AND SOLID WASTE AMENDMENTS (HSWA)

This section applies to the following Solid Waste Management Units (SWMUs) and/or to any newly identified SWMUs or Areas of Concern (AOCs).

Units permitted for post-closure care activities:

Site ST008 (UST No. 106 at Bldg. 110)

ERP Site ST008 is the physical location of Underground Storage Tank (UST) No. 106 that was used to manage waste solvents and contaminated fuels during the 1970's and early 1980's. UST No. 106, a 12,000-gallon steel tank, was excavated and removed in 1989 as part of the closure process. In March 2017 a remedy was put in place to address the residual contamination left in place after the tank was removed. The contamination consists of petroleum contamination in the shallow soils and petroleum contamination in the shallow transmissive zone at the site. There is some chlorinated contamination in the intermediate transmissive zone upgradient of the former tank pit that is migrating onto Site ST008 from upgradient Site SS028. The intermediate transmissive contamination will be addressed under Site SS028.

The Site ST008 treatment remediation system will consist of a series of nine dual phase extraction wells (DPE), installed in the vicinity of the old tank pit, to address contamination in both the soils and shallow transmissive zone. The vacuum pump used to operate the system will be located in a trailer in the Fuels storage area. Groundwater extracted by the system will be conveyed back to the CGTF for treatment. Soil vapor will be discharged to atmosphere.

The Permittee shall follow the post-closure care plan present in Attachment 5 of the permit.

Site ST012 (Paint Stripping Equalization Tank)

ERP Site ST012, the Paint Stripping Equalization Tank (PSET), was a reinforced concrete UST with a capacity of approximately 10,000 gallons. The PSET was installed in 1967 and had been used solely to hold paint stripping waste; it was taken out of service in 1988, and removed in June 1995. In 2014, the ST012 remedy was changed to aggressive treatment using injections of emulsified vegetable oil creating conditions conducive to enhanced reductive dechlorination of CVOC contamination in areas of elevated concentrations of chlorinated VOCs (i.e. hot spots) in the shallow, intermediate, and deep zones to reduce contaminant mass and mass flux. The remedy has flow-through biobarrier walls to treat the downgradient portions of the plume.

In addition to ERD, the currently operating groundwater system was retrofitted as an SVE system in order to efficiently reduce contaminant mass in the subsurface by volatilizing VOCs in the vadose and “smear” zone soils. The system is designed to create a negative pressure beneath Building 192 that will mitigate/prevent soil vapors from entering the building through the sub-slab/foundation.

The Permittee shall follow the post-closure care plan present in Exhibit 6 of the permit until MCLs are met and ODEQ has waived the 30 year monitoring requirement.

Solid Waste Management Units:

FT002 (Fire Training Area)
Site FT-02 is a two-acre area located near the south central boundary of the Base. It was used for firefighting training during the ~~1960s~~ 1950s until the ~~1980s~~2000s. The RCRA Facility Investigation (RFI) for this site has been completed in 1992. ~~The site is currently undergoing long-term groundwater monitoring.~~ In 2013 a predesign investigation was conducted at the site focusing on site soils to determine the nature and extent of residual soil contamination at the site. The investigation concluded that there was a small area of soils ~~in place at the site~~ between 12 and 16 feet below ground surface that exceeded ODEQ's GRO standards. In 2014 a soil vapor extraction system was placed into operation to treat these soils. The use of the SVE was discontinued in 2016 due to low mass removal rates.

In addition emulsified vegetable oil injections were conducted around monitoring well MW02-04 for the purpose of treating a trichloroethylene exceedance at this well. The site achieved MCLs in January 2018 and is currently undergoing long-term groundwater monitoring to monitor the effectiveness of the remediation.

LF003 (Tank Farm Landfill)
This former landfill covering approximately three acres was used from 1941 until 1952 to dispose of general refuse, containerized liquids, and tank sludge to depths of approximately 15 feet using the trench and fill method. RFI ~~has been~~ was completed in 1993. Site is currently included in groundwater monitoring program.

The free product recovery system has been inactive due to a lack of recoverable free product. An investigation conducted in 2013 showed no sources of contamination within the landfill and that free product and petroleum contamination associated with the landfill originated in an upgradient site, ST011. As a result, the trees associated with the phytoremediation system were cut down in July 2016, and removal of the remaining phytoremediation system components was completed in October 2017. Institutional controls and groundwater monitoring will continue at the Site

DP005 (Sludge Disposal Area)
Site DP005 resulted from a one-time disposal of approximately 1,000 gallons of fuel tank sludge. Multiple' investigations have been conducted since 1990. The source of consequential groundwater contamination has been removed. At least two interim remedial measures removed soils at Site DP005. The DEQ concurred with the Draft Final Feasibility Study Addendum, presenting groundwater removal with an interceptor trench and large-diameter vertical wells, water treatment with air stripping, surface water and groundwater monitoring, and institutional controls as the selected remedial alternative. The system has been in operation continuously since its installation in May 2003.

In 2014, the DP005 remedy was modified to aggressive treatment using injections of emulsified vegetable oil creating conditions conducive to enhanced reductive dechlorination (ERD) of CVOC contamination in areas of elevated concentrations of chlorinated VOCs (i.e. hot spots) to reduce contaminant mass and mass flux. In

addition, the existing groundwater extraction and treatment system was modified to become a groundwater recirculation system where extracted groundwater is treated using granular activated carbon amended with lactate and reinjected immediately upgradient of the plume to disperse a carbon source throughout the plume. A small SVE system was used to treat soils adjacent to the groundwater interceptor trench. The use of the SVE was discontinued in 2015 due to low mass removal rates and no significant concentrations methane being extracted by the system.

Site DP005 is being treated using ERD injections in the source area immediately south of the original ICT trench. All extraction wells and the ICT trench have been turned off and the groundwater treatment system has been taken offline as the only remaining impacted area is immediately adjacent to the trench. This area is being treated with direct injections.

SS007 (Hazardous Waste Accumulation Point)

Site SS007 is located northeast of the flightline apron, with portions of the site being located to the west and north of site LF003. The Hazardous Waste Accumulation Point consists of three different areas. One area has been used by the Defense Reutilization and Marketing Office (DRMO). Temporary storage of hazardous waste drums occurred from 1980 until 1994. Wastes stored at this site included solvents, metal treatment sludges, waste oils, and contaminated fuels. DRMO also ~~stores~~stored new product in an open storage area. The second area is the old Base Civil Engineering (BCE) storage area where polychlorinated biphenyl transformers were stored after removal and new solvents ~~were~~ stored for usage. At the time of issuance of the 1996 Permit, the area was open space. The third area is north of Fox Drive. In July 1997, the City of Enid deeded 158 acres to the Permittee for the expansion of the Permittee's operations. Historically, this area, known as North Site SS007, was used for agricultural purposes. The source area for contamination at this site appears to be located in the BCE storage area. This contamination has spread to the North Site SS007 area.

In 2014, the existing groundwater extraction and treatment system was modified to incorporate aggressive treatment (via in-situ bioremediation) of residual areas of elevated concentrations of chlorinated VOCs (i.e. ‘hot spots’) in the shallow zone to reduce contaminant mass.

Site SS007 is being treated using ERD injections in the source area immediately south of the original ICT trench. All extraction wells with the exception of the ICT trench have been turned off but the ICT trench will remain operational until EVO is detected in the trench influent.

To facilitate the remedy at North Site S007, the CGTF was taken offline and a treatment/recirculation trailer was placed on North Site 007 to treat/amend/recirculate groundwater from North Site 007 using the existing groundwater extraction system, including the north ICT, along with newly installed wells. Groundwater is treated using granular activated carbon amended with lactate and reinjected immediately upgradient and sidegradient of the plume to disperse a carbon source throughout the plume. The SS007 area will be divided into several recirculation cells to expedite the remediation of the plume. The north ICT trench will remain operational until EVO or lactate is detected in the trench influent. ~~The area is currently under corrective action in the form of the Central Groundwater Treatment Facility which provides groundwater extraction with air stripping and hydraulic containment.~~

WP023 (Industrial Waste Pit)
Site WP023 is located between Buildings 182 and 183, approximately 250 feet north of Site ST012. Past investigations found evidence of an impoundment (pond) approximately 10 feet by 20 feet in area. The depth of the pond, the total amount of waste transported to the pond, the specifications of the liner material (if any), and the period of operation of the pond are unknown. The pond is believed to have been abandoned in 1967 and subsequently covered with soil and grass by the early to mid-1970s. The RFI for the site has been completed. Based on multiple investigations conducted at this site in 2013 (USACE 1994, USACE1995, VAFB 2002), there is no current soil or groundwater contamination present at WP023 that originated from the WP023 release. The monitoring wells associated with Site WP023 are used to monitor groundwater contamination migrating from site ST012.

SS024 (Jet Engine Cleaning Shop)
Site SS024 is located at Building 187. Before 1992, hazardous material was transferred from inside the building via piping and an associated manhole outside Building 187. Spills that may have occurred during these transfers could have been the source of the area's contamination. The RFI for this site ~~has been~~ was completed in 1992. A groundwater monitoring system is in place. In 2014, the SS024 remedy was changed to aggressive treatment using injections of emulsified vegetable oil creating conditions conducive to enhanced reductive dechlorination (ERD) of CVOC contamination in areas of elevated concentrations of chlorinated VOCs (i.e. hot spots) in the shallow zone to reduce contaminant mass and mass flux. The remedy also has flow through biobarrier walls to treat the downgradient portions of the plume.

In addition to ERD, the currently operating groundwater system was retrofitted as an SVE system in order to efficiently control methane emissions from the injections into the SS024 “hot spot”. The use of the SVE was discontinued in 2016 due to low methane concentrations in the SVE effluent.
~~The area is currently under Corrective Action in the form of the Central Groundwater Treatment Facility, which provides groundwater extraction with air-stripping and hydraulic containment.~~

SS025 (COMBS Warehouse)
Site SS025 is located a Building 174, approximately 85 feet west of Elam Road at the east side of the flight apron, which was constructed in 1994. Review of historical information and existing analytical data suggests the trichloroethylene plume in groundwater at this site might have originated from outside the area, most likely from Site ST012 and/or Site SS024, which are upgradient with respect to groundwater flow. The investigations for this site ~~have been~~were completed in 1992, and a groundwater monitoring system is in place.

In 2014, the SS025 remedy was changed to aggressive treatment using injections of emulsified vegetable oil creating conditions conducive to enhanced reductive dechlorination (ERD) of CVOC contamination in areas of elevated concentrations of chlorinated VOCs (i.e. hot spots) in the shallow zone to reduce contaminant mass and mass flux. The remedy also has flow through biobarrier walls to treat the downgradient portions of the plume.

In addition to ERD, the currently operating groundwater system was retrofitted as an

SVE system in order to efficiently control methane emissions from the injections into the SS025 “hot spot”. The use of the SVE was discontinued in 2016 due to low methane concentrations in the SVE effluent

~~The area is currently under Corrective Action in the form of the Central Groundwater Treatment Facility, which provides groundwater extraction with air-stripping and hydraulic containment~~.

SS026 (Jet Fuel Storage Area)
Aboveground storage tanks (ASTs) containing jet fuel for Vance AFB operations are located approximately 100 feet west of a concrete-paved area used to store recreational vehicles. Groundwater contamination at the site reportedly resulted from activities in the 1970s and early 1980s. Residual fluids, sludges, and or rainwater (which might have contained JP-4 fuel contamination) were periodically discharged onto the ground from a diked area surrounding the ASTs where the recreational vehicle facility was later constructed. Investigations for this site ~~have been~~ were completed in 2007.

In 2014, a biosparge system was installed at SS026 to provide oxygen and enhance the natural attenuation of residual petroleum contamination at the site. As a result the phytoremediation plot was removed in Oct 2017 from the site. The site achieved MCLs in January 2018 and is currently undergoing long-term groundwater monitoring to monitor the effectiveness of the remediation.

SS028

SS028 was validated as a new IRP site in 2016 when an upgradient intermediate well, MW8-18, was determined to not be associated with ST008. The site is currently undergoing an RFI. Monitoring Well MW8-18 is being transferred to this site.

ST011

SS011 was a site previously closed under Oklahoma Corporation Rules but has been reopened because of petroleum products that have migrated to LF003. The site is currently undergoing an RFI

~~**SS027 (Entomology Shop)**~~
~~This site is Building 255, just to the east of the Central Groundwater Treatment Facility. A Preliminary Assessment/Site Inspection (PA/SI) was performed in 2007 to address the potential for pesticide and/or herbicide contamination at the site. Due to elevated levels of pesticides and herbicides detected in groundwater samples, the PA/SI Report recommended additional investigations be performed to evaluate the nature and extent of groundwater contamination.~~

~~The Permittee is required to perform a RFI of site SS027 in accordance with the Remedial Investigation/Feasibility Study Work Plan which was approved by DEQ on November 5, 2008.~~

A. STANDARD CONDITIONS

1. Waste Minimization

The Permittee shall submit a certified plan according to 40 CFR 270.11 in writing annually, by December 1, for the previous year ending September 30, specifying that:

a. The Permittee has a program in place to reduce the volume and toxicity of all hazardous wastes which are generated by the facility's operation to the degree determined to be economically practicable; and that the proposed method of treatment, storage, or disposal is the practicable method currently available to the Permittee which minimizes the present and future threat to human health and the environment. This certified plan must address the items below:

    1) Any written policy or statement that outlines goals objectives, and/or methods for source reduction and recycling of hazardous waste at the facility;

    2) Any employee training or incentive programs designed to identify and implement source reduction and recycling opportunities;

    3) Any source reduction and/or recycling measures implemented in the last five years or planned for the near future;

    4) An itemized list of the dollar amounts of capital expenditures (plant and equipment) and operating costs devoted to source reduction and recycling of hazardous waste;

    5) Factors that have prevented implementation of source reduction and/or recycling;

    6) Sources of information on source reduction and/or recycling received at the facility (e.g., local government, trade associations, suppliers, etc.);

    7) An investigation of additional waste minimization efforts which could be implemented at the facility. This investigation shall analyze the potential for reducing the quantity and toxicity of each waste stream through production reformulation, recycling, and all other appropriate means. The analysis shall include an assessment of the technical feasibility, cost, and potential waste reduction for each option;

    8) The Permittee shall submit a flow chart or matrix detailing all hazardous wastes it produces by quantity, type, and building/area;

    9) The Permittee shall demonstrate the need to use those processes which produce a particular hazardous waste due to a lack of alternative processes or available technology that would produce less hazardous waste.

2. Dust Suppression

    Pursuant to 40 CFR 266.23(b), the Permittee shall not use waste or used oil or any other material which is contaminated with dioxin, polychlorinated biphenyls (PCBs), or any other hazardous waste (other than a waste identified solely on the basis of ignitability), for dust suppression or road treatment.

3. Permit Modification

a. If at any time for any of the reasons specified in 40 CFR 270.41, the Administrative Authority determines that modification of this Permit is necessary, the Administrative Authority may initiate a permit modification according to 40 CFR 124.5, as follows:

1) Notify the Permittee in writing of the proposed modification and the date by which comments on the proposed modification must be received;

2) Publish a notice of the proposed modification in a locally distributed newspaper, broadcast the notice over a local radio station, mail a notice to all persons on the facility mailing list maintained according to 40 CFR 124. 10(c)(1)(Ix), and place a notice in the facility's information repository (a central source of all pertinent documents concerning the remedial action, usually maintained at the facility or some other public place in the vicinity of the permitted facility, such as a public library);

3) If the Administrative Authority receives no written comment on the proposed modification, the modification will become effective five (5) calendar days after the close of the comment period, The Administrative Authority will:

a) Notify the Permittee in writing of the final decision.

b) Notify individuals on the facility mailing list in writing that the modification has become effective and shall place a copy of the modified permit in the information repository, if a repository is required for the facility.

4) If the Administrative Authority receives written comment on the proposed modification, the Administrative Authority will make a final determination concerning the modification after the end of the comment period. The Administrative Authority will:

a) Notify the Permittee in writing of the final decision;

b) Provide notice of the final modification decision in a locally distributed newspaper and place a copy of the modified permit in the information repository, if a repository is required for the facility.

b. The Permittee may initiate permit modifications proceeding under 40 CFR 270.41 All applicable requirements and procedures as specified in 40 CFR 270.42 shall be followed.

c. Modifications of the Permit do not constitute a reissuance of the Permit.

4. Permit Review

This Permit may be reviewed by the Administrative Authority five years after the date of permit issuance and may be modified as necessary as provided for in V.A.3. Nothing in this section shall preclude the Administrative Authority from reviewing and modifying the Permit at any time during its term.

5. Compliance with Permit

   Compliance with this Permit during its term constitutes compliance, for the purposes of enforcement, with 40 CFR Parts 264 and 266 only for those management practices specifically authorized by this Permit. The Permittee is also required to comply with Parts 260, 261, 262, and 263 and OAC 252:205 as applicable.

6. Specific Waste Ban

   a. All land ban wastes that are generated from remediation or corrective action will be handled in accordance with 40 CFR 268. Failure to comply with the regulations may subject the Permittee to enforcement action under Section 3008 of RCRA and OAC 252:200.

   b. The Permittee may store wastes restricted under 40 CFR 268 solely for the purpose of accumulating quantities necessary to facilitate proper recovery, treatment, or disposal provided that it meets the requirements of 40 CFR 268.50(a)(2) including, but not limited to, clearly marking each tank or container.

   c. The Permittee is required to comply with all requirements of 40 CFR 268.7, as amended.

7. Information Submittal

   Failure to comply with any condition of the Permit, including information submittal, constitutes a violation of the Permit and is grounds for enforcement action, permit amendment, or revocation and reissuance. Falsification of any submitted information is grounds for enforcement, including possible criminal enforcement (40 CFR 270.43).

   The Permittee shall ensure that all plans, reports, notifications, and other submissions to the Administrative Authority required in this Permit are signed and certified in accordance with 40 CFR 270.11. A summary of the planned reporting requirements pursuant to this Permit is found in Table 1. Two copies of all deliverables shall be delivered to the DEQ Land Protection Division. The Permittee shall also submit to the DEQ a copy of all reports on a compact disc (CD) or Microsoft Windows-compatible electronic storage device.

8. Plans and Schedules Incorporation Into Permit

   All plans and schedules required by this Permit are, upon approval by the Administrative Authority, incorporated into this Permit by reference and become an enforceable part of this Permit. Since required items are essential elements of this Permit, failure to submit any of the required items or submission of inadequate or insufficient information may subject the Permittee to enforcement action under OHWMA and Section 3008 of RCRA and may include fines, suspension, or revocation of the Permit.

   Any noncompliance with approved plans and schedules shall be termed noncompliance with this Permit. Written requests for extensions of due dates for submittals may be granted by the Administrative Authority in accordance with V.A.3.

If the Administrative Authority determines that actions beyond those provided for, or changes to what is stated herein are warranted, the Administrative Authority may modify this Permit according to procedures in V.A.3.

9. Data Retention

   All raw data, such as laboratory reports, drilling logs, bench-scale or pilot-scale data, and other supporting information gathered or generated during activities undertaken pursuant to this Permit shall be maintained at the facility during the term of this Permit, Including any reissued Permits.

B. SPECIAL CONDITIONS

1. Based on the submitted Information, the Administrative Authority has determined there is no further action required for the Solid Waste Management Units (SWMUs) and Areas of Concern (AOCs) listed in Table 2(c) of this Section.

   For those ERP sites listed in Table 2(c) of this Section, an ERP report has been prepared and the Permittee submitted the Remedial Investigation (RI) and Feasibility Study (FS) reports to the Administrative Authority for review. The Administrative Authority accepted these reports and the sites are currently undergoing corrective action.

2. The following ERP sites were underground petroleum product tanks and under the authority and jurisdiction of the Oklahoma Corporation Commission; therefore, they are exempt from the requirements of this Permit: ~~ERP Site 11 (AQUA/AVGAS Fuel Distribution System),~~ ERP Site 13 (Quartermaster Service Station), ERP Site 14 (Abandoned UST by Building 202), ERP Site 15 (Abandoned UST by Building 1023), ERP Site 16 (Abandoned UST by Building 1024), ERP Site 17 (Abandoned UST by Building 1030), ERP Site 18 (Abandoned UST by Building T-1), and ERP Site 19 (Abandoned UST by Building T-2).

C. CORRECTIVE ACTION

1. Corrective Action for Releases: OHWMA and Section 3004(u) of RCRA, as amended by HSWA, and 40 CFR 264.101, require that permits issued after November 8, 1984, address corrective action for releases of hazardous waste including hazardous constituents from any SWMU at the facility, regardless of when the waste was placed in the unit.

2. Releases Beyond Facility Boundary

   a. The Permittee shall notify the Administrative Authority verbally, within 24 hours of discovery, of any release of hazardous waste or hazardous constituents that has the potential to migrate off-site.

   b. OHWMA and Section 3004(v) of RCRA as amended by HSWA, and Federal regulations promulgated as 40 CFR 264.101(c), require corrective actions beyond the facility property boundary, where necessary to protect human health and the environment, unless the Permittee demonstrates that, despite the Permittee's

best efforts, the Permittee was unable to obtain the necessary permission to undertake such actions. The Permittee Is not relieved of all responsibility to clean up a release that has migrated beyond the facility boundary where offsite access is denied.

3. Dispute Resolution

   a. The parties shall use their best efforts to informally and in good faith resolve all disputes or differences of opinion at the Project Manager level. If, however, disputes arise concerning the corrective action which the parties are unable to resolve at this level, including but not limited to, disputes over implementation of work plans, approval of documents, scheduling of any work, selection, performance or completion of any corrective action, or any other obligation assumed hereunder, the Permittee shall present a written notice of such dispute, and the basis for the objections, to the Chief Engineer of the Land Protection Division of the DEQ within ten business days of the receipt of DEQ's original disapproval, decision or directive. The notice shall set forth the specific points of the dispute, the position the Permittee maintains should be adopted as consistent with the Permit's requirements, thereof, and any matters which it considers necessary for DEQ's proper determination. The Chief Engineer shall provide to the Permittee a written statement of his decision on the pending dispute, which shall be deemed incorporated into the final Permit.

   b. If the Permittee objects to the Chief Engineer’s determination, the Permittee shall, within ten days of its receipt of the Engineering Manager's written decision, notify DEQ in writing of its objections, and may request that the Director of the Land Protection Division convene an informal conference. Promptly after such conference, the Director shall state in writing his decision regarding the issues in dispute. Such decision shall be the final resolution of the dispute and shall be implemented immediately by the Permittee according to the schedule contained therein.

D. REPORTING REQUIREMENTS

1. The Permittee shall submit, in accordance with V.A.7, signed quarterly progress reports of all activities (i.e., RFI, CMS) conducted pursuant to the provisions of this Permit no later than the 15th day of the month following the end of the quarter. These reports shall contain:

   a. A description of the work completed and an estimate of the percentage of work completed;

   b. Summaries of all findings, including summaries, of laboratory data;

   c. Summaries of all problems or potential problems encountered during the reporting period and actions taken to rectify problems;

   d. Projected work for the next reporting period;

   e. Summaries of contacts pertaining to corrective action or environmental matters with representatives of the local community, public interest groups or State

government during the reporting period;

f. Changes in key project personnel during the reporting period; and

g. Summaries of all changes made in implementation during the reporting period.

2. Copies of other reports (e.g., inspection reports), drilling logs, and laboratory data shall be made available to the Administrative Authority upon request.

E. NOTIFICATION REQUIREMENTS FOR AND ASSESSMENT OF NEWLY IDENTIFIED SWMUs

1. The Permittee shall notify the Administrative Authority, in writing, of any newly-identified SWMU(s) (i.e., a unit not specifically identified during the RFA), discovered in the course of groundwater monitoring, field investigations, environmental audits, or other means, no later than thirty (30) calendar days after discovery. The notification shall include the following items, to the extent available:

   a. The location of the newly-identified SWMU in relation to other SWMUs;

   b. The type and function of the unit;

   c. The general dimensions, capacities, and structural description of the unit (supply any available drawings);

   d. The period during which the unit was operated;

   e. The specifics, to the extent available, on all wastes that have been or are being managed at the SWMU; and

   f. Results of any sampling and analysis required for the purpose of determining whether releases of hazardous waste including hazardous constituents have occurred, are occurring, or are likely to occur from the unit.

2. Based on the results of this notification, the Administrative Authority will determine the need for further investigations or corrective measures at any newly-identified SWMU(s). If the Administrative Authority determines that such investigations are needed, the Administrative Authority may require the Permittee to prepare a plan for such investigations. This plan will be reviewed for approval as part of the RFI Work Plan or a new RFI Work Plan under Condition V.H. The Permit will be modified according to V.A.3 to incorporate the investigation requirements for the newly-identified SWMU(s), if required.

F. NOTIFICATION REQUIREMENTS FOR NEWLY-DISCOVERED RELEASESAT SWMU(s)

The Permittee shall notify the Administrative Authority in writing, no later than fifteen (15) calendar days after discovery, of any release(s) of hazardous waste or hazardous constituents discovered during the course of groundwater monitoring, field investigation, environmental auditing, or other means. Such newly-discovered releases may be from newly-identified units or from units for which, based on the findings of the RFA, the Administrative Authority had previously determined no further investigation was necessary. The Administrative Authority may require further investigation and/or interim

measures for the newly-identified release(s), and may require the Permittee to prepare a plan for the investigation and/or interim measure. The plan will be reviewed for approval as part of the RFI Work Plan or a new RFI Work Plan under Condition V.H. The Permit will be modified according to V.A.3. to incorporate the investigation, if required.

G. INTERIM MEASURES

1. If, during the course of any activity initiated under this Permit, the Administrative Authority determines that a release or potential release of hazardous constituents from a SWMU poses a threat to human health and the environment, the Administrative Authority may require interim measures. The Administrative Authority shall determine the specific measure(s) or require the Permittee to propose a measure(s). The interim measure(s) may include a permit modification, a schedule for implementation, and a written plan. The Administrative Authority shall notify the Permittee in writing of the requirement to perform interim measures. The Administrative Authority shall modify this Permit according to V.A. 3 to incorporate interim measures Into the Permit.

2. The following factors will be considered by the Administrative Authority in determining the need for interim measures or presumptive remedies:

   a. Time required to develop and implement a final remedy;

   b. Actual and potential exposure to human and environmental receptors;

   c. Actual and potential contamination of drinking water supplies and sensitive ecosystems;

   d. The potential for further degradation of the medium in the absence of interim measures;

   e. Presence of hazardous wastes in containers that may pose a threat of release;

   f. Presence and concentration of hazardous waste including hazardous constituents in soil having the potential to migrate to groundwater or surface water;

   g. Weather conditions that may affect the current levels of contamination;

   h. Risks of fire, explosion, or accident; and

   i. Other situations that may pose threats to human health and the environment.

3. The Permittee shall continue to implement the remedies outlined for each location ~~operate the Contaminated Groundwater Treatment Facility (CGTF). The CGTF shall continue to operate~~ until remediation of groundwater is achieved, or another type of remediation system can demonstrate the reduction of contaminants in groundwater to regulatory levels. The CGTF was restarted to treat groundwater originating at site ST008 when the remedy was implemented. The CGTF will be decommissioned after Site ST008 remedy has reached MCLs/RSLs and begins Long Term Monitoring and/or regulator approval

4. ~~The Permittee shall continue to maintain the three separate interceptor/collection trenches and extraction wells to provide adequate hydraulic containment of contaminated groundwater. The systems shall be maintained in operative condition until cleanup is achieved or another type remediation system can demonstrate the reduction of contaminants in groundwater to regulatory levels.~~

H. RFI WORK PLAN

1. The Permittee has an approved RCRA Facility Investigation (RFI) Work Plan (1998). The RFI and equivalent investigation have been completed at Vance Air Force Base. ~~ERP Site SS-27 is still undergoing RFI and equivalent investigation at the time of issuance of this Permit.~~ The following Permit Conditions shall apply to any newly identified SWMUs and/or Areas of Concern (AOCs) and newly discovered releases for which the Administrative Authority has determined a need for further investigations or corrective measures, in accordance with Permit Conditions V.E. and V.F., above.

   A RFI Work Plan must address releases of hazardous waste or hazardous constituents to all media for all newly-identified SWMUs and AOCs or any newly-discovered releases.

   a. The Work Plan shall describe the objectives of the investigation and the overall technical and analytical approach to completing all actions necessary to characterize the direction, rate, movement and concentration of releases of hazardous waste or hazardous constituents from specific units or groups of units, and their actual or potential receptors. The RFI Work Plan shall detail all proposed activities and procedures to be conducted at the facility, the schedule for implementing and completing such investigations, the qualifications of personnel performing or directing the investigations, including contractor personnel, and the overall management of the RFI. The Scope of Work for the RFI is in V.P.

   b. The RFI Work Plan shall describe sampling, data collection quality assurance, and data management procedures, including formats for documenting and tracking data and other results of investigations, and health and safety procedures.

   c. Development of the RFI Work Plan and reporting of data shall be consistent with the following EPA guidance documents or the equivalent thereof:

      1) RCRA Facility Investigation Guidance Document (EPA 5 3 0/5W-89-031);

      2) RCRA Groundwater Monitoring Technical Enforcement Guidance Document (OSWER 9950. 1) September 1986, or any other final updates of this document; and

      3) Test Methods for Evaluating Solid Waste (SW 846, 2nd ed.) 1982.

         The Permittee may propose and submit any variation from these guidance documents with justification to the Department for approval.

2. After the Permittee submits the Work Plan, the Administrative Authority will approve,

disapprove, or modify the Work Plan in writing.

If the Administrative Authority approves the Work Plan, the Permittee shall implement the plan according to the schedule contained in the plan. All approved Work Plans become incorporated into this Permit.

In the event of disapproval (in whole or in part) of the Work Plan, the Administrative Authority shall specify deficiencies in writing. The Permittee shall modify the plan to correct these within the time frame specified in the notification of disapproval by the Administrative Authority. The modified Work Plan shall be submitted in writing to the Administrative Authority for review. Should the Permittee take exception to all or part of the disapproval, the Permittee shall submit a written statement of the grounds for the exception within 10 days of receipt of the disapproval per Permit Condition V.C.3.

3. The Administrative Authority shall review for approval as part of the RFI Work Plan or as a new Work Plan any plans developed pursuant to Permit Condition V.E. addressing further investigations of newly-identified SWMUs, or Permit Condition V.F. addressing new releases from previously-identified SWMUs.

I. RFI IMPLEMENTATION

Upon receipt of written approval from the Administrative Authority for the RF\ Work Plan, the Permittee shall implement the RF\ according to the schedules and in accordance with the approved RF\ Work Plan and the following:

1. The Permittee shall notify the DEQ at least 10 days prior to any sampling, testing, or monitoring activity required by this Permit to give Department personnel the opportunity to observe investigation procedures and/or split samples;

2. Deviations from the approved RF\ Work Plan which are necessary during implementation of the investigations must be approved by the Administrative Authority and fully documented and described in the progress reports and in the RF\ Final Report.

J. RFI FINAL REPORT AND SUMMARY

1. Within sixty (60) calendar days after the completion of the RFI, the Permittee shall submit an RFI Final Report and Summary. Completion of the RFI is when all analyses have been received and the data has been validated. The RFI Final Report shall describe the procedures, methods, and results of all investigations as described in V.P.5. This includes SWMUs and their releases, the type and extent of contamination at the facility, sources and migration pathways, and actual or potential receptors. The RFI Final Report shall present all information gathered under the approved RFI Work Plan. The RFI Final Report must contain adequate information to support further corrective action decisions at the facility. The Summary shall summarize the RFI Final Report.

2. After the Permittee submits the RFI Final Report and Summary, the Administrative Authority shall either approve or disapprove them in writing.

If the Administrative Authority approves the RFI Final Report and Summary, the

Permittee shall mail the approved Summary to all individuals on the facility mailing list established pursuant to 40 CFR 124.10(c)(1)(ix), within fifteen (15) calendar days of receipt of approval.

If the Administrative Authority determines the RFI Final Report and Summary do not fully meet the objectives stated in Permit Condition V.P, the Administrative Authority may disapprove the RFI Final Report and Summary. If the Administrative Authority disapproves the Report, the Administrative Authority shall notify the Permittee in writing of the Report's deficiencies and specify a due date for submittal of a revised Final Report and Summary. Once approved, the Summary shall be mailed to all individuals on the facility mailing list as specified above.

K. DETERMINATION OF NO FURTHER ACTION

1. Based on the results of the RFI and other relevant information, the Permittee may submit an application to the Administrative Authority for a Class 3 permit modification under 40 CFR 270.42(c) to terminate the RFI/CMS process for a specific unit. This permit modification application must contain information demonstrating that there are no releases of hazardous waste including hazardous constituents from a particular SWMU at the facility that pose threats to human health and/or the environment, as well as additional information required in 40 CFR 270.42(c).

   If, based upon review of the Permittee's request for a permit modification, the results of the RFI and other information, including comments received during the sixty (60) day public comment period required for Class 3 permit modifications, the Administrative Authority determines that releases or suspected releases which were investigated either are non-existent or do not pose a threat to human health and/or the environment, the Administrative Authority will grant the requested modification.

2. If necessary to protect human health or the environment, a determination of no further action shall not preclude the Administrative Authority from requiring continued or periodic monitoring of air, soil, groundwater, or surface water, when site-specific circumstances indicate that releases of hazardous waste or hazardous constituents are likely to occur.

3. A determination of no further action shall not preclude the Administrative Authority from requiring further investigations, studies, or remediation at a later date, if new information or subsequent analysis indicates a release or likelihood of a release from a SWMU at the facility that is likely to pose a threat to human health or the environment. In such a case, the Administrative Authority shall initiate a modification to the Permit according to Permit Condition V.A.3.

L. CMS PLAN

1. If the Administrative Authority has reason to believe that a SWMU has released concentrations of hazardous constituents, or if the Administrative Authority determines that contaminants present a threat to human health or the environment given site-specific exposure conditions, the Administrative Authority may require a Corrective Measures Study (CMS) and shall notify the Permittee in writing. The notification may also specify remedial alternatives to be evaluated by the Permittee during the CMS.

2. The Permittee shall submit a CMS Plan to the Administrative Authority within one hundred and eighty (180) calendar days from notification of the requirement to conduct a CMS. The Scope of Work for a CMS Plan is in Permit Condition V.Q.3.

   The CMS Plan shall provide the following information:

   a. A description of the general approach to the investigation, and potential remedies;

   b. A definition of the overall objectives of the study;

   c. Specific plans for evaluating remedies to ensure compliance with remedy standards;

   d. Schedules for conducting the study; and

   e. The proposed format for the presentation of information.

3. After the Permittee submits the CMS Plan, the Administrative Authority will either approve, disapprove, or modify the plan in writing.

   If the Administrative Authority approves the CMS Plan, the Permittee shall implement the plan per Permit Condition V.M.

   In the event of disapproval (in whole or in part) of the CMS Plan, the Administrative Authority shall specify deficiencies in writing. The Permittee shall modify the plan to correct these within the time frame specified in the notice of deficiency. The modified CMS Plan shall be submitted in writing to the Administrative Authority for review. Should the Permittee take exception to all or part of the disapproval, the Permittee shall submit a written statement of the grounds for the exception within 10 days of receipt of the disapproval per Permit Condition V.C.3.

M. CMS IMPLEMENTATION

No later than fourteen (14) calendar days after the Permittee has received written approval from the Administrative Authority for the CMS Plan, the Permittee shall implement the Corrective Measures Study according to the schedules specified and in accordance with the approved CMS Plan. All approved plans become incorporated into this Permit as per Condition V.A.8.

N. CMS FINAL REPORT AND SUMMARY

1. Within sixty (60) calendar days after the completion of the CMS, the Permittee shall submit a CMS Final Report and Summary. Completion of the CMS is when all analyses have been received and the data has been validated. The Summary shall summarize the Final Report. The CMS Final Report shall discuss the results of investigations of each remedy studied and of any bench-scale or pilot tests conducted. It must include an evaluation of each remedial alternative. The CMS Final Report shall present all information gathered during the CMS, and must contain adequate information to support the remedy selection process. In the CMS Final

Report, the Permittee shall propose a corrective action program that shall:

a. attain compliance with corrective action objectives for hazardous constituents in each medium;

b. control sources of releases;

c. meet acceptable waste management requirements; and

d. protect human health and the environment.

2. After the Permittee submits the CMS Final Report and Summary, the Administrative Authority will either approve or disapprove them in writing.

   If the Administrative Authority approves the CMS Final Report and Summary, the Permittee shall mail the approved Summary to all individuals on the facility mailing list established pursuant to 40 CFR 124.10(c)(1)(ix), within fifteen (15) calendar days of receipt of approval.

   If the Administrative Authority determines the CMS Final Report and Summary do not fully meet the objectives stated in Permit Condition V.Q, the Administrative Authority may disapprove the CMS Final Report and Summary. If the Administrative Authority disapproves the Report, the Administrative Authority shall notify the Permittee in writing of the Report's deficiencies and specify a due date for submittal of a revised Final Report and Summary.

   Upon approval of the CMS Final Report and Summary by the Administrative Authority, the Permittee shall provide the approved Summary to all individuals on the facility mailing list established pursuant to 40 CFR 124. 1 0(c)(1)(ix), within fifteen (15) calendar days of receipt of approval.

3. Based on preliminary results and the CMS Final Report, the Administrative Authority may require the Permittee to evaluate additional remedies or particular elements of one or more proposed remedies.

O. CORRECTIVE MEASURE (REMEDY) SELECTION AND IMPLEMENTATION

Within fifteen (15) calendar days from receipt of approval of CMS Final Report and Summary, the Permittee shall submit a Permit Modification request according to Permit Condition V.A.3, for corrective measure (remedy) selection, based on the approved CMS Final Report. The resultant modified permit will include schedules for remedy implementation.

P. RFI SCOPE OF WORK

1. Purpose

   The purpose of the RFI is to determine the nature and extent of releases of hazardous wastes or hazardous constituents from solid waste management units. The required information shall include each item specified under Tasks 1-111. The Permittee shall furnish all personnel, materials, and services necessary for, or incidental to, performing the RFI.

If the Permittee believes that certain requirements of the Scope of Work are not applicable, the specific requirements shall be identified and a detailed rationale for inapplicability shall be provided.

2. Scope

The RFI consists of three tasks:

Task I: RFI Work Pan

a. Introduction
b. Environmental Setting
c. Source Characterization
d. Contamination Characterization
e. Potential Receptor Identification
f. Data Collection Quality Assurance Plan
g. Data Management Plan
h. Health and Safety Plan
i. Community Relations Plan
j. Project Management Plan

Task II: RCRA Facility Investigation

Task Ill: RFI Final Report and Summary

3. Task 1: RFI Work Plan

The Permittee shall prepare an RFI Work Plan as specified in V.H. and the following. The RFI Work Plan shall provide for and address the following information needs:

a. Introduction

1) Facility Description

The introduction shall summarize the regional location, pertinent boundary features, general facility physiography, hydrogeology, and historical use of the facility for the treatment, storage, or disposal of solid and hazardous waste. Information from existing reports and studies is acceptable, as long as the source of this information is documented, pertinent, and reflective of current conditions. This section shall include:

a) Map(s) depicting the information specified below. All maps shall be consistent with requirements set forth in 40 CFR 270.14 and shall be of sufficient detail and accuracy to locate a current and future work performed at the site.

(1) general geographic location;

(2) property lines, with the owners of all adjacent property clearly indicated, and all land previously owned and/or used by the Permittee around the facility;

(3) topography, waterways, wetlands, floodplains, water features, and drainage patterns;

(4) all tanks, buildings, utilities, paved areas, rights-of-way, and other features;

(5) all solid waste management units;

(6) all known past solid or hazardous waste treatment, storage and disposal areas or units regardless of whether they were active on November 19,1980;

(7) surrounding land uses (residential, commercial, agricultural , recreational); and

(8) the location of all production and groundwater monitoring wells. These wells shall be clearly labeled and ground and top of casing elevations included (these elevations may be included as an attachment).

b) A history and description of ownership and operation, solid and hazardous waste generation, treatment, storage and disposal activities at the facility.

c) A summary of approximate dates or periods of past waste releases, identification of the materials released, the amount released, the location released, and a description of the response actions conducted (local, state, or Federal response units, or private parties), including any inspection reports or technical reports generated as a result of the response.

d) A reference to all environmental, geologic, and hydrogeologic studies performed by all parties, at or near the facility, with a short summary of the purpose, scope, and significant findings thereof.

e) A reference to all environmental permits, applied for and/or received, the purpose thereof, and a short summary of requirements.

2) Nature and Extent of Contamination

a) The Introduction shall summarize all possible source areas of contamination.
This, at a minimum, should include all SWMUs. For each area, the Permittee shall identify the following:

(1) location of unit/area on a facility map;

(2) quantities of solid, hazardous, and radiochemical wastes;

(3) quantities of radiochemical and hazardous constituents, to the extent known; and

(4) identification of areas where additional information is necessary.

b) The Permittee shall prepare an assessment and description of the existing degree and extent of contamination. This should include:

(1) available monitoring data and qualitative information on locations and levels of contamination at the facility;

(2) all potential migration pathways including information on geology, pedology, hydrogeology, physiography, hydrology, water quality, meteorology, and air quality; and

(3) the potential impact(s) on human health or the environment, including demography, groundwater and surface water use, and land use.

3) Implementation of Interim Measures

The Permittee shall document and report on all interim measures which were or are being undertaken at the facility, including under state or Federal compliance orders, other than those specified in the Permit. This shall include:

a) Objectives of the interim measures: how the measure is mitigating a potential threat to human health or the environment and/or is consistent with and integrated into requirements for a long term solution;

b) Schedules for design, construction and monitoring; and

c) Schedule for progress reports.

b. Environmental Setting

The Work Plan shall provide for collection of information to supplement and verify existing information on the environmental setting at the facility. The Work Plan shall provide for characterization of the following:

1) Hydrogeology

The Work Plan shall describe in detail a program to evaluate hydrogeologic conditions at the facility. This program shall provide the following information needs:

a) A description of the regional, local, facility-wide, and SWMU-specific geologic and hydrogeologic characteristics affecting groundwater flow beneath the facility;

b) An analysis of any topographic features including surface water bodies that might influence the groundwater flow system;

c) A representative and accurate classification and description of the hydrogeologic units which may be part of migration pathways at the

facility (i.e., the aquifers and any intervening saturated and unsaturated units) based on field data, tests (e.g., gamma and neutron logging of existing and new wells, piezometers and borings), and cores;

d) The extent (depth, thickness, lateral extent) of hydrogeologic units which may be part of migration pathways based on field studies and cores, structural geology, and hydrogeologic cross sections, including:

(1) unconsolidated sand and gravel deposits;

(2) zones of fracturing or channeling in consolidated or unconsolidated deposits; and

(3) zones of high permeability or low permeability that might direct and restrict the flow of contaminants.

e) A description of representative water level or fluid pressure based on data obtained from groundwater monitoring wells and piezometers installed upgradient and downgradient of the potential contaminant source. Information needs include: potentiometric surface maps; hydrologic cross sections showing vertical gradients; vertical and horizontal components of flow; and temporal changes in hydraulic gradients.

f) A description of man-made influences that may affect site hydrogeology such as active and inactive local water-supply and production wells, pipelines, French drains, and ditches.

2) Soils

The Permittee shall describe in detail a program designed to characterize soil and rock units above the water table.

c. Source Characterization

The Permittee shall describe in detail a program designed to completely characterize the wastes and the areas where wastes have been placed, including: type, quantity, physical form, composition, disposition (containment and nature of wastes), and the facility characteristics affecting releases (e.g., facility security, engineered barriers). This shall include quantification of the following specific characteristics, at each source area:

1) Unit/disposal area characteristics, including but not limited to: location of unit/disposal area; type of unit/disposal area; design features; operating practices (past and present); period of operation; age of unit/disposal area; general physical conditions; and method used to close the unit/disposal area;

2) Waste characteristics, including but not limited to: type of waste placed in unit (hazardous classification, quantity, chemical composition); physical and chemical characteristics (physical form, physical description, temperature, pH, general chemical class, molecular weight, density, boiling point, viscosity, solubility in water, solubility in solvents, cohesiveness, vapor pressure); and migration and dispersal characteristics of the waste (sorption

coefficients, biodegradability, photodegradation rates, hydrolysis rates, chemical transformations).

d. Contamination Characteristics

The Permittee shall describe in detail a program to collect analytical data on groundwater, soils, surface water, sediment, and subsurface gas contamination when necessary to characterize contamination from a SWMU. The data shall be sufficient to define the extent, origin, direction, and, rate of movement of contaminant plumes. Data required shall include lime and location of sampling, media sampled, concentrations found, conditions during sampling, and the identity of the individual(s) performing the sampling and analysis. Each medium (groundwater, surface water and sediments, soil, air, and gas) must be investigated. If the Permittee believes certain media could not be affected by a release from a specific unit, a detailed justification for not investigating those media must be provided. The Permittee shall address the following types of contamination at the facility:

1) Groundwater Contamination

The Work Plan shall describe in detail a program of groundwater investigation to characterize any plumes of contamination at the facility. The program shall at a minimum provide for the following information needs:

a) a description of the horizontal and vertical extent of any immiscible or dissolved plume(s) originating from the facility;

b) the horizontal and vertical direction of contamination movement;

c) the velocity of contaminant movement;

d) the horizontal and vertical concentrations of any suspected 40 CFR 264 Appendix IX constituents;

e) an evaluation of factors influencing the plume movement; and

f) an extrapolation of future contaminant movement.

2) Soil Contamination

The Permittee shall describe in detail a program to characterize contamination of soil and rock units in the vicinity of the contaminant release. The program shall provide for the following information needs:

a) a description of the vertical and horizontal extent of contamination;

b) a description of contaminant and soil chemical properties within the contaminant source area. This includes contaminant solubility, speciation, adsorption, leachability, exchange capacity, biodegradability, hydrolysis, photolysis, oxidation, total organic carbon content, and other factors that might affect contaminant migration and transformation.

c) plume migration and transformation; specific contaminant concentrations; the velocity and direction of contaminant movement; and an extrapolation to future contaminant movement.

3) Surface Water and Sediment Contamination

The Permittee shall describe in detail a program to characterize contamination in surface water bodies and sediment resulting from contaminant releases at the facility. The investigation shall at minimum include the following:

a) a description of the surface water body including location, elevation, flow, velocity, depth, width, seasonal fluctuations, flooding tendencies, drainage patterns, and evapotranspiration rates;

b) a description of sediment characteristics including depositional area, thickness, mineralogy, grain size, density, ion exchange capacity, and total natural organic carbon content;

c) maps for all areas included in surface water and sediment investigations which meet requirements in 40 CFR 270.14 and which are sufficiently detailed and accurate to depict all the information required;

d) a description of the horizontal and vertical extent of any immiscible or dissolved plumes originating from the facility, and the extent of contamination in the underlying sediments;

e) the horizontal and vertical direction and velocity of contaminant movement;

f) an evaluation of the physical, biological, chemical, and radiochemical factors influencing contaminant movement;

g) an extrapolation to future contaminant movement;

h) a description of the chemistry of the contaminated surface waters and sediments. This includes pH, temperature, total dissolved solids, total suspended solids, biochemical oxygen demand, alkalinity, conductivity, dissolved oxygen profiles, nutrients, chemical oxygen demand, total organic carbon, and specific contaminant concentrations.

4) Air Contamination

The Permittee shall describe in detail a program to characterize particulate and gaseous contaminants released to the atmosphere. This investigation shall provide the following information: a description of the horizontal and vertical direction and velocity of contaminant movement; the rate and amount of the release; and the chemical, radiochemical, and physical composition of the contaminants released, including horizontal and vertical concentration profiles.

5) Subsurface Gas

The Permittee shall describe in detail a program to characterize the nature, rate and extent of releases of reactive gases from the units. Such a program shall include, but is not limited to: provisions for monitoring subsurface gases released from the unit, and an assessment of the potential for threat to human health and/or the environment.

e. Potential Receptors

The Permittee shall describe in detail a program to collect data to describe human populations and environmental systems that are susceptible to contaminant exposure from the facility. Chemical and radiochemical analysis of biological samples may be needed. Data on observable effects in ecosystems may also be required. The following characteristics shall be identified:

1) Local uses and possible future uses of groundwater, including:

a) type of use (i.e., potable, domestic, agricultural, residential, industrial, municipal)

b) location of all groundwater wells, names of owners or tenants at those locations, USGS/DODT well designations, and current use of those wells within a 1 mile radius of facility.

2) Local uses and possible future uses of surface waters within a 1.5 mile radius of the facility, including domestic and municipal, recreational, agricultural, industrial, and environmental.

3) Human use of or access to the facility and adjacent lands, including but not limited to recreation, hunting, residential, commercial, and industrial.

4) A demographic profile of people who use or have access to the facility and adjacent land, including, but not limited to age, gender, and sensitive subgroups.

5) A description of the local ecology, including biota in surface water bodies on, adjacent to, or affected by the facility, and a description of any endangered or threatened species near the facility.

f. Data Collection Quality Assurance Plan

The Permittee shall prepare a plan to document all monitoring procedures: sampling, field measurements, and sample analysis performed at the facility during the investigation to characterize the environmental setting, source, and contamination, so as to ensure that all information, data, and resulting decisions are technically sound, statistically valid, and properly documented.

1) The strategy section of the Data Collection Quality Assurance Plan shall include but not be limited to the following:

a) description of the intended uses for the data, and the necessary level of precision and accuracy for those intended uses;

b) description of methods and procedures to be used to assess the precision, accuracy and completeness of the measurement data; and

c) schedule and information to be provided in quality assurance reports, including at least:

(1) periodic assessment of measurement data accuracy, precision, and completeness;

(2) results of performance audits;

(3) results of systems audits; and

(4) significant quality assurance problems and resolutions.

2) The Sampling and Field Measurements Section of the Data Collection Quality Assurance Plan shall at least discuss:

a) selecting appropriate sampling and field measurements locations, depths, etc.

b) providing a statistically sufficient number of sampling and field measurement sites;

c) determining conditions under which sampling or field measurements shall be conducted;

d) determining which parameters are to be measured and where;

e) selecting the frequency of sampling and length of sampling period;

f) selecting the types of sample (e.g., composites vs. grabs) and number of samples to be collected;

g) delineating procedures designed to prevent contamination of sampling or field measurements equipment and cross contamination between sampling points;

h) documenting field sampling operations and procedures;

i) selecting appropriate sample containers;

j) preserving samples;

k) controlling chain-of-custody; and

l) disposing of all contaminated materials generated by activities in a manner compliant with all state and Federal regulations.

3) The Sample Analysis shall include:

a) chain-of-custody procedures;

b) sample storage procedures and holding times;

c) sample preparation methods;

d) analytical procedures;

e) calibration procedures and frequency;

f) data reduction, validation and reporting; and

g) frequency of internal quality control checks and laboratory performance audits.

g. Data Management Plan

The Permittee shall develop and initiate a Data Management Plan to document and track investigation data and results. This plan shall Identify and set up data documentation materials and procedures (data record), project file requirements, and project-related progress reporting procedures and documents.

1) The data record shall include at least the following for all sample and field measurements: unique measurement code; measurement location; measurement type; laboratory ID number; property or component analyzed; and results of analysis.

2) The Data Management Plan shall provide the format to be used to present the data and conclusions of the investigation, etc.

a) The following shall be presented in tables: raw data; data sorted by significant features such as location, media, constituent; data reduction for statistical analysis; and summary data.

b) The following shall be presented in graphical formats (e.g., bar graphs, line graphs, plan maps, isopleth plots, cross-sections, three-dimensional displays, etc.): sampling location and grid; levels of contamination at each sampling location; geographical extent of contamination; and changes in concentration relative to source, time, depth, and other parameters.

h. Health and Safety Plan

1) The Permittee shall be responsible for assuring that all personnel performing hazardous waste management practices and operating the remedial systems comply with all pertinent safety regulations.

These safety regulations must include, at a minimum:

a) descriptions of the facility including availability of resources such as roads, water supply, electricity and telephone service;

b) descriptions of the known hazards and evaluation of the risks associated with each activity conducted, including but not limited to on and off-site exposure to contaminants during implementation of interim measures;

c) lists of key personnel and alternatives responsible for site safety, response operations, and for protection of public health;

d) delineation of the work area;

e) descriptions of levels of protection to be worn by personnel in the work area;

f) procedures established to control site access;

g) decontamination procedures for personnel and equipment;

h) site emergency procedures;

i) emergency medical care procedures for injuries and toxicological problems;

j) requirements for an environmental field monitoring program;

k) routine and special training requirements for responders; and

l) procedures for protecting workers from weather-related problems.

2) The safety regulations shall be consistent with:

a) NIOSH Occupation Safety and Health Guidance Manual for Hazardous Waste Site Activities (1985);

b) EPA Order 1440.1 - Respiratory Protection;

c) EPA Order 1440.3 - Health and Safety Requirements for Employees engaged in Field Activities;

d) approved Facility Contingency Plan;

e) EPA Operating Safety Guide (1984);

f) OSHA regulations, particularly 29 CFR 1910 and 1926;

g) State and local regulations; and

h) other EPA guidance as provided.

i. Community Relations Plan

The Permittee shall prepare a plan for dissemination of information to the public regarding investigation activities and results. The Restoration Advisory Board (RAB) process will satisfy this requirement.

j. Project Management Plan

The Permittee shall prepare a Project Management Plan which will include a discussion of the technical approach, schedules, budget and key project

personnel. The project management plan will also include a description of qualifications of key project personnel performing or directing the RFI including contractor personnel. This plan shall also document the overall management approach to the RFI.

4. Task II: RCRA Facility Investigation

   The facility investigation activities shall follow the approved RFI Work Plan. All sampling and analyses shall be conducted in accordance with the Data Collection Quality Assurance Plan. All sampling locations shall be documented in a log and identified on a detailed site map. During the RFI, it may be necessary to revise the RFI Work Plan to increase or decrease the detail of information collected to accommodate the facility specific situation.

   The Permittee shall conduct investigations of SWMUs previously identified with known or suspected releases of contamination to characterize the facility (Environmental Setting), define the source (Source Characterization), define the degree and extent of contamination (Contamination Characterization), and identify actual or potential receptors.

   The investigations should result in data of adequate technical quality to develop and evaluate corrective measures alternatives during the Corrective Measures Study, when necessary.

5. Task Ill: RFI Final Report and Summary

   The Permittee shall analyze all facility investigation data collected during the RFI process and prepare a detailed report on the type and extent of contamination at the facility Including sources and migration pathways. All information generated during the investigation shall be presented and analyzed. All evidence and procedures used for making any determinations (e.g., velocity of groundwater, extent of contamination) shall be fully documented. The report shall describe extent of contamination (qualitative/quantitative) in relation to background levels indicative for the area. The report shall contain the results of all tests, calculations, inspections, record searches, and observations. It shall contain soil and groundwater contamination profiles, statistical comparisons, and the results of all sampling events conducted as part of the investigation. It shall display results in tables, graphs, maps, and cross sections as discussed in the Data Management Plan and Permit Condition V.P.3.g.2.

   The Permittee shall identify all relevant and applicable standards for the protection of human health or the environment (e.g., National Ambient Air Quality Standards, Federally-approved State water quality standards, groundwater protection standards, etc.)

   Data shall be evaluated to ensure it is sufficient in quality (e.g., quality assurance procedures have been followed) and quantity to describe the nature and extent of contamination, to evaluate the potential threat to human health or the environment, and to support a CMS, if required. The report shall present all data in an Appendix.

6. General RFI Reporting Requirements

a. Two hard copies and one IBM compatible disk copy of all reports and data shall be submitted by the Permittee to the Administrative Authority as specified in Permit Condition V.A. 7.

b. The RFI Work Plan shall be submitted by the Permittee to the Administrative Authority as described in Permit Condition V.H.

   The RFI Final Report and Summary shall be submitted by the Permittee to the Administrative Authority as described in Permit Condition V.J.

c. Within 90 days of the effective date of this Permit, the Permittee shall provide the Administrative Authority with signed, quarterly progress reports as specified in Permit Condition V.D.1.

Q. CMS SCOPE OF WORK

1. Purpose

   The purpose of the CMS is to develop and evaluate corrective measures alternatives and to recommend the corrective measure or measures to be taken. The required information shall include each item specified under CMS Tasks 1-111. The Permittee will furnish the personnel, materials, and services necessary to prepare the CMS, except as otherwise specified.

   If the Permittee believes that certain requirements of the Scope of Work are not applicable, the specific requirements shall be identified and the rationale for inapplicability shall be provided.

2. Scope

   The Corrective Measure Study consists of three tasks:

   Task I: CMS Plan

   a. Description of Current Situation
   b. Establishment of Corrective Action Objectives
   c. Description of Approach to CMS
   d. Schedule for CMS

   Task II: Corrective Measures Study

   a. Identification of Corrective Measures Alternatives(s)
   b. Screening of Corrective Measures Alternatives(s)
   c. Development of Corrective Measures Alternative(s)
   d. Evaluation of Corrective Measures Alternative(s)
   e. Selection of Corrective Measures Alternative(s)

Task III: CMS Final Report and Summary

1. Task I: CMS Plan

   a. Description of Current Conditions

      The Permittee shall briefly describe current conditions at the facility to update information provided in the RFI Final Report and Summary. This shall include previous and/or ongoing remedial activity or interim measures.

   b. Establishment of Corrective Action Objectives

      The Permittee shall propose to the Administrative Authority for review and approval, facility specific objectives for the corrective action. These objectives shall be based on public health and environmental criteria, information gathered during the RFI, EPA guidance, and the requirements of any applicable Federal statutes and regulations.

   c. Description of Approach to CMS

      The Permittee shall describe the general approach to the Corrective Measures Study. The approach shall include identification, development, screening, and evaluation of the corrective measures alternatives. The Permittee shall describe specific plans for laboratory and bench-scale studies, or field studies, if needed. Specific plans for evaluating remedy effectiveness shall also be developed. The approach shall specify formats to be used for data presentation, including raw data, maps, charts, graphs, engineering schematics, construction design, etc.

   d. Schedule

      The Permittee shall develop a schedule for implementing the corrective measures study, and a schedule for submitting quarterly progress reports on the study implementation.

2. Task II: Corrective Measures Study

   The CMS consists of five parts: identification, screening, development, evaluation, and selection of the corrective measures alternative(s).

   a. Identification of Preliminary Corrective Measures Alternative(s)

      Based on the results of the RFI and the CMS Plan objectives, the Permittee shall identify all possible alternatives for removal, containment, treatment and/or other remediation of the contamination.

   b. Screening of Preliminary Corrective Measures Alternatives

      The Permittee shall screen the identified preliminary corrective measures alternatives to eliminate those that may not prove feasible to implement, that rely on technologies unlikely to perform satisfactorily or reliably, or that do not achieve

the corrective action objective within a reasonable time period. This screening process focuses on eliminating those technologies which have severe limitations for a given set of wastes and site specific conditions. The screening step may also eliminate technologies based on inherent technological limitations.

Site, waste, and technological characteristics which are used to screen inapplicable technologies are described in more detail below:

1) Site Characteristics. Site data should be reviewed to identify conditions which may limit or promote the use of certain technologies. Technologies whose use is clearly precluded by site characteristics should be eliminated from further consideration;

2) Waste Characteristics. Identification of waste characteristics' that limit the effectiveness or feasibility of technologies is an important part of the screening process. Technologies clearly limited by waste characteristics should be eliminated from consideration.

3) Technological Limitations. The level of technology development, performance record, and operation and maintenance problems shall be identified for each technology considered. Technologies that are unreliable, perform poorly, or are not fully demonstrated, may be eliminated in the screening process.

c. Development of Corrective Measures Alternatives

The Permittee shall develop corrective measures alternatives based on corrective measures objectives, and identification and screening of preliminary alternatives. The Permittee shall rely on engineering practice to determine which of the previously identified and screened technologies appear most suitable for the site. Technologies can be combined to form the overall corrective measures alternatives. The alternatives developed should represent a workable number of options that appear to adequately address all site problems and corrective action objectives. Each alternative may consist of an individual technology or a combination of technologies. The Permittee shall document the reasons for excluding technologies.

When a new technology is proposed or similar waste streams have not routinely been treated or disposed of using the technology, the Permittee shall conduct laboratory and/or bench-scale studies to determine the applicability to facility conditions. The Permittee shall analyze the technologies, based on literature review, vendor contracts, and past experience to determine the testing requirements.

1) The Permittee shall develop a testing plan identifying the type(s) and goal(s) of the study(ies), the level of effort needed, and the procedures to be used for data management and Interpretation.

2) Upon completion of testing, the Permittee shall evaluate the testing results to assess the technology or technologies with respect to the site-specific questions identified in the test plan.

3) The Permittee shall prepare a report summarizing the testing program and its results, both positive and negative.

d. Evaluation of Corrective Measures Alternative(s)

The Permittee shall evaluate each corrective measures alternative developed in Permit Condition V.Q.2.c. The evaluation shall be based on technical, environmental, human health and institutional concerns. The Permittee shall also develop cost estimates for each corrective measure.

1) Technical, Environmental, Human Health, and Institutional Concerns

The Permittee shall provide a description of each corrective measures alternative which includes but is not limited to the following: preliminary process flow sheets; preliminary sizing and type of construction for buildings and structures; and rough quantities of utilities required. The Permittee shall evaluate each alternative in the four following areas:

a) Technical

The Permittee shall evaluate each corrective measure alternative based on performance, reliability, implementability and safety.

(1) The Permittee shall evaluate performance based on the effectiveness and useful life of the corrective measure:

(a) Effectiveness shall be evaluated in terms of the ability to perform intended functions such as containment, diversion, removal, destruction, or treatment. The effectiveness of each corrective measure shall be determined either through design specifications or by performance evaluation. Any specific waste or site characteristics which could potentially impede effectiveness shall be considered. The evaluation should also consider the effectiveness of combinations of technologies.

(b) Useful life is defined as the length of time the level of effectiveness can be maintained. Each corrective measure shall be evaluated in terms of the projected service lives of its component technologies. Resource availability in the future life of the technology, as well as appropriateness of the technologies, must be considered in estimating the useful life of the project.

(2) The Permittee shall provide information on the reliability of each corrective measure including operation and maintenance requirements and demonstrated reliability:

(a) Operation and maintenance requirements include the frequency and complexity of operation and maintenance. Technologies requiring frequent or complex operation and maintenance activities should be regarded as less reliable than technologies requiring

little or straightforward operation and maintenance. The availability of labor and materials to meet these requirements shall also be considered.

(b) Demonstrated and expected reliability is a way of measuring risk and effect of failure. The Permittee should evaluate whether technologies have been used effectively under analogous conditions; whether the combination of technologies have been used together effectively; whether failure of any one technology has an immediate impact on receptors; and whether the corrective measure has the flexibility to deal with uncontrollable changes at the site.

(3) The Permittee shall describe the implementability of each corrective measure including relative ease of installation (constructability) and total time required to achieve a given level of response:

(a) Constructability is determined by conditions both internal and external to facility conditions and includes such items as location of underground utilities, depth to water table, heterogeneity of subsurface materials, and location of facility (i.e., remote location vs. congested urban area). The Permittee shall evaluate what measures can be taken to facilitate construction under site specific conditions. External factors which affect implementation include the need for special permits or agreements, equipment availability, and the location of suitable off-site treatment or disposal facilities.

(b) Time has two components to be addressed: the time it takes to implement a corrective measure and the time it takes to see beneficial results. Beneficial results are defined as the reduction of contaminants to acceptable levels as established in the corrective measures objectives.

(4) The Permittee shall evaluate each corrective measures alternative with regard to safety. This evaluation shall include threats to the safety of nearby communities and environments as well as those to workers during implementation. Factors to consider include fire, explosion, and exposure to hazardous substances.

b) Environmental

The Permittee shall perform an assessment for each alternative. The assessment shall focus on facility conditions and pathways of contamination actually addressed by each alternative. The assessment for each alternative will include at a minimum, an evaluation of the short- and long-term beneficial and adverse effects of the response alternative, evaluation of any adverse effects on environmentally sensitive areas, and an analysis of measures to mitigate adverse impacts. For those ERP sites listed in Table 2(b) of this Section, where a Feasibility Study (FS) has been conducted, the FS report may be submitted to the Administrative Authority for review and comment in place of the assessment.

c) Human Health

The Permittee shall assess each alternative in terms of the extent to which it mitigates short- and long-term potential exposure to any residual contamination and protects human health both during and after implementation of the corrective measure. The assessment will describe the levels and characterizations of contaminants on-site, potential exposure routes, and potentially affected populations. Each alternative will be evaluated to determine the level of exposure to contaminants and the reduction over time. For management of mitigation measures, the relative reduction of impact will be determined by comparing residual levels of each alternative with existing criteria, standards, or regulations acceptable to the Administrative Authority.

d) Institutional

The Permittee shall assess relevant institutional needs for each alternative. Specifically, the effects of Federal, State, and Local environmental and public health standards, regulations, guidance, advisories, ordinances, or community relations on the design, operation, and timing of each alternative shall be considered.

2) Cost Estimate

The Permittee shall develop an estimate of the cost of each corrective measures alternative and for each phase or segment of the alternative. The cost estimate shall include capital, and operation and maintenance costs.

a) Capital costs consist of direct and indirect costs.

(1) Direct capital costs include:

(a) Construction costs: Cost of materials, labor (including fringe benefits and worker's compensation), and equipment required to install the corrective measures alternative;

(b) Equipment costs: Costs of treatment containment, disposal and/or servicing of equipment used to implement the action;

(c) Land and site development costs: Expenses associated with purchase of land and development of existing property; and

(d) Building and services costs: Costs of process and non-process buildings, utility connections, purchased services, and disposal costs.

(2) Indirect capital costs include:

(a) Engineering expenses: Costs of administration, design, construction, supervision, drafting, and testing of corrective

measures alternatives;

(b) Legal fees and license or permit costs: Administrative and technical costs necessary to obtain licenses and permits for installation and operation;

(c) Start-up and shakedown costs: Costs incurred during corrective measure start-up; and

(d) Contingency allowances: Funds to cover costs resulting from unforeseen circumstances such as adverse weather conditions, strikes, and inadequate facility characterization.

b) Operation and maintenance costs are post-construction costs necessary to ensure continued effectiveness of a corrective measure. The Permittee shall consider the following operation and maintenance cost components:

(1) Operating labor costs: Wages, salaries, training, overhead, and fringe benefits associated with the labor needed for post-construction operation;

(2) Maintenance materials and labor costs: Costs for labor, parts, and other resources required for routine maintenance of facilities and equipment;

(3) Auxiliary materials and energy: Costs of such items as chemicals and electricity for treatment plant operations, water and sewer service, and fuel;

(4) Purchased services: Sampling costs, laboratory fees, and professional fees which can be predicted;

(5) Disposal and treatment: Costs of transporting, treating, and disposing of waste materials, such as treatment plant residues, generated during operation;

(6) Administrative costs: Costs associated with administration of corrective measures operation and maintenance not included under other categories;

(7) Insurance, taxes, and licensing costs: Costs of such items as liability and accident insurance; real estate taxes on purchased land or rights-of-way; licensing fees for certain technologies; and permit renewal and reporting costs;

(8) Maintenance reserve and contingency funds: Annual payments into escrow funds to cover costs of anticipated replacement or rebuilding of equipment, and any large unanticipated operation and maintenance costs; and

(9) Other costs: Items that do not fit any of the above categories.

e. Selection of Corrective Measures Alternative(s)

The Permittee shall select a corrective measures alternative using technical, human health, and environmental criteria. At a minimum, the following criteria shall be used to select the final corrective measure or measures.

(1) Technical

(a) Performance. Corrective measure or measures which are most effective at performing their intended functions and maintaining performance over extended periods of time will be given preference;

(b) Reliability. Corrective measure or measures which do not require frequent or complex operation and maintenance activities and have proven effective under conditions similar to those anticipated will be given preference;

(c) Implementability. Corrective measure or measures which can be constructed and operated to reduce levels of contamination to attain or exceed applicable standards in the shortest period of time will be preferred; and

(d) Safety. Corrective measure or measures which pose the least threat to the safety of nearby residents and environments as well as workers during implementation will be preferred.

(2) Human Health

The corrective measure or measures must comply with existing EPA criteria, standards, or regulations for the protection of human health. Corrective measures which provide the minimum level of exposure to contaminants and the maximum reduction in exposure with time are preferred.

(3) Environmental

The corrective measure or measures imposing the least adverse impact or greatest improvement on the environment over the shortest period of time will be preferred.

3. Task Ill: CMS Final Report and Summary

The Permittee shall prepare a CMS Final Report and Summary presenting the results of the CMS and recommending a corrective action program. The Report shall at a minimum include:

a. A summary of all the corrective measures alternatives originally identified and the screening rationale employed. The results of development of each alternative shall be described, and the evaluation of those developed shall be presented in detail. The report will describe the rationale for selection of a corrective measures alternative, including performance expectations, preliminary design

criteria and rationale, general operation and maintenance requirements, and long-term monitoring requirements. The report shall include summary tables which allow the alternative or alternatives to be easily understood. Trade-offs among health risks, environmental effects, and other pertinent factors shall be highlighted.

b. A proposed corrective action program that will attain compliance with concentration level objectives, control sources of releases, meet acceptable waste management requirements, and protect human health and the environment.

c. Design and implementation precautions, including special technical problems, additional engineering data required, permits and regulatory requirements, access, easements, and right-of-way, health and safety requirements, and community relations activities.

d. Cost estimates and schedules including capital cost estimate, operation and maintenance cost estimate, and project schedule (design, construction, operation).

e. A schedule for corrective measure (remedy) implementation.

4. General CMS Reporting Requirements

a. Two hard copies and one IBM compatible disk copy of all reports shall be submitted by the Permittee to the Administrative Authority as specified in Permit Condition V.A.7.

b. The CMS Plan shall be submitted by the Permittee to the Administrative Authority as described in Permit Condition V.I.

c. The CMS Final Report and Summary shall be submitted by the Permittee to the Administrative Authority as described in Permit Condition V.N.

d. Within 90 days of the date the Permittee is notified to begin a CMS, the Permittee shall provide the Administrative Authority with signed, quarterly progress reports as specified in Permit Condition V.D.1.

Table 1
RFI/CMS Submission Summary

Below is a summary of the planned reporting requirements pursuant to this Permit:

Actions	Due Date
Progress reports on all activities	quarterly; no later than the 15th day of the month following the end of the quarter
Notification of newly-identified SWMUs	thirty (30) calendar days after discovery
Notification of newly-discovered releases	fifteen (15) calendar days after discovery
Interim Measures Plan	as determined by Administrative Authority
Revised Interim Measure Plan	as determined by Administrative Authority
CMS Plan	one hundred and eighty (180) calendar days after notification of requirement to perform CMS
Revised CMS Plan	as determined by Administrative Authority, usually within thirty (30) calendar days of receipt of notice of deficiency
CMS Final Report and Summary	sixty (60) calendar days after completion of CMS
Revised CMS Final Report	as determined by Administrative Authority, usually thirty (30)} calendar days after receipt of notice of deficiency

Table 2(a)
RFI Site Requiring an RFI

Below is a summary of the ERP sites requiring an RFI, funded under the Defense Environmental Restoration Account (DERA):

SWMU #	ERP Site	Description
	ST011	AQUA/AVGAS Fuel Distribution System
	SS028	Upgradient of Site ST008

Table 2(b)
SWMUs and AOCs Requiring No Further Action

Below is a list of the ERP sites, SWMUs, and AOCs that, based on the submitted information, do not require an RFI at the present time

SWMU #	ERP Site	Description
5	LF004	East Boundary Landfill
7	WP001	Chemical Disposal Pit
12.1		IWTP – Raw Waste Lift Station #1
19		Paint Booth Water Curtain in Building 128
20		Paint Booth Water Curtain in Building 297
23		Concrete Sump outside Building 128
26		Washrack at Building 141
AOC 1		Grit Separator at Building 141
AOC 2		Grit Separator at Building 187
AOC 3		Industrial Wastewater Sewer Lines
AOC 4		Sanitary Wastewater Sewer Lines
AOC 5		Paint Booth Water Curtain in Building 284
AOC 8		Lift Station East of Building 130
	~~ST011~~	~~AQUA/AVGAS Fuel Distribution System~~
	ST013	Quartermaster Service Station
	ST014	Abandoned UST at Building 202
	ST015	Abandoned UST at Building 1023
	ST016	Abandoned UST at Building 1024
	ST017	Abandoned UST at Building 1030
	ST018	Abandoned UST at Building T-1
	ST019	Abandoned UST at Building T-2
	WP023	Industrial Waste Pit
	SS-027	Entomology Shop

Table 2(c)
SWMUs Undergoing Corrective Action

SWMU #	ERP Site	Description
10	ST012	Paint Stripping Equalization Tank
AOC 6		Paint Stripping Collection Channel - Building 192
	~~WP023~~	~~Industrial Waste Pit~~
	SS024	Jet Engine Shop, Building 187
	SS025	COMBS Warehouse
3	LF003	Tank Farm Landfill
1	SS007	Hazardous Waste Accumulation Point
4	ST008	UST's near Building 110
	DP005	Sludge Disposal Area

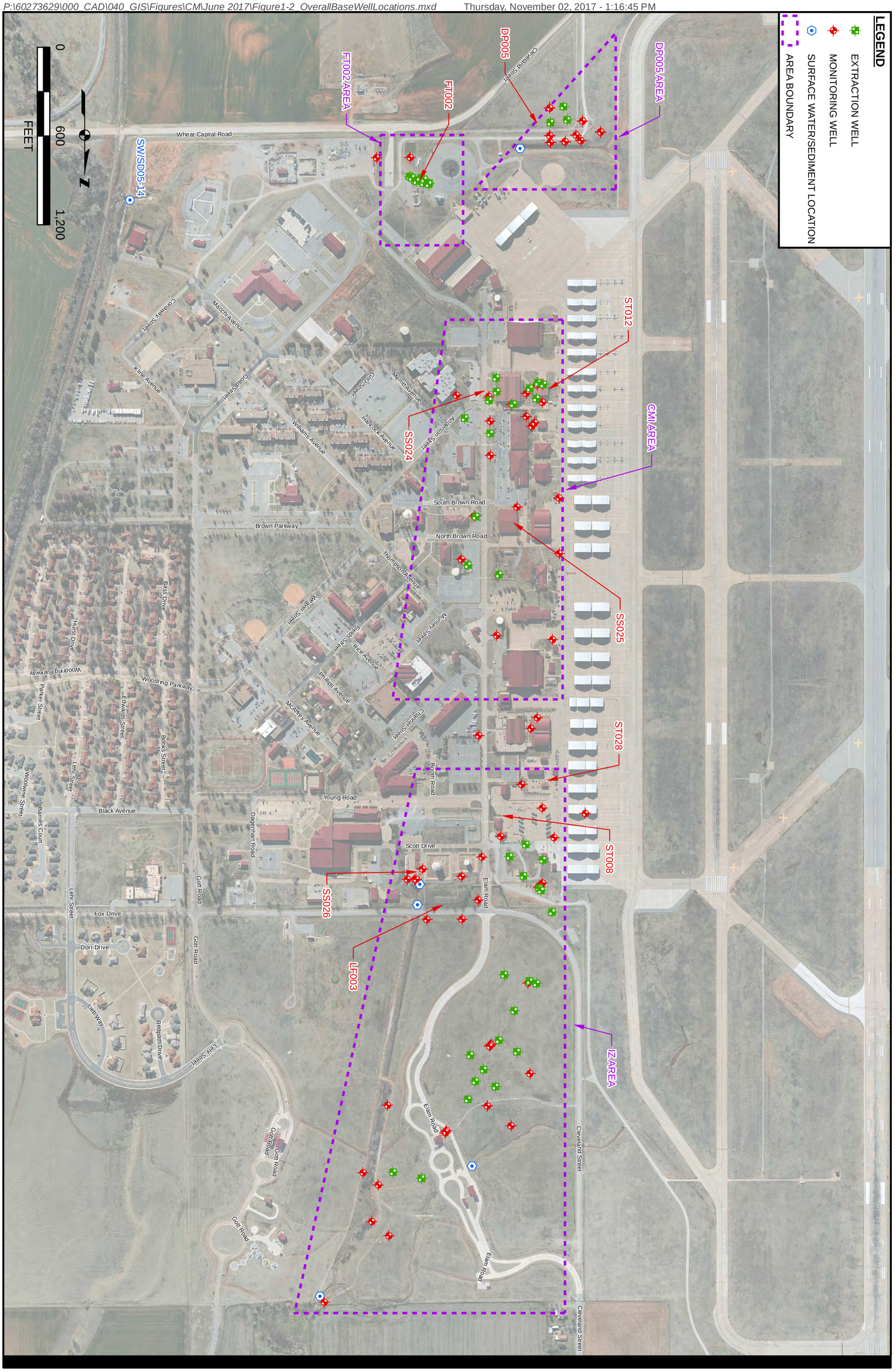
Table 2(d)
SWMUs Undergoing Long-Term Groundwater Monitoring

SWMU #	ERP Site	Description
8	FT002	Fire Training Area 2
	SS026	Jet Fuel Storage Area

ATTACHMENT 1

SITE MAP

P:\60273629\000_CAD\040_GIS\Figures\CM\June 2017\Figure1-2_OverallBaseWellLocations.mxd Thursday, November 02, 2017 - 1:16:45 PM



VANCE AFB

VANCE AIR FORCE BASE, OKLAHOMA

Project No.: 60273629 Date: 2018/07

BASEWIDE SITE MAP

AECOM

Figure: 1

ATTACHMENT 2

INSPECTION AND MAINTENANCE ACTIVITIES

ATTACHMENT 2

Inspection and Maintenance Activities

Throughout the post-closure care period, the integrity and effectiveness of the corrective actions will be monitored and maintained. Inspection and maintenance activities for the extraction wells, gathering systems, monitoring well equipment, and surveyed points are included in Figure 3-1 of Attachments 5 and 6.

The appropriateness and effectiveness of the groundwater monitoring system will be routinely evaluated and modified throughout the post-closure care period.

Inspection procedures for the post-closure care sites (IRP Sites ST08 and ST012) can be found in Section 3.0 of Attachments 5 and 6.

ATTACHMENT 3

PERSONNEL TRAINING

ATTACHMENT 3

Personnel Training

Vance AFB has a personnel training program which has been established to satisfy the requirements of 40 CFR, Section 264.16. Contractors hired by the United States Air Force are responsible for providing the training. The training covers:

- Introduction to RCRA
- Identification of hazardous waste
- Management of waste at accumulation points
- Use, marking, labeling, and transportation of containers
- Waste "turn-in" procedures (internal tracking system)
- Manifesting and transportation of hazardous waste
- Spill prevention and response to emergencies
- Personnel safety, health, and fire
- Waste minimization

Training is conducted initially for new employees or for employees who have transferred to the facility. Annual updates of the initial training topics are also administered, and training records maintained. In addition to this training, HAZWOPER training (OSHA 1910.120) is required for personnel who work full-time in the Central Groundwater Treatment Facility (CGTF).

ATTACHMENT 4

SAMPLING AND ANALYSIS PLAN

GROUNDWATER SAMPLING AND ANALYSIS PLAN
VANCE AIR FORCE BASE, OKLAHOMA

VANCE AIR FORCE BASE, OKLAHOMA

January 2006

Updated March 2018

Groundwater Sampling and Analysis Plan
Vance Air Force Base, Oklahoma

January 2006

Updated July 2018

Cover Page

GROUNDWATER SAMPLING AND ANALYSIS PLAN
VANCE AIR FORCE BASE, OKLAHOMA

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TABLES

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ACRONYMS AND ABBREVIATIONS

AFB	Air Force Base
AFCEE	Air Force Center for Environmental Excellence
AG	amber glass
^{o}C	degrees Celsius
CDQAR	Chemical Data Quality Assurance Report
CF	casing factor
CGTF	Central Groundwater Treatment Facility
COC	chain of custody
CRRL	contract required reporting limits
DEQ	Department of Environmental Quality
DOT	Department of Transportation
DQCR	Daily Quality Control Report
DQO	data quality objective
DRO	diesel range organic
DTW	depth-to-water
EM	Engineer Manual
EPA	Environmental Protection Agency
ER	Engineer Regulation

ACRONYMS AND ABBREVIATIONS (Continued)

ERPIMS	Environmental Resources Program Information Management System
FTL	field team leader
GC	Gas Chromatograph
GCMS	Gas Chromatograph/Mass Spectrometry
GFAA	Graphite Furnace Atomic Absorption
GRO	gasoline range organic
HCl	hydrochloric acid
HDPE	high density polyethylene
HN03	nitric acid
ICAP	Inductively Coupled Plasma-Atomic Emission Spectrometry
IRP	Installation Restoration Program
LQMP	Laboratory Quality Management Plan
mg/kg	milligrams per kilogram
mg/L	milligrams per liter
mL	milliliter
MS	matrix spike
MSD	matrix spike duplicate
PARCCS	precision, accuracy, representativeness, comparability, completeness & sensitivity
PM	project manager
PPE	personal protective equipment
PTFE	polytetrafluoroethylene
QA	quality assurance
QA/QC	quality assurance/quality control
QAO	quality assurance officer
QC	quality control
RCRA	Resource Conservation and Recovery Act
SAP	Sampling and Analysis Plan
SSHO	site safety and health officer
SVOC	semivolatile organic compound
TAT	turn-around-time
TD	total depth
TM	technical manager
TPH	Total Petroleum Hydrocarbons
µg/kg	micrograms per kilogram
µg/L	micrograms per liter
USACE	U.S. Army Corps of Engineers
VOC	volatile organic compound

1.0 INTRODUCTION

1.1 Purpose and Scope

This Sampling and Analysis Plan (SAP) presents the procedures required to sample and analyze groundwater samples at Vance Air Force Base (AFB), Oklahoma, and describes the analytical and Quality Assurance/Quality Control (QA/QC) programs. This SAP includes general procedures and performance requirements for compliance monitoring programs at identified Installation Restoration Program (IRP) sites required by the Oklahoma Department of Environmental Quality (DEQ) Resource Conservation and Recovery Act (RCRA) Post-Closure Permit, signed on August 8, 1996, and subsequent permit modifications. Sampling and analytical requirements for specific sites will be subject to change based on the results of on-going compliance monitoring and achievement of permit goals.

This SAP documents procedures for field screening and monitoring well water level measurements, well purging, groundwater sample collection, sample containerization, preservation, handling, custody, and shipping; field documentation, equipment decontamination, analytical testing, electronic deliverables, and presents an overview of the QA/QC program. The SAP also addresses the process for establishing procedures for the sampling and analysis of other matrices, such as surface water and sediment when required. The SAP was prepared in accordance with the applicable regulations contained in 40 CFR Part 264.97.

The ultimate accuracy of any data generation begins with a sampling and measurement procedure that is fully conceived and implemented. This SAP is designed to delineate the methods that will be used to accomplish the chemical data quality objectives. Data quality objectives include the data quality indicators of precision, accuracy, representativeness, comparability, completeness, and sensitivity.

Sampling and analytical activities will be documented in accordance with this plan and Environmental Resources Program Information Management System (ERPIMS) protocols which is the current Air Force system for validation and management of data from environmental projects at all Air Force bases. Analytical methods and target compounds for compliance monitoring activities are provided in Attachment 1.

1.2 References

References used in the preparation of this SAP include the following:

(a) U.S. Environmental Protection Agency, December 1996, Test Methods for Evaluating Solid Waste Physical/Chemical Method s, SW-846 (Third Edition).

(b) U.S. Army Corps of Engineers, February 2001, Engineer Manual EM 200-1-3, Engineering and Design - Requirements for the Preparation of Sampling and Analysis Plans.

(c) U.S. Army Corps of Engineers, February 2001, Performance Evaluation (PE) Program.

(d) U.S. Army Corps of Engineers, April 1998, Engineer Regulation ER 1110-1-263, Engineering and Design - Chemical Data Quality Management for Hazardous, Toxic, Radioactive Waste Remedial Activities.

2.0 PROJECT ORGANIZATION AND RESPONSIBILITIES

The project management organization will be based on specific project requirements. Key project personnel and their roles/responsibilities for various aspects of groundwater sampling activities performed at Vance AFB are listed below. Not all of these personnel may be required to support these activities and one individual may have serve in dual roles when applicable. Due to the general nature of this document, the project organization and personnel responsibilities will be identified in site-specific work plans or addenda to these work plans required for environmental activities.

2.1 Responsibilities of Key Personnel

Project Manager:
The program manager (PM) is responsible for the overall control of project schedules, budgets, and technical performance. The project manager is also responsible for identifying the overall project objectives.

Technical Manager:
The technical manager (TM) is responsible for identifying tasks and developing site-specific work plans and procedures for completing these tasks in order to achieve the project objectives.

Field Team Leader:
The field team leader (FTL) is responsible for completing the tasks identified in the work plan as they apply to the field investigation team. The FTL is responsible for documenting the day-to-day activities and notifying the TM and PM whenever deviations to the work plan may occur due to change in site conditions.

Site Safety and Health Officer:
The site safety and health officer (SSHO) is responsible for the development of the Site Safety and Health Plan as it relates to the work plan. The SSHO is also responsible for the day-to-day control of health and safety activities.

Project Chemist:
The project chemist is responsible for the development of the Sampling and Analysis Plan as it relates to the work plan. The project chemist is also responsible for reviewing field efforts and analytical laboratory deliverables and generating a chemical data quality assurance report (CDQAR), also known as a data validation report.

Project Geologist:
The project geologist is responsible for reviewing and interpreting groundwater data and making recommendations regarding future well locations, monitoring well construction, well rehabilitation, pump configuration, etc.

Quality Assurance Officer:
The quality assurance officer (QAO) is responsible for overseeing the technical aspects of the project and reviews the deliverables for the project to verify that the work meets the objectives established in the work plan.

Field Sampling Personnel:
The field sampling personnel report to the field team leader and are responsible for obtaining samples and completing other sampling tasks, and packaging and shipping samples to the designated off-site laboratory.

2.2 Analytical Laboratory

An off-site analytical laboratory will be designated to provide analytical services for each groundwater sampling event. The laboratory will be appropriately certified to perform the project analyses. The contract laboratory will be responsible for receiving, preparing and analyzing samples, and for reporting the results.

A copy of the Laboratory Quality Management Plan (LQMP) from the lab will be supplied to the project chemist as a submittal prior to execution of project work. The designated laboratory will be provided a copy of the SAP or site-specific addenda to the SAP for their reference.

3.0 FIELD ACTIVITIES

3.1 Groundwater

3.1.1 Field Screening Measurements

Each monitoring well will be screened for organic vapors with a photo ionization detector (PID) immediately upon opening the well for water level measurements to determine if appropriate personal protective equipment (PPB) is being used. Any adjustments to PPB will be made at this time.

The SSHO may choose to modify the level of PPE and the frequency at which monitoring wells are screened dependent upon the amount of historical data that are available for each site.

3.1.2 Water Level Measurement

Before a well is purged and samples are collected, the static water level will be measured to the nearest 0.01 foot using an electronic water level indicator. The total well depth will be measured to the nearest 0.01 foot at least annually. Static water level and any total well depth measurements will be recorded. All site wells should be opened prior to purging to allow for equilibration before water level measurements are made.

3.1.3 Monitoring Well Purging Procedures

Before sampling begins, new plastic sheeting must be placed on the ground surrounding the well. The plastic sheeting must be of sufficient size to keep all equipment from contacting the ground surface.

Before opening well cap, remove any standing water from within the protective casing. **Do not allow any standing water to enter the well casing.**

Remove well cap and use PID to check for volatile organic compounds (VOCs) in breathing zone and in the well casing. Record all data on the monitoring well sample collection form. **If well is pressurized, allow at least several minutes for the water level to equilibrate and note this information on the well sampling form.**

Measure depth-to-water from the top of the well casing. Consult previous sample collection form or well database to determine the depth of the screened interval for the well. Record all the information on the monitoring well sample collection form.

When placing the pump in the well to be sampled, lower the pump with one continuous smooth motion to minimize the disturbance of any sediment that may have accumulated in the well. The water level meter probe may be lowered with the pump to monitor the depth. The pump should be placed within three feet of the bottom of the screened interval. **Do not raise and lower the pump in the well.** It is important to minimize mixing of stagnant borehole water and disturbing sediment which may have collected at the bottom of the well. Secure the pump at the well head when it reaches the appropriate depth.

Set up the water quality meter and flow-through cell:

- Attach the pump tubing to the flow-through cell.

- Retract the water level meter to the top of the water and record the water level. If the water level has not changed significantly (< 0.3 feet), the well will likely sustain low-flow sampling. Secure the water level meter at the appropriate depth to monitor draw-down as pumping proceeds.

- Record the pump controller settings.

- Record the time, the depth to water, and estimated pump intake depth.

- Begin pumping. Bypass the flow-through cell and monitor the pump discharge. Adjust the discharge to a rate that is just high enough to pump water to the surface. Attach flow through cell and adjust the flow rate as necessary to maintain flow through the cell. **The flow rate must be set and maintained constant throughout the purge and sampling process.**

- Monitor the flow rate and draw down. The highest flow rate that produces **NO DRAWDOWN** is ideal. The flow rate must be less than 0.02 L/min and create drawdown of no more than half the length of submerged screened portion of the well. **The water level should never be allowed to drop to within 2 feet of the top of the pump.** If the well will not sustain a 40 mL/min purge rate with no drawdown, the well be pumped dry and a grab sample will be collected with a disposable Teflon bailer. The standard suite of water quality parameters will be recorded at the time of sample collection.

  While purging, initially measure and record the stabilization parameters every 5 minutes. As the readings begin to stabilize, begin recording the parameters every three minutes. The monitoring well will be considered purged when all parameters are stabilized for three consecutive readings. The three readings should be within:

  - 0.5 degrees C for Temperature
  - 3% for specific conductivity
  - 10% for DO
  - 0.1 for pH
  - 10mv ORP
  - Turbidity as low as possible (<10 NTU ideal)

  Once stabilization has been confirmed with three consecutive readings, sample collection may begin. All monitoring wells should be purged for a minimum of 40 minutes before sample collection should be considered.

  Wells with slow recharge will be pumped or bailed dry and then sampled as soon as sufficient recharge has occurred to fill the sample containers. Wells shall be sampled within 24 hours of purging, including those wells that are purged dry. Depth to water at the time of sampling shall also be recorded.

  If sediment has accumulated in a monitoring well or if turbidity levels cannot be maintained within acceptable limits during purging, the well may be considered for redevelopment at the discretion of the field team leader or project geologist. Well redevelopment will be accomplished using standard methods and

protocols. Well purge and redevelopment fluids will be containerized and subsequently treated at the Central Groundwater Treatment Facility (CGTF).

3.1.4 Determine Immiscible Layers/Free Product Presence and Sampling

Immiscible layers are not anticipated, but, if present, an electronic interface probe will be used to measure the level of the immiscible surface in order to determine the apparent thickness prior to water level measurements. A sample will be collected using a transparent, precleaned Teflon bailer, and the presence of the immiscible layer will be confirmed visually. The collected liquids will be containerized separately from well purge fluids for storage and disposal.

3.1.5 Groundwater Quality Measurement Procedures

Commercially available, field rugged analytical instrumentation will be used to collect field measurements. Measurements will be taken in accordance with manufacturer specifications and guidelines. The instruments will meet or exceed applicable state and federal guidelines associated with groundwater sampling.

3.1.6 Groundwater Monitoring Well Sampling Procedures

Monitoring wells will be sampled with a dedicated Teflon® bladder or other acceptable sample pump if the well is not equipped with a dedicated pump system, or using a Teflon® bailer with a new nylon or polypropylene cord. Generators used to power sampling pumps will be placed downwind of the well to prevent exhaust fumes from contaminating the sample. For samples intended for volatile organics analysis, the pumping rate will be no greater than 100 milliliters per minute to prevent agitation of the water. Similarly, if bailers are used they will be slowly lowered into the wells. Sampling will progress from the least contaminated well to the most contaminated well, if such information exists. Otherwise, upgradient wells will be sampled before downgradient wells. The sampling progression is not as critical for wells with dedicated pump systems.

Pre-cleaned sample containers will be filled directly from the bailer or pump discharge tube. Samples will be preserved prior to shipment to the laboratory for analysis. Groundwater sampling analytical parameters and methods are given in Table 3-l. Individual analytical constituents and associated detection limits are given in Attachment 1. The appropriate sample size/containers, preservation methods, and holding times for all required analyses are given in Table 3-2. Samples will be collected (when applicable) in the following sequence:

- Volatile organic compounds (VOCs)
- Total Petroleum Hydrocarbon - Gasoline Range Organics (TPH-GRO)
- Semivolatile organic compounds (SVOCs)
- Total Petroleum Hydrocarbon -Diesel Range Organics (TPH-DRO)
- Metals
- ~~Pesticides~~

3.1.7 Sample Handling Procedures for Groundwater

Groundwater samples will be collected in appropriate containers, which will be filled, preserved (when required), and chilled as soon as possible. The sampler will wear disposable latex gloves, and will change to new gloves between each monitoring well location. Groundwater samples will not be filtered. Pre-preservation of sample containers will be performed when applicable.

If high levels of metals results possibly caused by suspended solids in groundwater samples are of concern, consideration may be given to collecting and submitting samples for laboratory analysis of both total and dissolved metals.

3.1.8 Sample Containers and Preservation Techniques

Samples will be containerized and preserved in accordance with current state and federal guidelines. Groundwater, wastewater, travel blank, and rinsate blank samples are anticipated to be collected for this effort. Table 3-1 and Table 3-2 reference information pertaining to sample containers and preservation techniques.

In the absence of any specified sampling or analytical method or technique, the project team will reference the most current edition of EPA's Office of Solid Waste SW-846 analytical method manual.

Table 3-1
Compliance Monitoring - Sampling and Analytical Requirements

IRP Site.	Matrix	Number of Samples	Quality Control Samples	Parameter	Method[a]	Turn-around-Time (TAT)
ST012,WP023, SS024 & SS025	Groundwater	34	See note	VOCs	SW-846 8260B	30 Days
		34	See note	SVOCs	SW-846 8270e	30 Days
LF003, SS007, & ST008 & SS028	Groundwater	4224	See note	VOCs	SW-846 8260B	30 Days
		4224	See note	RCRA Metals	SW-846 6010B / 7470	30 Days
	Surface Water	4	See note	VOCs	SW-846 8260B	30 Days
		4	See note	RCRA Metals	SW-846 601OB I 7470	30 Days
	Sediment	4	See note	VOCs	SW-846 8260B	30 Days
		4	See note	RCRA Metals	SW-846 6010B / 7471	30 Days
FT002	Groundwater	2	See note	VOC	SW-846 8260B	30 Days
		2	See note	SVOCs	SW-846 8270e	30 Days
		21	See note	RCRA Metals	SW-846 601OB /7470	30 Days
		21	See note	TPH-GRO/DRO	SW-846 8015M	30 Days
		2	See note	Pesticides	SW-846 8081A	30 Days
DP005	Groundwater	98	See note	VOC	SW-846 8260B	30 Days
		98	See note	SVOCs	SW-846 8270e	30 Days
		91	See note	RCRA Metals	SW-846 6010B / 7470	30 Days
		96	See note	TPH-OK GRO/ DRO	SW-846 8015M	30 Days
	Surface Water	2	See note	VOC	SW-846 8260B	30 Days
		2	See note	SVOCs	SW-846 8270e	30 Days

Table 3-1
Compliance Monitoring - Sampling and Analytical Requirements

IRP Site.	Matrix	Number of Samples	Quality Control Samples	Parameter	Method[a]	Turn-around-Time (TAT)
DP005 (continued)		~~2~~	~~See note~~	~~TPH-GRO/DRO~~	~~SW-846 8015M~~	~~30 Days~~
		~~2~~	~~See note~~	~~RCRA Metals~~	~~SW-846 60108 / 7470~~	~~30 Days~~
	Sediment	~~2~~	~~See note~~	~~VOCs~~	~~SW-846 82608~~	~~30 Days~~
		~~2~~1	See note	SVOCs	SW-846 8270e	30 Days
		~~2~~	~~See note~~	~~TPH-GRO/DRO~~	~~SW-846 8015M~~	~~30 Days~~
		~~2~~	~~See note~~	~~RCRA Metals~~	~~SW-846 60108 / 7471~~	~~30 Days~~
Drums or Poly Tank (Disposal)	Redevelopment/ Purge Water	1 per site	None	VOCs	SW-846 82608	30 Days
				SVOCs	SW-846 8270C	30 Days
				RCRA Metals	SW-846 60108 / 7471	30 Days

a - U.S. EPA, 1996. *Test Methods for Evaluating Solid Waste, Physical Chemical Methods (SW·846)*, Update Ill.
DRO - diesel range organic
GRO - gasoline range organic
RCRA - Resource Conservation and Recovery Act
SVOC - semivolatile organic compound
TPH - total petroleum hydrocarbons
VOC - volatile organic compound
Note: A minimum of ten percent (10%) of the groundwater samples collected at each site (or group of sites) and of the additional samples associated with other matrices, such as surface water and sediment, shall be quality control samples. The groundwater specific analyte list for each well is found in Section IV Part B of the Permit.

Table 3-2
Sample Volume, Containerization, Preservation, and Holding Times

Parameter	Container/Minimum Sample Volume	Holding Time	Preservation
Water (Groundwater, Surface Water, Wastewater, Travel Blanks, Rinsate Blanks)			
VOC	3 X 40 ml Vial with PTFE septa cap	14 Days	HCL to pH <2 4°C No Headspace
SVOC	2 X 1L AG	7 Days to Extraction 40 Days to Analysis	4°C
RCRA Metals	1 X 1L HDPE bottle	6 Months, except for Mercury (28 days)	$HN0_3$ to pH <2 4°C
TPH-GRO	3 X 40 ml Vial with PTFE septa cap	14 Days	HCL to pH <2 4°C No Headspace
TPH-DRO	2 X 1L AG	7 Days to Extraction 40 Days to Analysis	4°C
~~Pesticides~~	~~2 X 1L AG~~	~~7 Days to Extraction 40 Days to Analysis~~	~~4°C~~
Sediment			
VOC	1 4oz wide mouth jar with PTFE septa lid	14 days to Analysis	No preservation
SVOC	1 8oz wide mouth jar with PTFE septa lid	14 days to Extraction 40 Days to Analysis	No preservation
RCRA Metals	1 8oz wide mouth jar with PTFE septa lid	6 month, except for Mercury (28 days)	No preservation
TPH GRO	1 8oz wide mouth jar with	11 days to Analysis	No preservation
TPH DRO	PTFE septa lid	14 days to Extraction 40 Days to Analysis	No preservation

The above listed volumes provide an adequate quantity of sample to analyze a matrix spike (MS) and matrix spike duplicate (MSD).
AG - amber glass jug
^{o}C - degrees centigrade
DRO - diesel range organic
GRO - gasoline range organic
HCI - hydrochloric acid
HDPE - high-density polyethylene
HN03 - nitric acid
mL - milliliter
PTFE - polytetrafluoroethylene
RCRA - Resource Conservation and Recovery Act
SVOC – semivolatile organic compound
TPH - total petroleum hydrocarbons
VOC - volatile organic compound

3.1.9 Field Quality Control Sampling Procedures

Groundwater samples will be collected in duplicate to monitor the accuracy and precision of field and laboratory techniques and methods. Additionally, travel blanks and rinsate blanks will be collected and analyzed for quality control purposes. Discussions regarding these sample types are listed in Section 8.0 of this plan.

3.1.10 Instrumentation and Equipment Decontamination Procedures

Reusable sampling equipment, such as hailers, buckets, funnels, and spoons, will be decontaminated prior to use. At a minimum, this equipment will be washed using a biodegradable non-phosphate detergent (such as Alconox, Liquinox, or equivalent) and potable water, followed by two deionized water rinses, and allowed to air dry.

Sample locations known to be grossly contaminated as determined by field observation or former analytical testing will require sample equipment to include a final isopropyl alcohol rinse prior to being air-dried.

Equipment used to develop or purge groundwater from a monitoring well will be washed and rinsed as required. The field team leader is responsible for ensuring that all equipment coming into contact with soil or groundwater is free of contamination and will not compromise the validity of the sample results.

The electronic water level indicator used to measure depth to groundwater in monitoring wells will be decontaminated in the field prior to use at each well. The decontamination procedure will be the same as that used for sampling equipment. Decontamination fluids will be containerized and subsequently treated at the CGTF.

3.2 Surface Water and Sediment

Additional samples associated with such matrices as surface water and sediment will be collected during groundwater sampling activities at identified IRP sites. Sampling and analytical requirements are shown in Table 3-1 and sample volume, containerization, preservation, and holding times are shown in Table 3-2. Individual analytical constituents and associated detection limits are given in Attachment 1.

4.0 FIELD OPERATIONS DOCUMENTATION

4.1 Field Logbook and Sample Field Sheets

The field team leader and other team members will maintain bound field logbooks to provide a daily record of significant events, observations, and measurements during sampling. All information pertinent to sampling will be recorded in the logbooks. All entries will be signed and dated and must include at least the following information:

- Name and title of author, date and time of entry, and weather/environmental conditions during the field activity
- Location of sampling activity
- Name and title of field crew
- Name and title of site visitors
- Sample media (i.e., groundwater)
- Sample collection method
- Number and volume of sample(s) taken
- Date and time of collection
- Sample identification number(s)
- Sample distribution (i.e., which laboratory the sample was sent to for analysis)
- Field observations
- Field measurements (i.e., groundwater quality parameters)

These notes must be dated and signed (each page) for validity in a court of law. All logbook entries will be made with waterproof ink and legibly written. Field notes will be entered into a bound logbook and the pages will be consecutively numbered. All entries will be in chronological order. The language will be factual and objective. No erasures will be permitted. If an incorrect entry is made, .the error will be crossed out with a single strikeout mark, initialed and dated.

4.2 Daily Quality Control Reports

The field logbook will be used to prepare a Daily Quality Control Report (DQCR). DQCRs will be completed each day of field activities, if required, by the field team leader or other authorized personnel and forwarded to the TM or PM daily or upon request. The report will include the following general information:

- Name of site personnel and visitors
- Summary of field activities and progress of work
- Verbal instructions/recommendations from government personnel
- Change in site conditions
- Safety issues
- General remarks

4.3 Field Measurement Records

The field logbook will be used to document and track the calibration and maintenance of all instrumentation used in the field.

5.0 SAMPLE PACKAGING AND SHIPPING REQUIREMENTS

Samples collected during the field activities will be shipped via commercial or government courier to the designated analytical laboratory(s). Coolers will not be shipped for Saturday delivery unless arrangements have been made with the respective laboratory prior to the shipment. A cooler of suitable strength for packaging and shipping samples will be used and will be manifested to meet U.S. Department of Transportation (DOT) regulations (dangerous goods, etc.). The inside of each cooler will be lined with a plastic commercial grade trash bag or otherwise sealed to prevent leaking, and all samples and sample packing materials will be placed inside the bag. The bottom and sides of each cooler will be lined with bubble wrap, a polyethylene foam insert, or other cushioning material. All samples will be kept upright in the cooler. Once the samples are in the cooler, ice will be placed in the cooler with the samples. A sufficient amount of ice will be added to the coolers to ensure they arrive at the laboratory at a temperature of 4° Celsius (^{o}C) (±2°C). The original chain-of-custody record will be placed in a watertight plastic bag and taped to the inside lid of the cooler. The cooler will be secured with strapping tape and custody seals will be affixed to or near the seal/lip of the cooler lid. The custody seals will be covered with wide, clear adhesive tape. Appropriate shipping labels will be placed on each cooler. These labels should identify the shipper and the laboratory, points of contact, phone numbers, and street addresses.

6.0 DATA ASSESSMENT ORGANIZATION AND RESPONSIBILITIES

Data assessment will begin with the evaluation of the samples received onsite, and will include all relevant and appropriate requirements. The contract laboratory will perform a similar assessment of the received samples. All analyses will be conducted with respect to the laboratory's standard operating procedures, and applicable federal method requirements and guidance. The laboratory will document all concerns encountered with the various analyses with respect to these regulations. The project chemist will prepare an analytical data package, which will substantiate the results reported by the offsite laboratory. The offsite laboratory will prepare a similar analytical data package and deliver it to the project chemist.

7.0 DATA QUALITY OBJECTIVES

Data Quality Objectives (DQOs) are qualitative and quantitative statements that specify the quality of data required from field and laboratory data collection activities to support decisions concerning risk and remediation. DQOs are established prior to data collection and describe what data are needed, why the data are needed, and how the data will be used to address the problems being investigated. DQOs help to ensure that all data collected are legally and scientifically defensible.

7.1 Measurement Quality Objectives for Chemical Data Measurement

All groundwater samples collected from monitoring wells and samples collected from other matrices will be analyzed offsite. At a minimum, 10% of the samples collected will be collected in duplicate. These samples will be shipped offsite to the same analytical laboratory for analysis as the primary (field) samples. These samples will be identified as QC duplicate samples and labeled accordingly.

One equipment or rinsate blank will be collected and analyzed for 5% of the groundwater samples; whenever the same sampling equipment is used repeatedly. Results from these samples assist in evaluating decontamination procedures and equipment cross-contamination.

Travel blanks will accompany all aqueous sample shipments; specifically with those samples being collected and. analyzed for volatile organics. Travel blanks are collected and analyzed to assist with evaluating cross-contamination among each volatile organic sample shipment.

8.0 SAMPLE HANDLING, DELIVERY, AND CUSTODY REQUIREMENTS

Proper sample handling, delivery, and maintenance of a chain of custody are key components to building the documentation and support for data that can be used for decision-making. It is essential that all sample handling and sample chain of custody requirements be performed in a complete, accurate, and consistent manner.

8.1 Sample Handling and Delivery

Samples will be delivered to the designated laboratories by local courier or by a common carrier such as Federal Express. Hard plastic ice chests or coolers with similar durability will be used for shipping samples. The coolers must be able to withstand a 4-foot drop onto solid concrete in the position most likely to cause damage. The samples must be cushioned to cause the least amount of damage if such a fall occurs.

All aqueous volatile organic compound sample vials will be shipped in the same cooler on a given day. A travel blank will be included in each cooler with aqueous volatile organic samples (travel blanks are not required for coolers containing volatile organic soil or sediment samples). After packing is complete, the cooler will be strapped closed with strapping tape and with chain of custody seals affixed across the top and bottom joints. Each container will be clearly marked w7ith a sticker containing the originator's address and the address and point of contact for the receiving laboratory.

The following procedures must be used when transferring samples for shipment:

- An original chain of custody (COC) form identifying the contents must accompany all sample coolers/packages. When transferring possession of the samples, the individuals relinquishing and receiving the sample must sign, date, and note the time on the record. This record documents transfer of custody of samples from the field sampler to another person or to the laboratory. The original chain of custody record must accompany the shipment, and the technician must retain a copy.
- Samples must be properly packaged for shipment and delivered to the appropriate laboratory for analysis with a separate signed chain of custody form enclosed in each sample box or cooler.

8.2 Sample Custody

Sample custody and documentation procedures described in this section will be followed throughout all sample collection activities. Components of sample custody procedures include the use of field logbooks, sample labels, custody seals, and chain of custody forms. Each person involved with sample handling must be trained in chain of custody procedures before the start of the field project. The original chain of custody form must accompany the samples during shipment from the field to the offsite laboratory.

A sample is under custody under the following conditions:

- It is in one's actual possession
- It is in one's view, after being in one's physical possession
- It was in one's physical possession and that person locks it up to prevent tampering
- It is in a designated and identified secure area

8.2.1 Field Custody

The following procedures must be used to document, establish, and maintain custody of field samples:

- Sample labels must be completed for each sample with waterproof ink, ensuring that the labels are legible and affixed firmly on the sample container.
- All sample-related information must be recorded in the project logbook.
- The field sampler must retain custody of samples until they are transferred or properly dispatched.
- An original chain of custody record will accompany all samples. This record documents the transfer of custody of samples from the field investigator to another person, to the laboratory, or to other organizational entities. An authorized signature for relinquishment and receipt of the samples must accompany each change of possession.
- Completed original chain of custody forms will be enclosed in a plastic cover and placed inside the shipping container used for sample transport from the field to the laboratory.
- When samples are relinquished to a shipping company for transport, the tracking number from the shipping bill or receipt will be recorded on the chain of custody form.
- Custody seals must be affixed on shipping containers when samples are shipped to the laboratory to prevent sample tampering during transportation.

8.2.2. Laboratory Custody

Each laboratory receiving samples must comply with the laboratory sample custody requirements outlined in the subcontract document and its own quality assurance plan. The field team leader or project chemist will notify the laboratory of upcoming field sampling activities and the subsequent transfer of samples to the laboratory. This notification will include information concerning the number and type of samples to be shipped, and the expected date of arrival.

The laboratory sample custodian will use the following procedures, once the samples have arrived at the laboratory:

- The laboratory will designate a sample custodian who will be responsible for maintaining custody of the samples and for maintaining all associated records documenting that custody.
- Upon receipt of the samples, the custodian will check the original chain of custody and request-for-analysis documents and compare them with the labeled contents of each sample container for corrections and traceability. The sample custodian will sign the original chain of custody and record the date and time received. The sample custodian also will assign a unique laboratory sample number to each sample.
- Cooler temperature will be checked and recorded.
- Care will be exercised to annotate any labeling or descriptive errors. If discrepancies occur in the documentation; the laboratory will immediately contact the field team leader as part of the corrective action process. A qualitative assessment of each sample container will be performed to note anomalies, such as broken or leaking bottles. This assessment will be recorded as part of the incoming chain of custody procedure.

- If all data and samples are correct and there has been no tampering with the custody seals, the "Received by Laboratory" box will be signed and dated.
- Samples will be stored in a secured area and at a temperature of 4°C (±2 °C), if necessary, until analyses are to begin.
- The laboratory will send a sample acknowledgment letter to the project chemist and project manager as a record that the shipment arrived and the condition of the containers upon arrival. Any discrepancy will be identified and corrective actions performed. The project chemist may need to provide guidance concerning additional actions. The project manager will retain a copy of the sample acknowledgment with the chain of custody.
- A chain of custody form will accompany all samples. When transferring the possession of samples, the individuals relinquishing and receiving will sign, date, and note the time on the record. This record documents transfer of custody of samples from the field sampler to another person, or to the laboratory. Overnight carriers will be treated as a single entity, and a single signature will be required when samples are delivered to the laboratory.
- A laboratory chain of custody form will accompany the sample or sample fraction through final analysis for control.
- Copies of the chain of custody and request-for-analysis forms will accompany the laboratory report and will become a permanent part of the project records.
- Samples must be properly packaged for shipment and delivered to the appropriate laboratory for analysis with a separate signed chain of custody form enclosed in each sample box or cooler.
- A chain of custody form identifying the contents must accompany all packages. The original record must accompany the shipment, and the field team leader must retain a copy. Additional details about laboratory sample custody will be included in the laboratory comprehensive quality assurance plan.

8.3 Holding Time Requirements

All samples will be processed as required to provide compliance with the holding time limits for preparation and analysis. The sample holding time will be determined from the date and time the sample is collected in the field. Sufficient lead time will also be allowed for the reanalysis of samples within holding times in the event that calibration, method, or quality control failures occur. Noncompliance with the method-specific holding time limits, without proper justification, will be grounds for rejecting the data· results.

8.4 Verification/Documentation of Cooler Receipt Condition

The offsite laboratory will submit a tabulation of samples received from the project team within 10 days after the sampling event is completed and will update their records to include any subsequent sampling events. The following information will be provided for each sample received:

- Date sample was received by the lab
- Lab package identification number
- Field sample identification number

- Project site
- Cooler number
- Cooler condition (temperature, packaging, damage, etc.)
- Type of sample media & the parameters listed on the chain-of-custody.

8.5 Corrective Action for Incoming Samples

The offsite laboratory will not be held accountable for any sample deficiencies noted upon arrival at the performing laboratory, such as broken or leaking sample containers, high cooler temperatures, etc. The laboratory will immediately notify the project chemist or technical manager by telephone concerning such deficiencies in order to obtain guidance regarding the appropriate action required.

9.0 ANALYTICAL PROCEDURES

Offsite analyses will be conducted utilizing the latest approved update of the methods stipulated in the field sampling plan and individual contract laboratory task orders. Required target compounds, methods and contract required reporting limits (CRRLs) are listed in Attachment 1. The analyses for these parameters will comply with current EPA SW846 method guidance.

The contract laboratory will maintain written laboratory-specific standard operating procedures for all methods and general operations necessary to perform the requested analytical services. The standard operating procedures will fully detail the actual procedures and documentation used to implement performance-based methods. Simply referencing a given method or method number will not be acceptable. The standard operating procedures will be based on the latest available guidance published by the federal government and other pertinent references.

10.0 DATA REDUCTION AND EVALUATION

The data reduction and evaluation process begins with the receipt of all laboratory data submittals and associated chemical data quality review reports or case narratives. The offsite laboratory will have been required to meet a list of laboratory deliverables designed specifically for the project prior to start of work. The project chemist then evaluates the data generated by all the laboratories and determines whether the data are reliable, defensible, and complete.

The data shall be evaluated with regards to project specific quality assurance objectives, i.e., Precision, Accuracy, Representativeness, Comparability, Completeness, and Sensitivity; otherwise known as PARCCS. They are defined as follows:

10.1 Precision

Precision examines the distribution of the reported values about their mean. The distribution of reported values refers to how different the individual reported values are from the average reported value. Evaluating spiked sample recoveries and associated duplicate recoveries are commonly used to assess analytical precision.

10.2 Accuracy

Accuracy measures the bias in a measurement system and is difficult to measure for the entire data collection activity. Analytical accuracy is commonly assessed by evaluating known and unknown QC sample and spiked sample recoveries. This includes the evaluation of internal and surrogate standard recoveries. Evaluating travel blank, method blank, and equipment blank results to determine potential concentration contribution from various outside sources, i.e., field or lab activities, is also used to assess accuracy.

10.3 Representativeness

Representativeness expresses the degree to which sample data accurately and precisely depicts the characteristics of a population of samples. Representativeness is commonly assessed by evaluating, duplicate field and laboratory samples, i.e., field and QC samples.

10.4 Comparability

Comparability is a qualitative parameter expressing the confidence with which one data set can be compared with another. Comparability is assessed by evaluating field samples to previous sampling data at a particular site.

10.5 Completeness

Completeness is defined as the percentage of measurements made which are judged to be valid measurements compared to the total number of measurements planned.

10.6 Sensitivity

Sensitivity addresses how well selected analytical methods and instruments respond to change in analyte concentration. The appropriate analytical methods must be selected to meet or exceed specific project data requirements. Some methods may not be applicable for the analysis of certain environmental matrices. Sensitivity is assessed by evaluating the reported method detection limits and evaluating calibration information provided by the laboratory

11.0 LABORATORY OPERATIONS DOCUMENTATION

11.1 Data Reporting Procedures Data Management Procedures

Chemical data quality management and laboratory documentation will fully comply with the latest edition of USACE ER-1110-1-263, "Chemical Data Quality Management for Hazardous Waste Remedial Activities". The offsite analytical laboratory will provide the following data and documentation in the paper and electronic copies of the data packages and will comply with the following requirements.

- Complete documentation of all incoming sample shipments by the performing laboratories is required. This will include, at a minimum, the following: (a) signing for sample shipments, (b) receiving and reviewing all shipments for completeness and accuracy against enclosed letters and forms, (c) signing and dating the enclosed chain-of-custody forms, (d) logging all shipments of samples into appropriate log books and/or computer laboratory information management systems, and (e) contacting the project chemist immediately for resolution of any problems that may have been noted. Individual cooler receipt forms will be used for each shipment to verify and document any problems noted.
- The chain-of-custody form, any shipping documents, completed cooler receipt forms, telephone conversation record forms, and any corrective action forms will be maintained by the laboratory for each shipment and included in the data package when the final results are reported.
- Analytical results will be provided on the performing laboratory's letterhead, dated and signed by the designated laboratory project manager. Results for more than one field sample or more than one parameter will not be combined on the same data results sheet. The data results sheets will contain the following information at a minimum:

  Client identification

  Project site identification & Contract Task Order Number

  Field sample identification number as written on custody form

  Laboratory sample identification number

  Matrix (soil, water, sediment, etc.)

  Dates sample was collected and received at Lab

  Date & time sample extracted or prepared

  Date & time sample analyzed w/ parameter identification

  Preparation, extraction & method numbers

  Preparation, analysis, quality control & other batch number

  Method quantitation limit for each analyte

  Method detection limit for each analyte

  Results reported in consistent units

  Results reported as an actual value, estimated value or value below the method detection limit (i.e. non detected)

Applicable data qualifiers

Tentatively identified compounds for applicable parameters

Dilution factors for each analyte

Percent solids for solid media samples w/ results reported on a dry-weight basis

- If significant equipment fouling and/or matrix interference can be avoided, samples will initially be analyzed undiluted. Otherwise, serial dilution or screening protocols will be practiced to analyze samples at the lowest possible dilution factor. If the results for one or more analytes exceed their calibration range, when the sample is analyzed near or at a particular dilution, those results should be qualified and the sample diluted and reanalyzed to obtain valid results for those analytes. The desired goal is to report the result for a particular target analyte, either undiluted or at the lowest possible dilution factor, as long as the result falls within its calibration range.
- Standard EPA data qualifiers will be used to indicate (1) blank contamination, (2) sample- analytical anomalies associated with an analyte, (3) analyte results which fall between the method detection limit and actual sample quantitation limits, (4) data rejected due to exceedence of method-specific holding times, high cooler temperatures, or other significant quality control data deficiencies, and (5) data results which exceed the upper calibration curve limit for that analyte.
- A quality control summary, which provides tabulated results of laboratory blanks, surrogate spikes & recoveries, matrix spike/matrix spike duplicate, laboratory control spike,
- laboratory duplicates, relative percent differences and field duplicates will be provided. Acceptable surrogate, matrix spike & laboratory control spike recovery ranges & relative percent difference limits will be shown on the field or quality control data pages adjacent to the actual results obtained.
- Sample calibration and internal standard/retention time summaries will be provided for applicable parameters
- Sample identification numbers will be cross-referenced with laboratory identification numbers and quality control sample numbers. Tables which cross-reference field samples with associated method blanks, matrix spike/matrix spike duplicate, and laboratory control spike samples will be provided.
- A detailed case narrative will be provided for each parameter or parameter set. The case narrative will include analysis/preparation method numbers, batch numbers, standard operating procedure references, statements concerning the validity of the calibration, internal standard and quality control sample results, use of manual integrations, and other technical information concerning holding times, sample preservation- integrity and conformance with the method standard operating procedure. Recommendations regarding qualification or rejection of the associated data will be provided.
- An electronic deliverable will be provided with each data package.
- Analytical documentation, such as detailed calibration data, mass spectra, chromatograms, method detection limit studies, performance standards, and other laboratory quality control information will not be included in the deliverables, however, these data will be provided, if requested.

- The contractor will promptly address comments received from the Project Chemist regarding the data package deliverables. A copy of any resulting data package revisions will be promptly provided to the project chemist for compliance review.

11.2 Laboratory Turnaround Time

Unless specified otherwise in the analytical services contract, an unbound copy of each completed laboratory data package, including all required quality control documentation, will be provided to the project chemist within a period of 30 calendar days after the associated samples were received by the performing laboratory.

Accelerated data submittals required within 3 to 21 calendar days can be faxed. Electronic copies of the data results with the associated quality control sample results can also be delivered. The performing laboratory will also concurrently provide information regarding any significant quality control deficiencies related to these sample results.

11.3 Data Archival/Retention Requirements

Sufficient and appropriate controlled-access archiving space will be provided by the contract laboratory to store the data and its associated detailed quality control documentation generated by the laboratory for a period of 36 months after the analysis has been completed.

11.4 Electronic Data Deliverable

The contract laboratory will also provide all project analytical data in an electronic data format. The file structure will comply with the latest version of the ERPIMS format. ERPIMS is the current Air Force system for validation and management of data from environmental sites at all Air Force bases. These data contain analytical chemistry samples, tests, and results as well as hydrogeological information, site/loc11tion descriptions, and monitoring well characteristics. QC data are also required input into the database.

11.5 Review of ERPIMS Diskette Deliverable

Upon receipt of the laboratory diskette deliverable, the diskette will be reviewed by contractor technical personnel. The review will consist of reviewing the format and files to ensure that they also comply with the format. The review will also consist of a review of the diskette contents for completeness; all analytical data has been entered correctly. If problems are encountered in the analytical data, the diskette will be returned to the analytical lab for a correction. After the data base review is completed, the files will be converted into ERPIMS files. Unless otherwise instructed by Vance AFB, the ERPIMS format files will be submitted to the Air Force Center for Environmental Excellence (AFCEE) for addition to the Vance AFB ERPIMS data set.

12.0 DATA ASSESSMENT PROCEDURES

The project chemist shall closely scrutinize field and quality control sample results. Inconsistencies found between these results shall be examined and Federal guidelines employed to judge the validity of the results. Differences in field and quality control results which are greater than five times the sample quantitation limit are noted and reviewed. Duplicate sample result differences that are greater than a factor of two (for aqueous samples) and a factor of five (for soil/sediment samples) are considered to fall outside typical quality control ranges and are reviewed. Differences, which cannot be adequately interpreted by the project chemist, shall be noted and evaluated by the technical team. The data will either be accepted, rejected, or if practical; the sample in question may be reanalyzed.

13.0 Future Modifications to the Compliance Monitoring Program

To simplify the process of modifying the groundwater compliance monitoring going forward with regards to addition or removal of monitoring wells or analytes from the program, a series of criteria will be developed that must be met for either monitoring wells or analytes being dropped from the program. These are the same criteria used in sections used in sections 4.1 and 4.2 to modify the monitoring well network and list of analytes in this current Proposed Permit Mod. This monitoring program modification procedure will be added to the current proposed Permit Mod.

Monitoring Wells

For monitoring wells to be considered for removal from the basewide sampling program they must meet three criteria outlined below.

1. At least three monitoring events with no analytes above their regulatory criteria (MCL/RSL).Monitoring events must be separated by a one year period.
2. Monitoring wells in critical locations such as a well monitoring the downgradient edge of a plume will not be eliminated from the program.
3. Monitoring wells that will be part of the LTM program as part of the site closure process will not be eliminated from the program.

Analytes

The analyte lists will be modified using the following criteria.

1. Any COCs detected above their relative MCL/RSL, during the past three years, would be included in each sites/monitoring wells analyte list.

2. Any non COC detected above its MCL/RSL, during the past three years, would be included in each sites/monitoring wells analyte list.

3. Sites where reductive dechlorination has been implemented, which include Sites ST012, SS024, SS025, SS007, DP005 and FT002, analyte list would include TCE, Cis 1,2 DCE and VC at all wells regardless of whether there have been detections above MCLs within the last three years.

If a monitoring well or analyte meets the outlined criteria, a recommendation will be made in the Annual Groundwater Monitoring Report to drop or add a monitoring well or analyte. The recommendation will be supported by data supporting the recommendation. Upon concurrence, by ODEQ, that the recommendation is acceptable, a letter will be sent to ODEQ that includes the updated groundwater compliance monitoring well list for the next year's groundwater compliance sampling.

ATTACHMENT 1

ANALYTICAL METHODS AND CONSTITUENT/REPORTING LIMITS

VOLATILE ORGANIC ANALYSES BY GCMS – LIQUID AND SOLID BY METHOD SW 846 8260B		
Parameter	**Reporting Limit**	
Total Volatile Organics	**Liquid (µg/L)**	**Solid (µg/kg)**
~~Acetone~~	~~20~~	~~50~~
Benzene	1	5
~~Bromodichloromethane~~	~~1~~	~~5~~
~~Bromoform~~	~~1~~	~~5~~
~~Bromomethane (Methyl Bromide)~~	~~1~~	~~5~~
Carbon Tetrachloride	1	5
~~Chlorobenzene~~	~~1~~	~~5~~
~~Chloroethane~~	~~1~~	~~5~~
~~2-Chloroethylvinyl Ether~~	~~5~~	~~5~~
Chloroform	1	5
~~Chloromethane (Methyl Chloride)~~	~~1~~	~~5~~
~~Dibromochloromethane~~	~~1~~	~~5~~
~~1,2-Dichlorobenzene~~	~~1~~	~~5~~
~~1,3-Dichlorobenzene~~	~~1~~	~~5~~
~~1,4-Dichlorobenzene~~	~~1~~	~~5~~
1,1-Dichloroethane	1	5
~~1,2-Dichloroethane~~	~~1~~	~~5~~
1,1-Dichloroethene	1	5
~~cis-1,2-Dichloropropene~~	~~1~~	~~5~~
trans-1,2-Dichloroethene	1	5
~~1,2-Dlchloropropane~~	~~1~~	~~5~~
cis-1,2 - Dichloroethene	1	5
~~cis-1,3-Dichloropropene~~	~~1~~	~~5~~
~~trans-1,3-Dlchloropropene~~	~~1~~	~~5~~
Ethyl Benzene	1	5
Methylene Chloride	10	10
~~Methyl Ethyl Ketone (MEK)~~	~~10~~	~~10~~
~~4-Methyl-2-pentenone (MIBK)~~	~~10~~	~~10~~
1,1,2,2-Tetrachloroethane	1	5
Tetrachloroethene	1	5
Toluene	1	5
1,1,1-Trichloroethane	1	5
1,1,2-Trichloroethane	1	,5
Trichloroethene	1	5
~~Trichlorfluoromethane~~	~~1~~	~~5~~
Vinyl Chloride	2	5
o-Xylenes	1	5
m&p-Xylenes	1	5

SEMIVOLATILE ANALYSES BY GCMS – LIQUID AND SOLID BY METHOD SW-846 8270C		
Parameter	**Reporting Limit**	
Semivolatile Organics	**Liquid (µg/L)**	**Solid (µg/kg)**
Acenaphthene	10	330
Acenaphthylene	10	330
Anthracene	10	330
Benz(a)anthracene	10	330
Benzo(b)fluoranthene	10	330
Benzo(k)fluoranthene	10	330
Benzo(g,h,i)perylene	10	330
Benzo(a)pyrene	10	330
Benzyl alcohol	20	330
Bis(2-chloroethyl)ether	10	330
Bis(2-chloroethoxy)methane	10	330
Bis(2-chloroisopropyl)ether	10	330
Bis(2-ethylhexyl)phthalate	10	670
4-Bromophenyl Phenyl Ether	10	670
Butyl benzyl phthalate	10	330
Carbazole	10	330
4-Chloraniline	20	330
4-Chloro-3-methylphenol	20	330
2-Chloronaphtlialene	10	330
2-Chlorophenol	10	330
4-Chlorophenyl Phenyl Ether	10	330
Chrysene	10	330
Dibenz(a,h)anthracene	10	330
Dibenzofuran	10	330
Di-n-butyl Phthalate	10	670
1,2-Dichlorobenzene	10	330
1,3-Dichlorobenzene	10	330
1,4-Dichlorobenzene	10	330
3,3'-Dichlorobenzidlne	20	330
2,4-Dichlorophenol	10	1700
Diethylphthalate	10	1700
2,4-Dimethyl Phenol	10	330
Dimethylphthalate	10	330
4,6-Dlnitro-2-methyl phenol	50	330
2,4-Dinitrophenol	50	330
2,4-Dinitrotoluene	10	330
2,6-Dinitrotoluene	10	330
Di-n-octyl phthalate	10	330

SEMIVOLATILE ANALYSES BY GCMS – LIQUID AND SOLID BY METHOD SW-846 8270C		
Parameter	**Reporting Limit**	
Semivolatile Organics	**Liquid (µg/L)**	**Solid (µg/kg)**
Fluoranthene	10	330
Fluorene	10	330
Hexachlorobenzene	10	330
Hexachlorobutadiene	10	330
Hexachlorocyclopentadiene	10	330
Hexachloroethane	10	330
Indeno(1,2,3-cd)pyrene	10	330
Isophorone	10	330
2-Methylnaphthalene	10	330
2-Methylphenol	50	1700
3-Methylphenol	50	1700
4-Methylphenol	50	1700
Naphthalene	10	330
2-Nitroaniline	10	330
3-Nitroaniline	50	1700
4-Nitroanlline	10	330
Nitrobenzene	10	330
2-Nitrophenol	50	1700
4-Nilrophenol	10	330
N-Nltrosodiphenylamine	10	330
N-Nitroso-di-n-propylamine	10	330
Pentachlorophenol	10	330
Phenanthrene	10	330
Phenol	10	330
Pyrene	10	330
Pyridine	10	330
1,2,4-Trichlorobenzene	10	330
2,4.5-Trichlorophenol	10	330
2,4,6-Trichlorophenol	10	330

TOTAL PETROLEUM HYDROCARBONS BY GC - LIQUID AND SOLID BY METHOD SW-846 801SM		
Parameter	**Reporting Limit**	
Total petroleum hydrocarbons	**Liquid (mg/L)**	**Solid (mg/kg)**
Gasoline range organics	0.1	1
Diesel range organics	1.0	10

METALLIC (TOTAL) PARAMETERS BY GFAA FURNACE OR ICAP – LIQUID AND SOLID			
Parameter	**Method**	**Reporting Limit**	
Total Metals	**SW-846 7000A, 60108 (ICP) or 6020**	**Liquid (µg/L)**	**Solid (mg/kg)**
Arsenic	SW-846 60108, 6020 or 7060A,	5	1
~~Barium~~	~~SW-846 60108~~	~~100~~	~~10~~
~~Cadmium~~	~~SW-846 60108~~	~~5~~	~~1~~
~~Chromium~~	~~SW-846 60108~~	~~10~~	~~1~~
Lead	SW-846 7421	5	1
~~Mercury~~	~~SW-846 7470A~~	~~0.20~~	~~0.5~~
Selenium	SW-846 7740	5	1
~~Silver~~	~~SW-846 60108~~	~~10~~	~~1~~

~~PESTICIDES -LIQUID BY METHOD SW-846 8081A[1]~~	
~~**Parameter**~~	~~**Reporting Limit**~~
~~**Pesticides**~~	~~**Liquid (µg/L)**~~
~~Aldrin~~	~~0.050~~
~~alpha-BHC~~	~~0.050~~
~~beta-BHC~~	~~0.050~~
~~delta-BHC~~	~~0.050~~
~~gamma-BHC (Lindane)~~	~~0.050~~
~~alpha-Chlordane~~	~~0.050~~
~~gamma-Chlordane~~	~~0.050~~
~~Dieldrin~~	~~0.10~~
~~4,4'-DDE~~	~~0.10~~
~~4,4'-DDT~~	~~0.10~~
~~Endrin~~	~~0.10~~
~~Endosulfan sulfate~~	~~0.10~~
~~Endrin aldehyde~~	~~0.10~~
~~Endrin ketone~~	~~0.10~~
~~Endosulfan-1~~	~~0.10~~
~~Endosulfan-11~~	~~0.10~~
~~Heptachlor~~	~~0.050~~
~~Heptachlor epoxide~~	~~0.050~~
~~Methoxychlor~~	~~0.50~~
~~Toxaphene~~	~~0.50~~

Notes:
[1] Tables presented this SAP update correspond with the changes proposed in the July 2018 RCRA Permit Modification.

ATTACHMENT 5

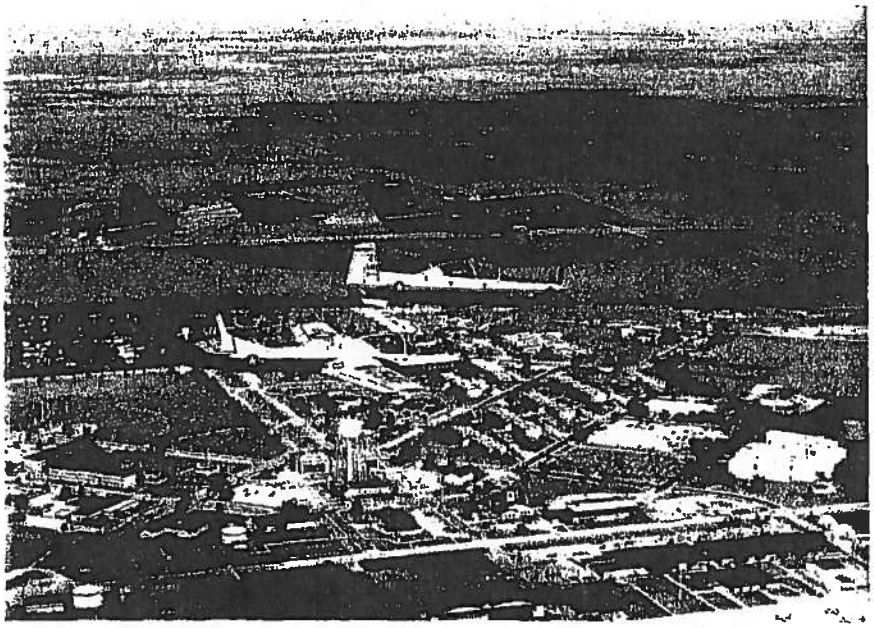
POST-CLOSURE PLAN FOR SITE 8

U.S. AIR FORCE ENVIRONMENTAL RESTORATION PROGRAM

VANCE AIR FORCE BASE, OKLAHOMA

POST-CLOSURE PLAN

IRP Site ST-08



February, 2006

Updated March 2018

Prepared by: 71LRS/CEVR

U.S. AIR FORCE ENVIRONMENTAL RESTORATIONPROGRAM

VANCE AIR FORCE BASE, OKLAHOMA

POST-CLOSURE PLAN
IRP Site ST008

February 2006

Updated July 2018

~~**Prepared by: 71LRS/CEVR**~~

TABLE OF CONTENTS

ACRONYMS

AFB	Air Force Base
BGL	Below Ground Level
CFR	Code of Federal Regulation
CGTF	Central Groundwater Treatment Facility
DEQ	Oklahoma Department of Environmental Quality
DOD	Department of Defense
IRP	Installation Restoration Program
LF	Landfill
RCRA	Resource Conservation and Recovery Act
SAP	Sampling and Analysis Plan
SS	Spill Site
ST	Storage Tank
USAF	United States Air Force
UST	Underground Storage Tank

LIST OF FIGURES

1.0 INTRODUCTION

Vance Air Force Base (AFB) has submitted this Post-Closure Plan in accordance with 40 Code of Federal Regulations (CFR) Part 264.118. It is also intended to fulfill the requirements of the Part B Post-Closure Permit Application for the renewal of the existing permit issued on August 6, 1996 by Oklahoma Department of Environmental Quality (DEQ). Regulations for the Part B Post-Closure Permit include but are not limited to applicable sections of 40 CFR 264, Standards for Owners and Operators of Hazardous Waste Treatment Storage and Disposal, Subpart G, Closure and Post-Closure, 40 CFR 270, Hazardous Waste Permit Program, Subpart B, Permit application, and all Oklahoma Department of Environmental Quality (DEQ) Land Protection Division rules and regulations as applicable.

1.1 SITE LOCATION, DESCRIPTION, AND HISTORY

Vance AFB lies in north central Oklahoma, in Garfield County, about 5 miles southwest of downtown Enid, Oklahoma. Figure 1-1 provides a location map. The base covers approximately 2,122 acres and is surrounded by privately owned farming lands. The majority of Vance AFB is dedicated to aircraft runways and taxiways that cover approximately 1,100 acres. Base living quarters for Air Force personnel and their dependents are located on the far northeastern side of the base in the military family housing area. In addition to the facilities at Vance AFB, a remote facility known as Kegelman Auxiliary Field (KAux) is used for "touch-and-go" landings. KAux is located 30 miles north-northwest of Vance AFB in Alfalfa County, Oklahoma. Figure 1-1 shows the location of Vance AFB and KAux.

Site ST008 consists of the former underground storage tanks (USTs) at Building 110. The site is located in the northern area of Vance AFB, due south of Site SS007, west of Elam Road, and east of the flightline. Figure 1-2 is a Site ST008 location map.

Site ST008 had five USTs that were removed in March 1989. The individual tanks were designated as UST No. 106, UST No. 108, UST No. 109, UST No. 112, and UST No. 113. UST No. 106 was the farthest west in the series of tanks. Each tank had a capacity of 12,000 gallons and was constructed of steel. From 1941 to 1970, USTs Nos. 108 and 109 stored lubricating oil, UST No. 112 stored diesel fuel, UST No. 113 stored kerosene, and UST No. 106 stored oil. These USTs were located southeast of Building 116 (Building 110 has been demolished) at the northeast comer of the flightline apron.

From 1970 to 1980, UST No. 106 stored a variety of solvents, contaminated fuels, and waste oils. UST No. 106 was removed in 1989; however, contaminants in the soil were left in place during closure and the area was covered with a Resource Conservation and Recovery Act (RCRA) concrete cap. The RCRA Closure Plan was approved in 1990. A summary of that plan is provided in the following paragraphs.

1.2 RCRA CLOSURE PLAN

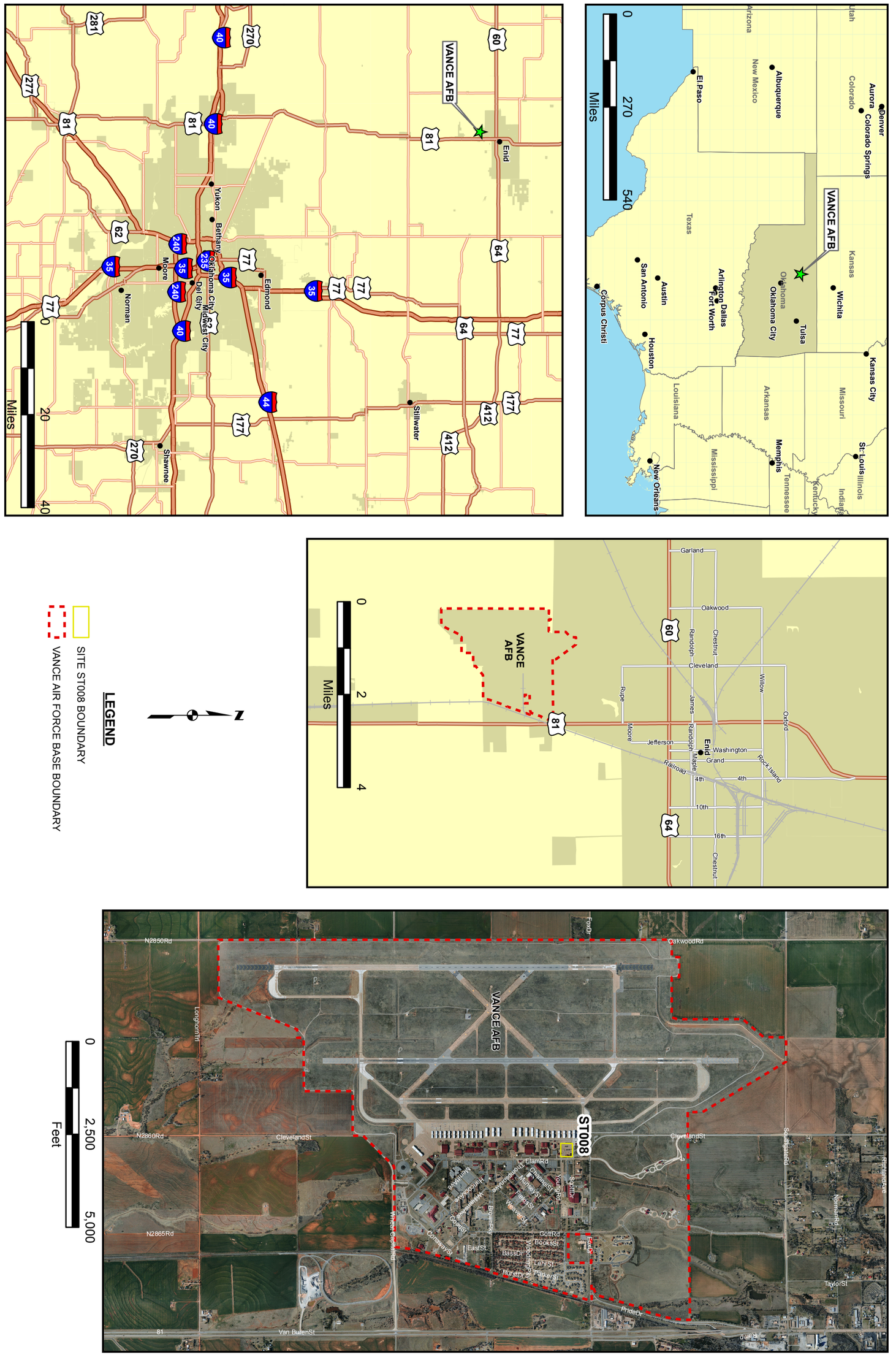
The RCRA Closure Plan, dated April, 1990, presented the results of extensive soil and groundwater sampling conducted at the site, an evaluation of the nature and extent of contamination and presented "clean" and "landfill" closure plans. The "landfill" closure plan was chosen since the site could not be "clean closed". After the removal of the tank and one foot of topsoil, the subgrade was compacted and covered with a compacted aggregate base layer. The top layer of the final landfill cap system consisted of a minimum of 10 inches of reinforced concrete. The final concrete cap was approximately one hundred feet by eighty feet and has a three percent slope to a concrete curb system located along the cap and soil interface. Figure 1-3 is a site plan of conditions prior to closure. Figure 1-4 is a topographic map. Figure 1-5 is a landfill closure cap plan and Figure 1-6 is a concrete cap section. Closure certification of IRP Site ST008 was accepted by Oklahoma State Department of Health Hazardous Waste Management Services in a letter dated April 13, 1993. The approved closure plan, modifications, and all correspondence are available for review in the Information Repository at the Enid Public Library.

A RCRA Post-Closure Plan, dated November, 1990 was the regulatory mechanism for post-closure activities until the RCRA Post-Closure Care Permit was issued to Vance AFB on August 8, 1996. The Permit incorporated both the Closure and Post-Closure Plans. The Permit identified groundwater and soil contamination associated with releases from former USTs near Building 110. As a result, the Permit required corrective action and monitoring of specified monitoring wells at Site ST008 on a semiannual basis, as set forth in Permit Conditions IV.C.2 and IV.C.3.

Site ST008 is one of five sites known as the Industrial Zone. Even though only Site ST008 is the subject of this post-closure plan, information from the other sites is included because they are all part of one operable unit. Site~~s ST-11 and~~ ST-13 ~~are~~ is a petroleum site~~s~~ and ~~are~~ is considered closed. There is no ongoing activity at these two sites.

Corrective action occurred in 1996 when Site ST008 and SS007 were connected to the newly constructed Central Groundwater Treatment Facility (CGTF). In September, 1997 a final work plan for the construction of an interim remedial action was submitted to Oklahoma DEQ for approval. Upon approval, construction of an interceptor collection trench took place in November, 1997. Further corrective action took place when a final work plan for an interim remedial action at North Site SS007, dated November 16, 2001 was approved by DEQ. Another interceptor collection trench was constructed in January 2002. The two trenches collect contaminated groundwater, which is transported via a gathering system to the CGTF. A site map is shown on Figure 2-1. In March, 2003 the monitoring well network for the Industrial Zone was expanded in a permit modification. A list of wells in the monitoring well network is shown in Figure 2-5. Final remedial action for the Industrial Zone took place when a final work plan, dated Feb. 2003, was approved by DEQ for the installation of a free product recovery system and a phytoremediation system at Site LF003. Construction was completed in May, 2004.

Additional remediation was initiated in 2017 to address the residual soil contamination as well as residual contamination in the shallow transmissive zone at ST008 (AECOM 2015). The remediation will consist of the installation and operation of a dual phase extraction system in the vicinity of the old tank pit. A new site was discovered immediately upgradient of Site



VANCE AFB

VANCE AIR FORCE BASE, OKLAHOMA
Project No.: 60273629 Date: 03/2018

VANCE AIR FORCE BASE AND SITE ST008 LOCATION MAP
POST-CLOSURE PLAN

AECOM

Figure: 1-1

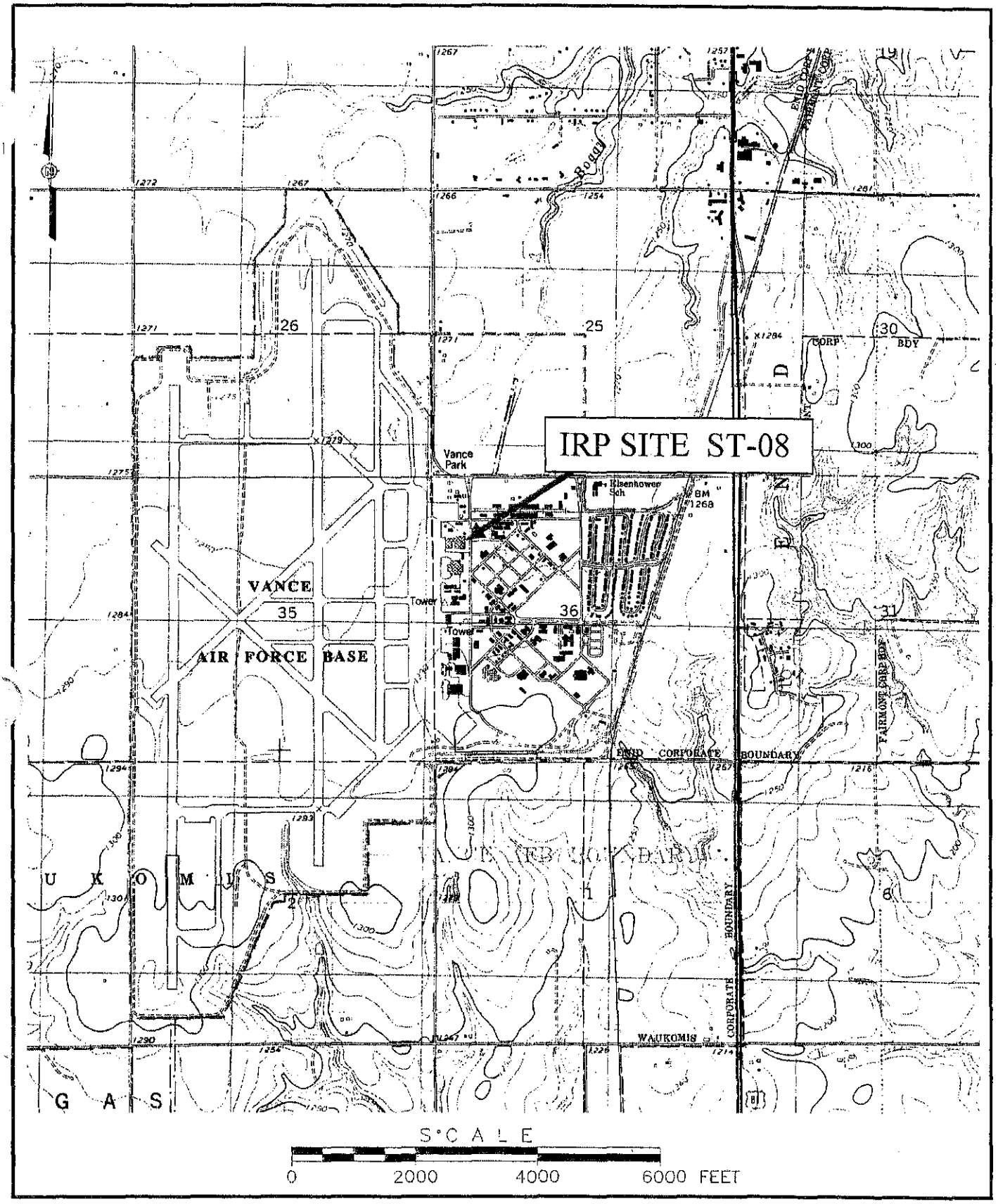
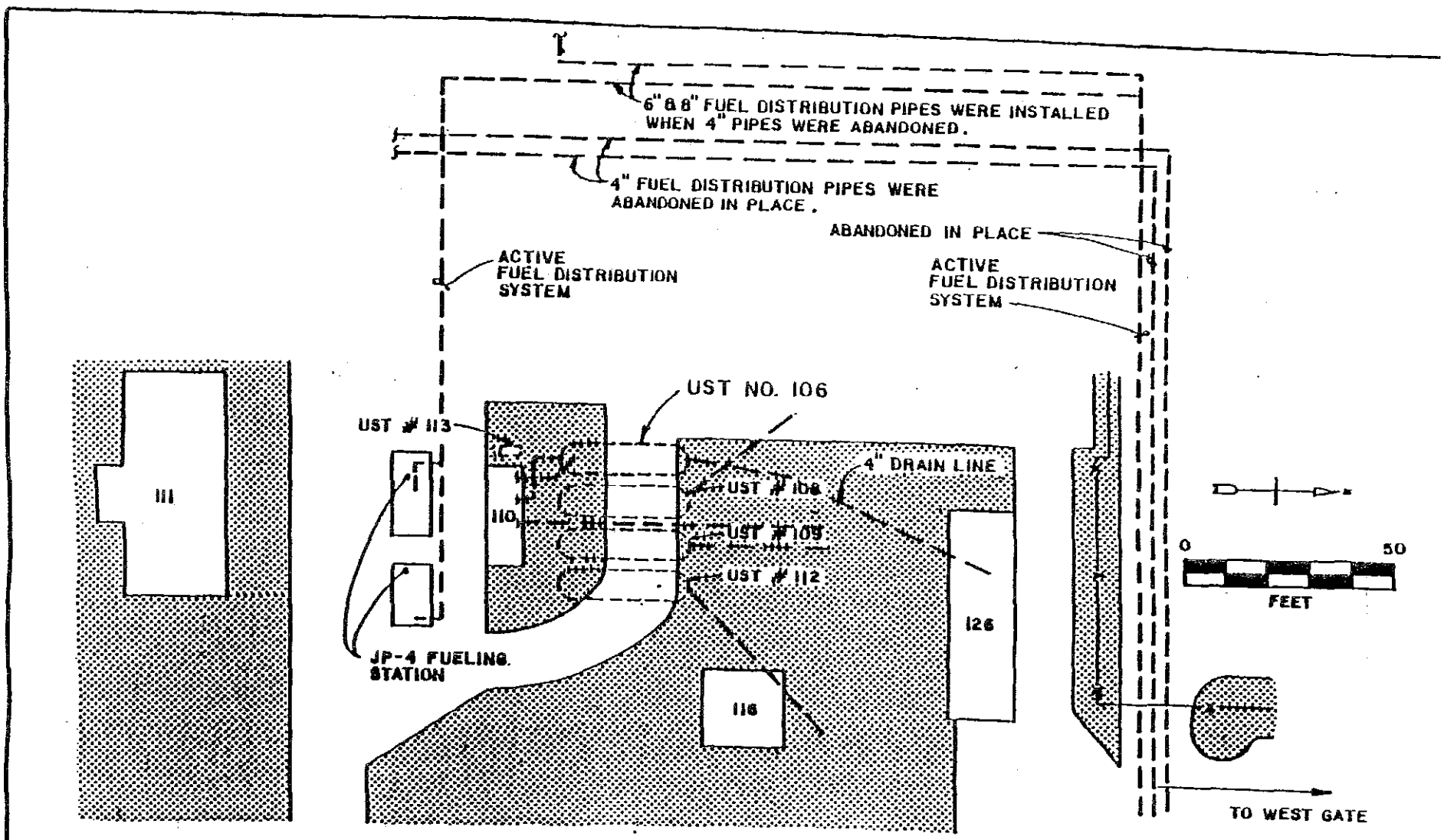


Figure 1-2 IRP Site 8 Location Map



LEGEND:

UST UNDERGROUND STORAGE TANK

UNPAVED AREAS, REMAINDER OF AREA IS PAVED.

SOURCE: NUS, 1988b; VAFB 43a & b; VAFB, 1989e; & TULSA COE, 1990e.

NOTES:

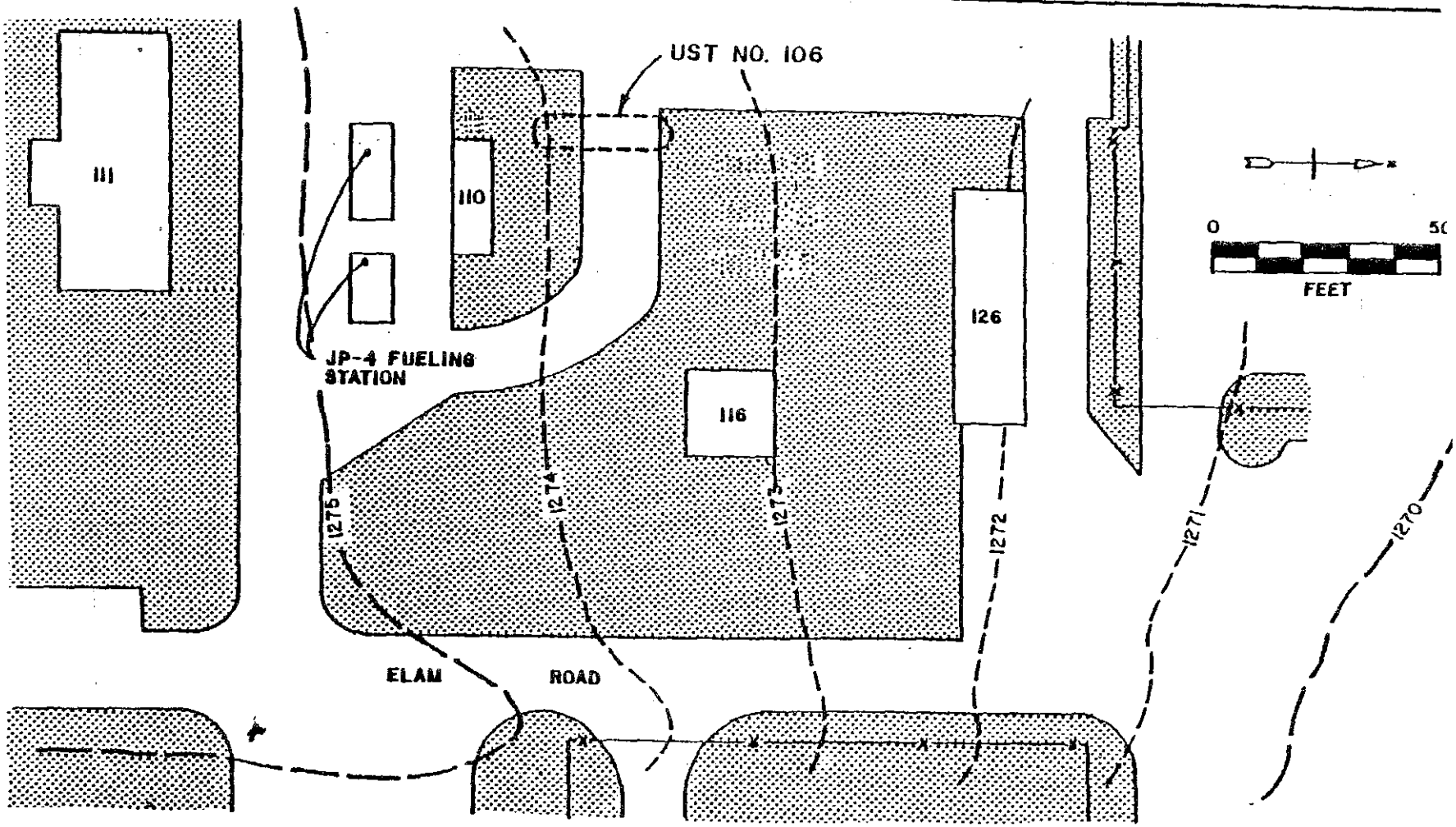
- UST'S 106, 108, 109, 112 AND 113 WERE REMOVED AND THEIR RESPECTIVE PIPING SYSTEMS WERE ABANDONED IN PLACE DURING PARTIAL CLOSURE ACTIVITIES COMPLETED MARCH 1989.
- PIPING SYSTEMS ABANDONED IN PLACE BETWEEN UST's 108, 109, 112, AND 113 ARE NOT ILLUSTRATED.

IRP SITE NO. 8

SITE PLAN

UST NO. 106
POST-CLOSURE PLAN
VANCE AFB, OK

FIGURE
1-3



LEGEND:

- UST — UNDERGROUND STORAGE TANK
- UNPAVED AREAS. REMAINDER OF AREA IS PAVED
- 1275 — APPROX. LAND SURFACE ELEVATION ABOVE MSL

NOTE:

INTERMEDIATE CONTOURS HAVE BEEN INTERPOLATED FROM 1275 AND 1270.

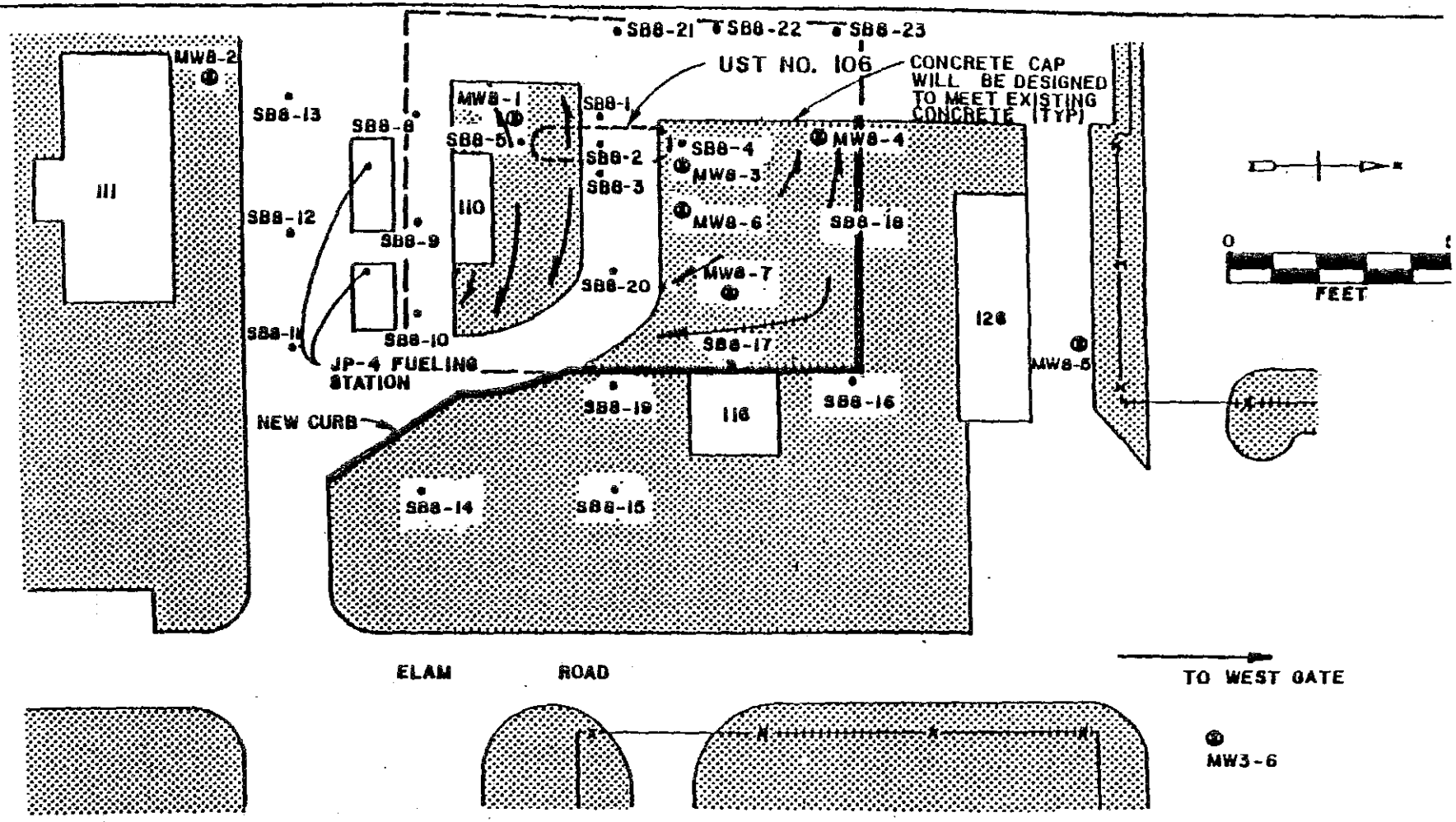
UST NO. 106 WAS THE ONLY HAZARDOUS WASTE MANAGEMENT UNIT AT IRP SITE NO. 8.

SOURCE: VAFB, 1989b

IRP SITE NO. 8
TOPOGRAPHIC MAP

UST NO. 106
POST-CLOSURE PLAN
VANCE AFB, OK

FIGURE
1 - 4



LEGEND:

UST	UNDERGROUND STORAGE TANK
•	SOIL SAMPLING LOCATION
⊕	GROUND WATER MONITORING WELL LOCATION
	UNPAVED AREAS, REMAINDER OF AREA IS PAVED
→	DIRECTION OF RUN-OFF
— —	LIMITS OF CLOSURE

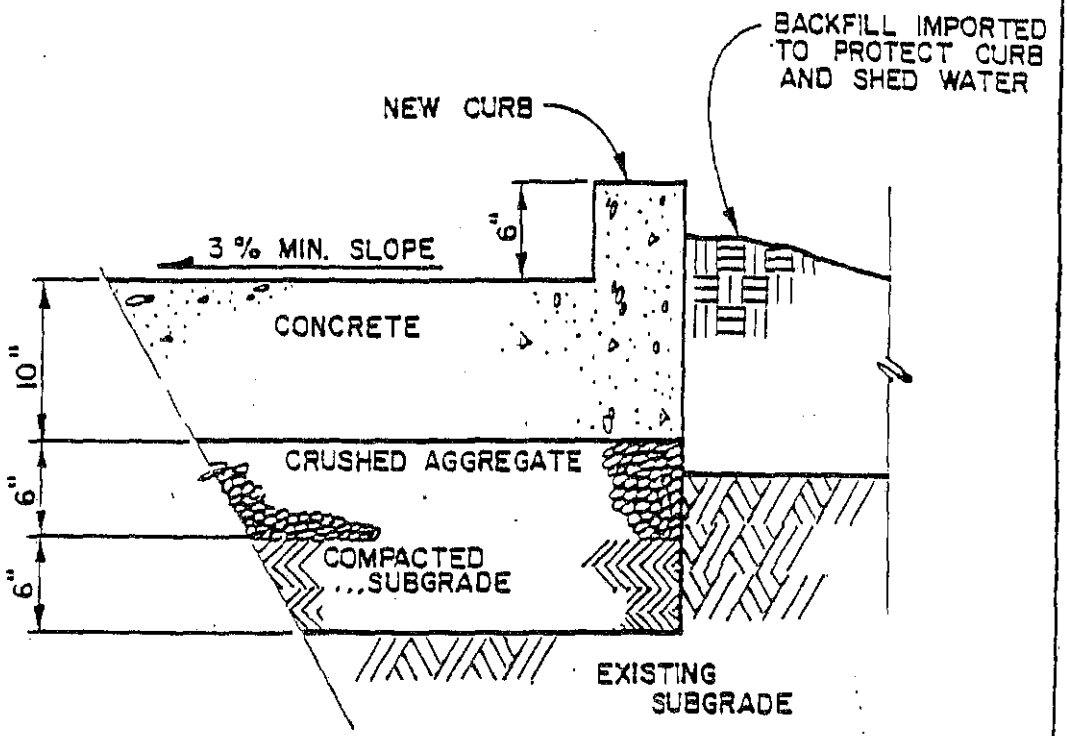
NOTES:

1. CONCRETE CAP DESIGN WILL INTEGRATE NEW CONCRETE WITH EXISTING CONCRETE AND DIVERT RUN-OFF AS SHOWN.
2. THE LIMITS OF LANDFILL CLOSURE CAPPING WILL CORRESPOND WITH THE UNPAVED AREAS WITHIN THE LIMITS OF FINAL CLOSURE ACTIVITIES.

IRP SITE NO. 8 LANDFILL CLOSURE CAP PLAN

UST NO. 106
POST-CLOSURE PLAN
VANCE AFB, OK

FIGURE 1-5



CONCRETE CAP SECTION

NOTE: DESIGN MEETS USAF PAVEMENT SPECIFICATIONS.

IRP SITE NO. 8 LANDFILL CLOSURE CAP SECTION	
UST NO. 106 POST-CLOSURE PLAN VANCE AFB, OK	FIGURE 1-6

ST008. The Site has been designated as Site SS028 and monitoring well MW08-18 has been reassigned to this site.

1.3 SCOPE OF POST-CLOSURE PLAN.

The scope of appropriate post-closure activities described within this Post-Closure Plan has been developed to satisfy the specific requirements of 40 CFR 264. 117 through 264.120.

This Post-Closure Plan consists of the following sections:

Section 2	Groundwater Monitoring
Section 3	Inspection and Maintenance Activities
Section 4	Post-Closure Care Implementation and Duration
Section 5	Post-Closure Care Documentation and Certification
Section 6	References

2 GROUNDWATER MONITORING

The groundwater monitoring activities discussed in this section provide a description of the following items:

Existing conditions at Site ST008
Monitoring well network
Evaluation procedures and frequency for groundwater sampling
Types of laboratory analyses

2.1 EXISTING CONDITIONS

Groundwater occurs at Site ST008 from six to twelve feet below land surface and flows to the north-northeast. A geologic cross section is shown in Figure 2-2. A potentiometric surface map is shown in Figure 2-3. The CGTF had been operating only 8 hours a day until June 2004, when it began operations 24 hours per day/7 days per week. The increasing distance between the potentiometric contours upgradient of the two interceptor collection trenches located on Site SS007 suggests that the shallow transmissive zone is shifting to a new equilibrium state with a broader capture zone and flatter gradients. The hydraulic gradient was last calculated to be 0.005 ft./ft. for the shallow transmissive zone in September 2003. The average hydraulic conductivity is estimated to be 6.75 x 10-4 cm/sec for the shallow transmissive zone. The groundwater flow velocity in the shallow zone had an average rate of 17.5 ft/yr. A photograph of the site is shown on Figure 2-4.

2.2 MONITORING WELL NETWORK

The compliance monitoring well network for Site ST008 ~~and the other sites in the Industrial Zone~~ consists of ~~five~~ two monitoring wells~~. Four of the monitoring wells are~~ screened in the shallow transmissive zone (10 to 30 feet below ground level (bgl)). ~~and one is screened in the intermediate transmissive zone (35 to 50 feet bgl).~~

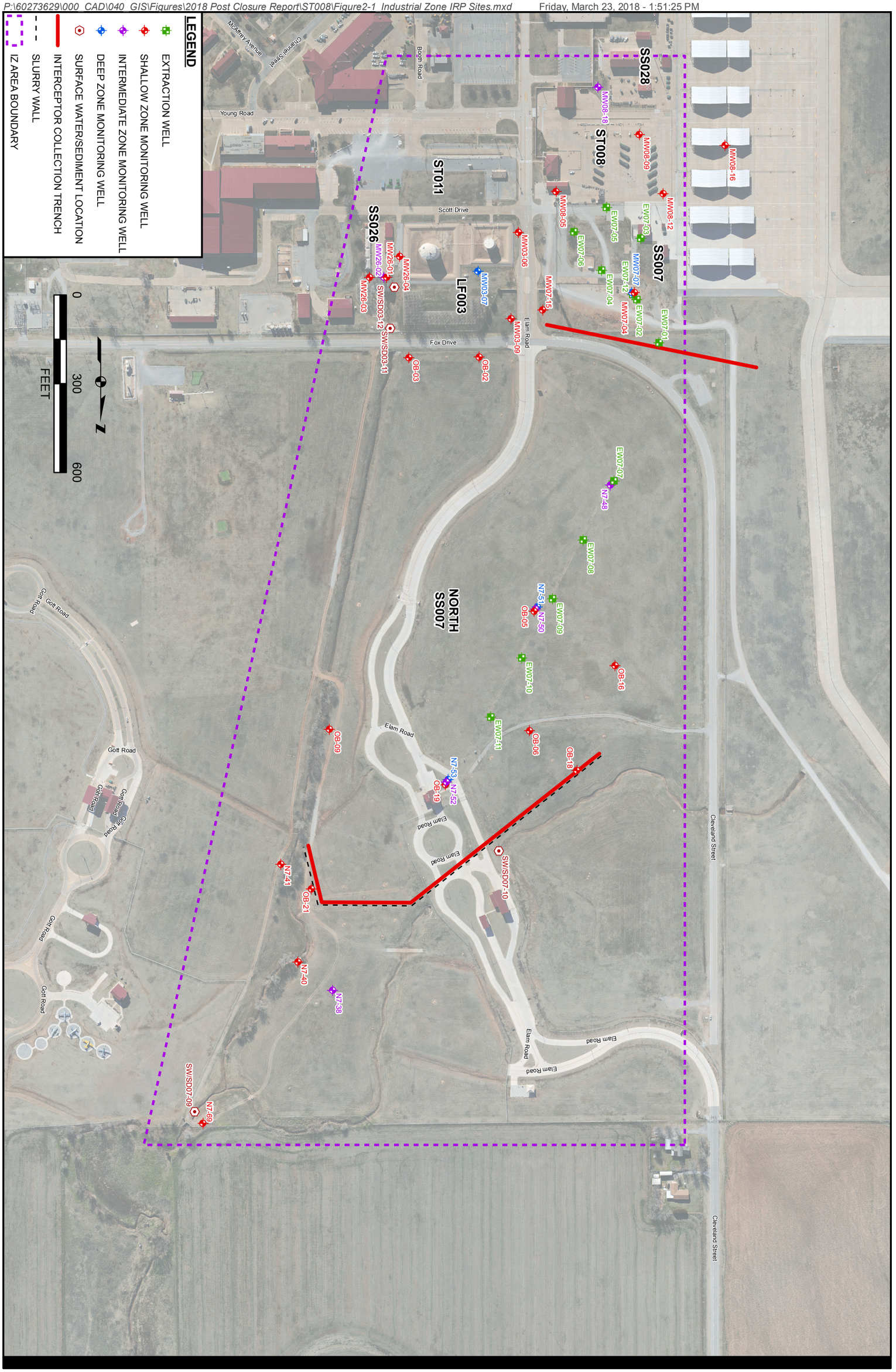
2.3 EVALUATION PROCEDURES

All compliance well~~s, surface water and sediment~~ samples at Site ST008 are taken annually. During each event, wells are purged and sampled in accordance with the Sampling and Analysis Plan (Attachment 4 of this Permit).

2.4 TYPES OF LABORATORY ANALYSIS

Groundwater~~, surface water and sediment~~ are sampled for volatile organic compounds and RCRA metals ~~in the industrial zone~~. Methods and procedures are outlined in detail in the SAP provided in Attachment A to the 2018~~06~~ Level 2 Permit Modification ~~Renewal Application~~.

P:\60273629\000_CAD\040_GIS\Figures\2018 Post Closure Report\ST008\Figure2-1_Industrial Zone IRP Sites.mxd Friday, March 23, 2018 - 1:51:25 PM



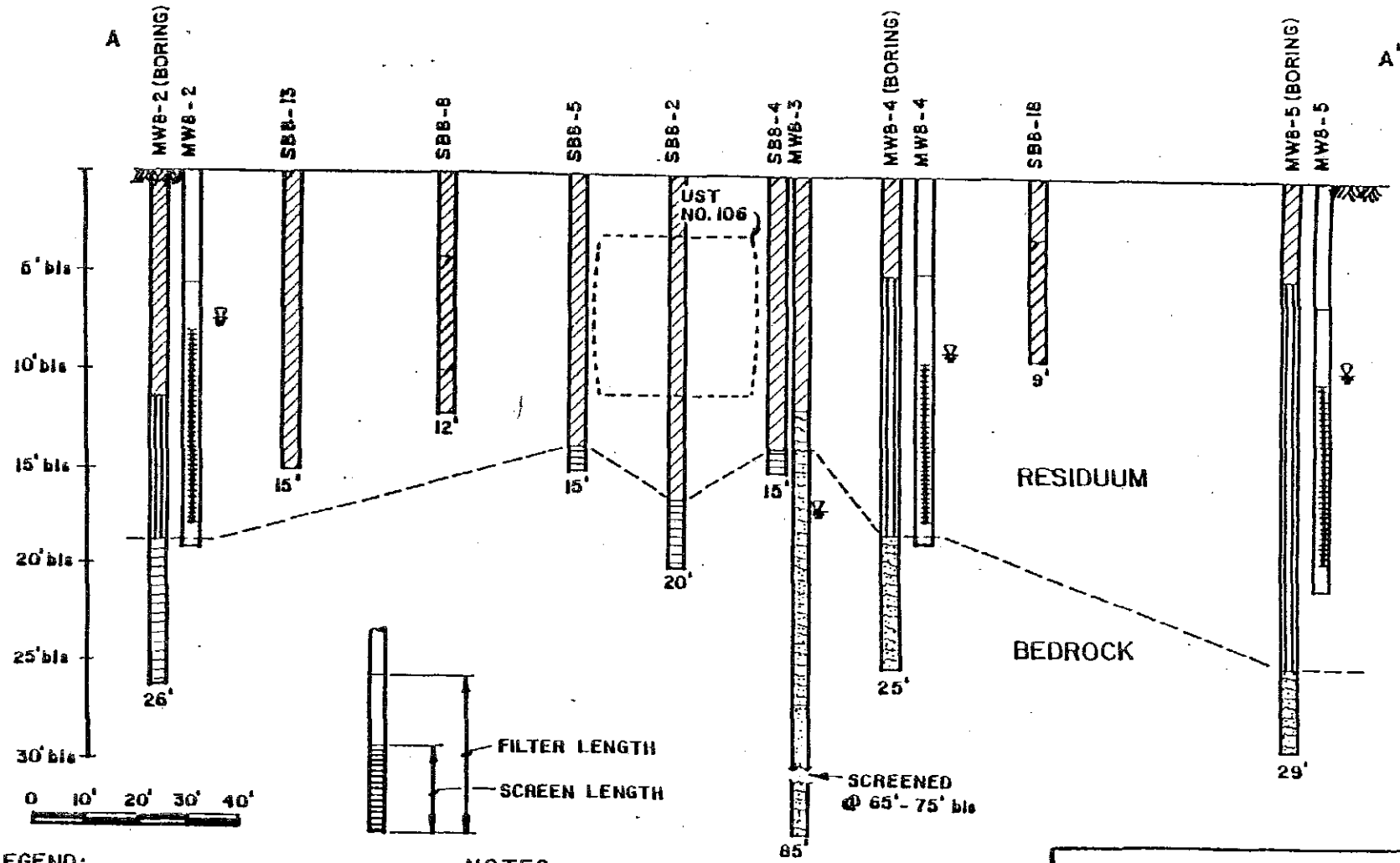
VANCE AFB

VANCE AIR FORCE BASE, OKLAHOMA
Project No.: 60273629 Date: 03/2018

INDUSTRIAL ZONE IRP SITES
POST-CLOSURE PLAN

AECOM

Figure: 2-1



LEGEND:

- WATER TABLE ON AUG. 23, 1990
- SCREENED INTERVAL
- SILTY CLAY
- CLAYEY SILT
- SHALE
- CLAY
- SILTSTONE
- SANDSTONE

NOTES:

SEE FIGURE 2-1 FOR PLAN VIEW OF SECTION A-A', SOIL BORING AND MONITORING WELL LOCATIONS.

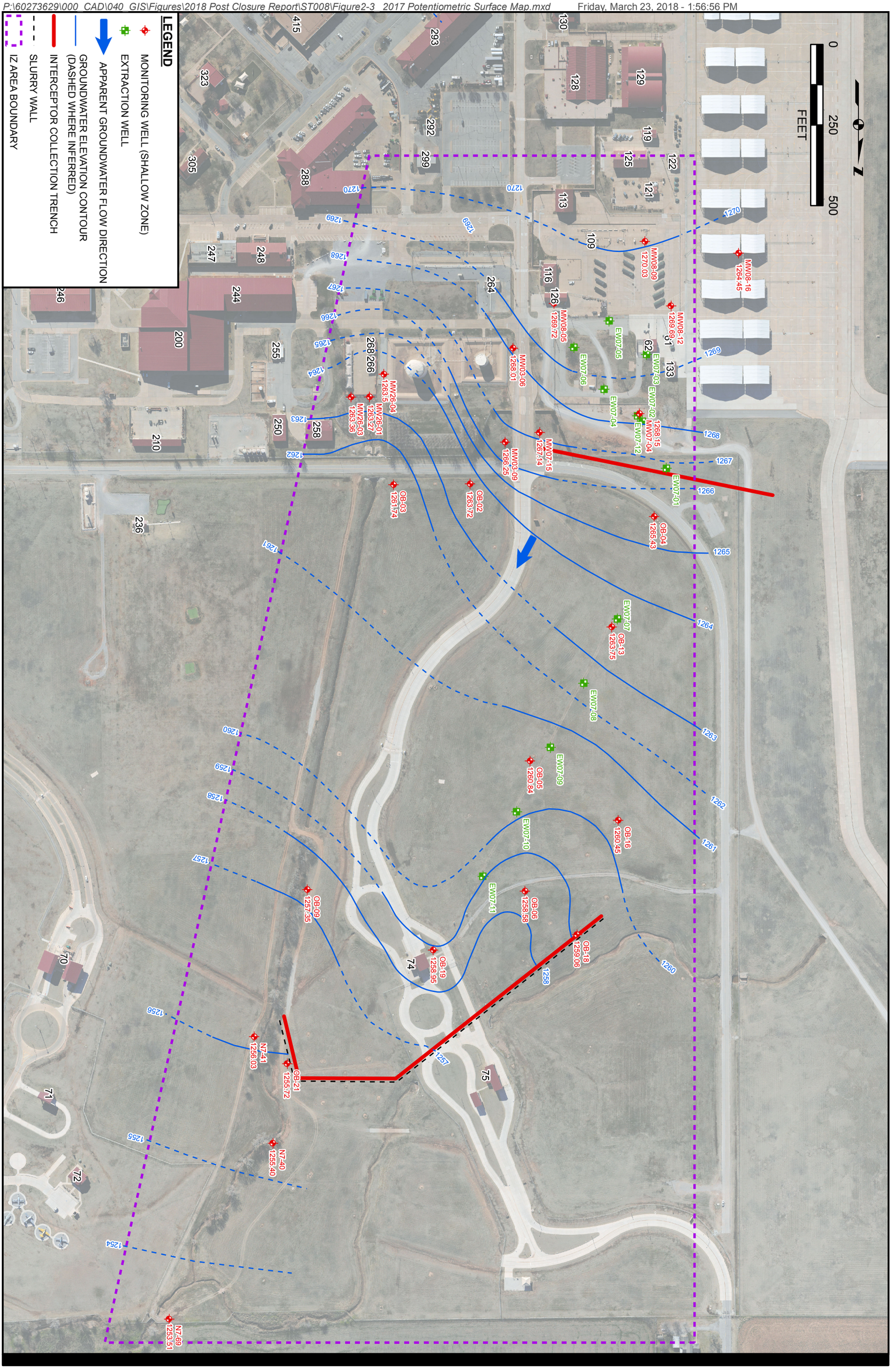
SITE GEOLOGY BASED ON TULSA COE FIELD INVESTIGATION ACTIVITIES.

IRP SITE NO. 8 GEOLOGIC CROSS SECTION A-A'

UST NO. 106
POST-CLOSURE PLAN
VANCE AFB, OK

FIGURE 2-2

P:\60273629\000_CAD\040_GIS\Figures\2018 Post Closure Report\ST008\Figure2-3_2017 Potentiometric Surface Map.mxd Friday, March 23, 2018 - 1:56:56 PM



VANCE AFB

VANCE AIR FORCE BASE, OKLAHOMA
Project No.: 60273629 Date: 03/2018

2017 POTENTIOMETRIC SURFACE MAP
POST-CLOSURE PLAN

AECOM

Figure: 2-3

FIGURE 2-4

IRP SITE ST-08

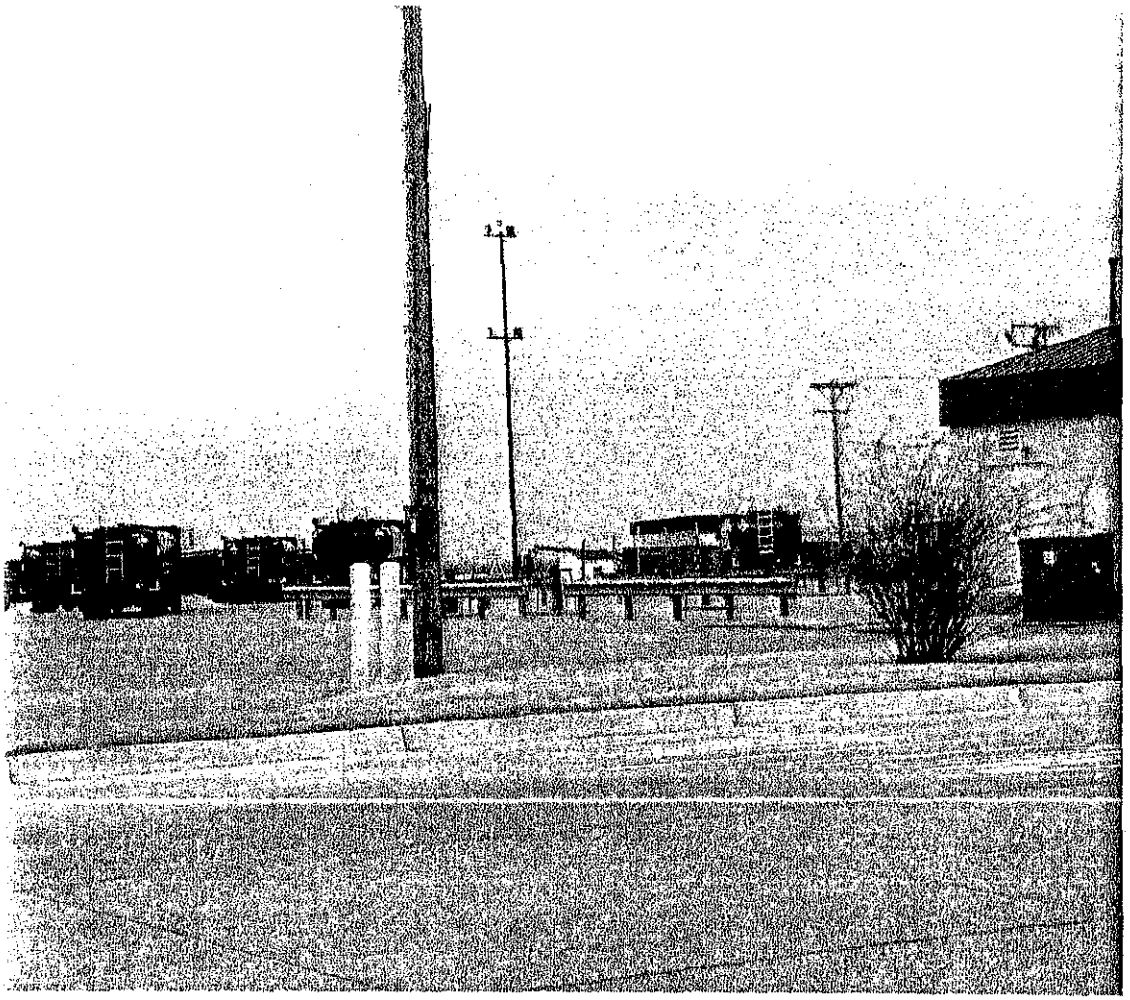


FIGURE 2-5
COMPLIANCE MONITORING WELL NETWORK
INDUSTRIAL ZONE

The following monitoring wells are sampled as shown:

Well ID	Well Type	Monitoring Frequency
~~**Site LF003**~~		
~~3-6~~	~~Shallow~~	~~Annual~~
~~3-7~~	~~Deep~~	~~Annual~~
~~3-9~~	~~Shallow~~	~~SemiannualAnnual~~
~~OB-2~~	~~Shallow~~	~~SemiannualAnnual~~
~~7-15~~	~~Shallow~~	~~Annual~~
~~**Site SS007 (including North Site SS007)**~~		
~~7-4~~	~~Shallow~~	~~Annual~~
~~7-7~~	~~Deep~~	~~Annual~~
~~OB-2~~	~~Shallow~~	~~Semiannual~~
~~OB-3~~	~~Shallow~~	~~Semiannual~~
~~OB-4~~	~~Shallow~~	~~SemiannualAnnual~~
~~OB-5~~	~~Shallow~~	~~Annual~~
~~OB-6~~	~~Shallow~~	~~Annual~~
~~OB-9~~	~~Shallow~~	~~Semiannual~~
~~OB-13~~	~~Shallow~~	~~Annual~~
~~OB-16~~	~~Shallow~~	~~Annual~~
~~OB-18~~	~~Shallow~~	~~Semiannual~~
~~OB-19~~	~~Shallow~~	~~Annual~~
~~OB-21~~	~~Shallow~~	~~SemiannualAnnual~~
~~N7-38~~	~~Intermediate~~	~~SemiannualAnnual~~
~~N7-40~~	~~Shallow~~	~~Semiannual~~
~~N7-41~~	~~Shallow~~	~~SemiannualAnnual~~
~~N7-48~~	~~Intermediate~~	~~Annual~~
~~N7-50~~	~~Intermediate~~	~~Annual~~
~~N7-51~~	~~Deep~~	~~Annual~~
~~N7-52~~	~~Intermediate~~	~~SemiannualAnnual~~
~~N7-53~~	~~Deep~~	~~Semiannual~~
~~N7-69~~	~~Shallow~~	~~Semiannual~~
Site ST008		
8-5	Shallow	Annual
8-9	Shallow	Annual
~~8-12~~	~~Shallow~~	~~Annual~~
~~8-16~~	~~Shallow~~	~~Annual~~
~~8-18~~	~~Intermediate~~	~~Annual~~

Wells sampled for Benzene, TCE, Cis 1,2 DCE, VC and Naphthalene ~~volatile organic compounds and metals~~ in accordance with the Sampling and Analysis Plan.

~~In addition to the above listed wells, four surface water and sediment locations will be sampled for volatile organic compounds and metals in accordance with the Sampling and Analysis Plan.~~

List of Monitoring Wells
CMI Area
Vance Air Force Base, Oklahoma

8-18	Intermediate	Annual

Wells sampled for Benzene, TCE, Cis 1,2 DCE, VC and Naphthalene ~~volatile organic compounds and metals~~ in accordance with the Sampling and Analysis Plan.

~~In addition to the above listed wells, four surface water and sediment locations will be sampled for volatile organic compounds and metals in accordance with the Sampling and Analysis Plan.~~

AECOM

Figure: 2-6

INDUSTRIAL ZONE MONITORING WELLS/CONCENTRATION CONTOUR MAP
JUNE 2017

VANCE AFB

VANCE AIR FORCE BASE, OKLAHOMA
Project No.: 60273629 Date: 2017/10

P:\60273629\000_CAD\040_GIS\Figures\CM\June 2017\Figure2-6_Industrial Zone Monitoring.mxd Friday, April 20, 2018 - 1:58:41 PM

Cleveland Street

Elam Road

Booth Road

Channel Street

Scott Drive

Dagenhart Road

Goff Road

LEGEND

- *BENZENE CONCENTRATION CONTOUR (DASHED WHERE INFERRED)*
- *BENZENE CONCENTRATION CONTOUR (DASHED WHERE INFERRED)*
- *TCE CONCENTRATION CONTOUR (DASHED WHERE INFERRED)*
- APPARENT GROUNDWATER FLOW DIRECTION
- INTERCEPTOR COLLECTION TRENCH
- SLURRY WALL
- INTERCEPTOR COLLECTION TRENCH (SEE NOTE 3)
- AREA BOUNDARIES

NOTES

1. CONCENTRATION LEVELS MEASURED IN MICROGRAMS PER LITER (µg/L)

2. SITE SS007 NORTHERN ICT IS PART OF ACTIVE REMEDIATION SYSTEM.

3. SITE SS007 SOUTHERN ICT REMAINS IN PLACE, BUT IS NOT AN ACTIVE COMPONENT OF REMEDIATION SYSTEM.

0 280 560
FEET

3.0 INSPECTION AND MAINTENANCE ACTIVITIES

Throughout the post-closure care period, the integrity and effectiveness of the concrete cap and other site features will be monitored and maintained. The appropriate post-closure care inspections and maintenance activities for the concrete cap, run-off and run-on control measures, and monitoring well equipment are listed in Figure 3-1.

The appropriateness and effectiveness of the groundwater monitoring system will be routinely evaluated and modified throughout the post-closure care period.

Although the final concrete cap is inherently secure, restricted facility access and other site security measures will help prevent unauthorized disturbance of the final concrete cap and associated site features.

The semiannual site inspection activities will require approximately two hours of onsite personnel time during each event. United States Air Force (USAF) contractors will conduct site inspections while completing sampling and analysis events. A site inspection will also be conducted after any known earthquake, severe storm, or disturbance in the vicinity of the site.

Each site inspection will assess the integrity and effectiveness of the concrete cap system and the other site features. Stored equipment and vehicles will be moved as necessary to facilitate site inspections, maintenance activities, and repair efforts.

Qualified personnel will investigate subsided or settled areas of the concrete cap system before repair to determine the cause of the displacement.

Drainage structures in the vicinity of the site will be kept free of vegetation and debris. Erosion of soils bermed adjacent to the final cap will be restored to the original contours. Additional surface grading will also be performed as necessary to prevent ponding or run-on conditions.

Records of all maintenance and repair activities conducted during the post-closure care period will be kept at the facility.

4.0 CLOSURE CARE IMPLEMENTATION AND DURATION (11-1-90)

4.1 POINT OF CONTACT

A copy of the approved Post-Closure Plan will be kept at the facility throughout the post-closure care period. The current point of contact at the facility for matters concerning the post-closure care of the site is as follows:

Ms. Marilyn Wells
~~Environmental Branch Office~~ AFCEC/CZO
Vance AFB, Building 2884~~8~~
Enid, Oklahoma 13705-5000
(~~405~~)580 213~~249-6303~~7082

In addition, the facility contact will be responsible for updating the post-closure plan as needed and ensuring that OSH and EPA copies are also kept current. If operations at Vance AFE were to cease before the end of the post-closure care period or the facility contact were unavailable, ~~the USAF's Environmental Planning Division at Randolph APE would be the~~ the Tinker AFB ISS would be the secondary contact during the post-closure care period. The current secondary point of contact is as follows:

~~Dr. Dee Ann Sanders~~ Mr. James Dawson-
~~HQ ATCIDEEV (Dynamac)~~Tinker ISS
~~Building 661, Room 117 Building 1 Room221~~
~~Randolph AFB, Texas 78150-5001~~ Tinker AFB, OK 73145
~~(512) 652-3302~~(405) 736-3060

4.2 SITE SECURITY

Vance AFB is a DOD facility with restricted access to the property. Vance APE is fenced, secured, and patrolled by security personnel 24 hours per day. The ongoing security program includes daily inspection of all perimeter fences and gates for damage caused by intruders, accidents, or natural events. Damaged fencing is repaired or replaced as soon as practically possible. After final closure cap construction is completed, temporary warning signs, safety flagging, and site fencing will be removed.

If the ongoing site security program at Vance AFB were discontinued or the facility were closed during the post-closure care period, this Post-Closure Plan would be revised to describe alternative site security measures that would satisfy the requirements of 40 CFR 265.14.

In accordance with 40 CFR 265.119(b)(1), the notice in the property deed will also protect against disturbance of the final closure system. Surveyed benchmarks will be strategically positioned during the final closure survey and located within Vance AFB. These benchmarks will be chosen for visibility and protection from accidental damage, obstruction, removal, and deformation.

In accordance with 40 CFR 265.117(2)(b), the regional administrator of EPA Region VI may require continuation of any site security requirements of 40 CFR 265.14 during part or all of the post-closure care period.

4.3 DURATION OF POST-CLOSURE CARE PERIOD0

The post-closure care period will be 30 years from the date of final closure of the UST No. 106 site, in accordance with 40 CFR 265.117(a)(1) unless otherwise modified.

4.4 MODIFICATION OF POST-CLOSURE CARE PERIOD

In accordance with 40 CFR 265.117(2)i and ii, the regional administrator of EPA Region VI may shorten or extend the post-closure care period. The regional administrator may:

[40 CFR 265.117(2)i]
"Shorten the post-closure care period applicable to the hazardous waste management unit, or facility, if all disposal units have been closed, if he finds that the reduced period is sufficient to protect human health and the environment (e.g., leachate or ground water monitoring results, characteristics of the hazardous waste, application of advanced technology, or alternative disposal, treatment, or reuse techniques indicate that the hazardous waste management unit or facility is secure); or"

[40 CFR 4206 5.117(2)ii]
"Extend the post-closure care period applicable to the hazardous waste management unit or facility, if he finds that the extended period is necessary to protect human health and the environment (e.g., leachate or ground water monitoring results indicate a potential for migration of hazardous wastes at levels which may be harmful to human health and the environment)."

In accordance with 40 CFR 265.118(g)(1) and (2), the duration of the post-closure care period may also be modified at any time prior to the end of the post-closure care period in either of the following ways:

[40 CFR 265.118(g)(1)]
"The owner or operator or any member of the public may petition the Regional Administrator to extend or reduce the post-closure care period applicable to a hazardous waste management unit or facility I based on cause, or alter the requirements of the post-closure care period based on cause."

[40 CFR 265.118(g)(2)]
"The Regional Administrator may tentatively decide to modify the post-closure plan if he deems it necessary to prevent threats to human health and the environment. He may propose to extend or reduce the post-closure care period applicable to a hazardous waste management unit or facility based on cause or alter the requirements of the post-closure care period based on cause."

Vance AFE or USAF officials may elect to exercise the option to modify the [l duration of the post-closure care period in accordance with 40 CFR 265.118(g)(1).

5.0 POST-CLOSURE CARE DOCUMENTATION AND CERTIFICATION

5.1 POST-CLOSURE DOCUMENTATION

The post-closure documentation to be retained by the designated point of contact specified in Section 4. 1 will include the following items.

- Survey plat from the final closure activities
- Closure certification documents
- Local zoning authority approval and filing of survey plat
- Surveying and recordkeeping information
- Groundwater monitoring records of sampling, analyses, and results
- Copies of the ~~all~~ approved Post-Closure Plans and modifications used during the post-closure care period
- Copies of any field notes, site photographs, survey data, or field reports that have been generated during the semiannual inspection activities
- Records of all maintenance and repair activities conducted at the site during the post-closure care period

5.2 POST-CLOSURE CERTIFICATION

Semiannual inspections, to be conducted throughout the 30-year post-closure care period, will result in information associated with 60 inspections. Copies of all the post-closure documentation items listed in Section 5.1 will be made available for review.

Upon completion of the post-closure period, an independent professional engineer registered in Oklahoma and a Vance AFB official will certify that the post-closure care activities have been conducted in accordance with the approved Post-Closure Plan and any approved modifications to the plan.

Certification documents will be submitted to the Oklahoma DEQ Administrative Authority within 60 days of completion of the established post-closure care period. When Vance AFB submits the certification documents, it will request that DEQ confirm the end of post-closure care period for the UST No. 106 site.

6.0 REFERENCES

AECOM, 2015. Draft Final Remedial Design/Corrective Measures Implementation Plan for ST008, Vance Air Force Base, Oklahoma, July.

Title 40 CFR Part 264, Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal

Title 40 CFR Part 270, Hazardous Waste Permit Program

Vance AFB, 1990 Approved Closure Plan, UST No. 106 at Building 106 (IRP Site No.8) and all subsequent modifications

Vance AFB, 1990 Approved Post-Closure Plan, UST No. 106 at Building 106 (IRP Site No. 8) and all subsequent modifications

Vance AFB, Final Project Work Plan, Central Groundwater Treatment Facility, June 18, 1996

Vance AFB, Final Project Work Plan, Industrial Zone Interim Remedial Action, September, 1997

Vance AFB, Final Project Work Plan, Industrial Zone Interim Remedial Action, North Site SS007, November 16, 2001

ATTACHMENT 6

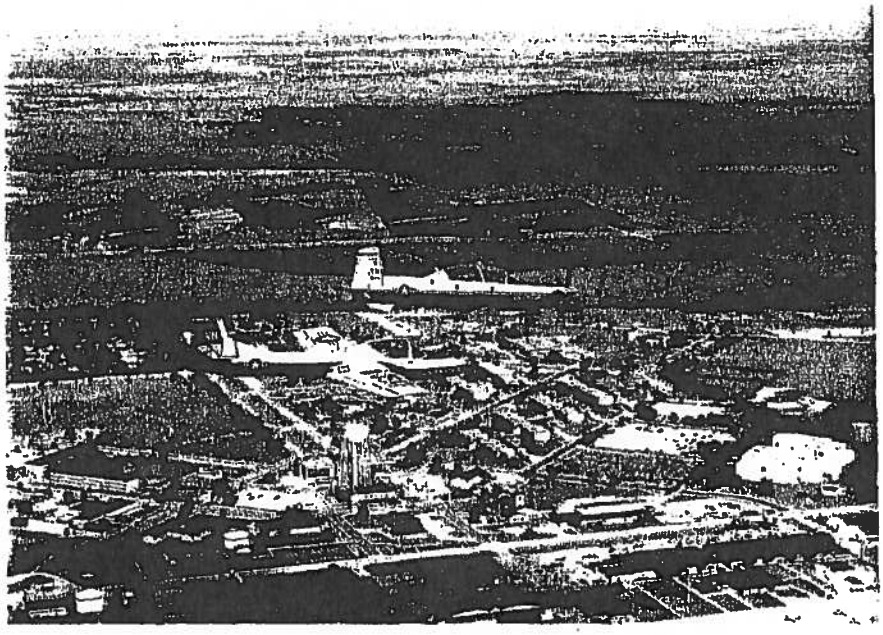
POST-CLOSURE PLAN FOR SITE 12

U.S. AIR FORCE
ENVIRONMENTAL RESTORATION PROGRAM

VANCE AIR FORCE BASE, OKLAHOMA

POST-CLOSURE PLAN

IRP Site ST-12



February, 2006

Updated March 2018

Prepared by: 71LRS/CEVR

U.S. AIR FORCE ENVIRONMENTAL RESTORATIONPROGRAM

VANCE AIR FORCE BASE, OKLAHOMA

POST-CLOSURE PLAN
IRP Site ST012

February, 2006

Updated July 2018

~~**Prepared by: 71LRS/CEVR**~~

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ACRONYMS

AFB	Air Force Base
BGL	Below Ground Level
CFR	Code of Federal Regulations
CGTF	Central Groundwater Treatment Facility
DEQ	Oklahoma Department of Environmental Quality
DOD	Department of Defense
LF	Landfill
RCRA	Resource Conservation and Recovery Act
RP	Restoration Program
SAP	Sampling and Analysis Plan
SS	Spill Site
ST	Storage Tank
USAF	United States Air Force
UST	Underground Storage Tank

LIST OF FIGURES

1.0 INTRODUCTION

Vance Air Force Base (AFB) has submitted this Post-Closure Plan in accordance with 40 Code of Federal Regulations (CPR) Part 264.118. It is also intended to fulfill the requirements of the Part B Post-Closure Permit Application for the renewal of the existing permit issued on August 6, 1996 by Oklahoma Department of Environmental Quality (DEQ). Regulations for the Part B Post-Closure Permit include but are not limited to applicable sections of 40 CFR 264, Standards for Owners and Operators of Hazardous Waste Treatment Storage and Disposal, Subpart G, Closure and Post-Closure, 40 CPR 270, Hazardous Waste Permit Program, Subpart B, Permit application, and all Oklahoma Department of Environmental Quality (DEQ) Land Protection Division rules and regulations as applicable.

1.1 SITE LOCATION, DESCRIPTION, AND HISTORY

Vance AFB lies in north central Oklahoma, in Garfield County, about 5 miles southwest of downtown Enid, Oklahoma: Figure 1-1 provides a location map. The base covers approximately 2,122 acres and is surrounded by privately owned farming lands. The majority of Vance AFB is dedicated to aircraft runways and taxiways that cover approximately 1,100 acres. Base living quarters for Air Force personnel and their dependents are located on the far northeastern side of the base in the military family housing area. In addition to the facilities at Vance AFB, a remote facility known as Kegelman Auxiliary Field (KAux) is used for "touch-and-go" landings. KAux is located 30 miles north-northwest of Vance AFB in Alfalfa County, Oklahoma.

Site ST012 consists of a paint stripping equalization tank (PSET) that was used to provide temporary holding and separation of paint stripping wastes from 1967 to 1988. The PSET was located immediately southeast of Building 192 in which aircraft were periodically repainted as part of a maintenance program. In 1988, the tank was taken out of service. Figure 1-2 is a Site ST012 location map.

The RCRA Closure Plan was approved in January, 1994 and amended in October, 1994. A summary/history of that plan is provided in the following paragraphs.

1.2 RCRA CLOSURE PLAN

The RCRA Closure Plan, dated January 1994 and the amendment date October 1994 presented the results of extensive soil and groundwater sampling conducted at the site, an evaluation of the nature and extent of contamination and presented "clean" and "landfill" closure plans. The "landfill" closure plan was chosen since the site could not be "clean closed." The amendment to the closure plan provided details for the tank removal.

In a letter dated March 27, 1995, a project work plan for an interim remedial action at Site ST012 was approved by the Oklahoma DEQ. In May 1995, the content of the PSET, approximately 200-300 gallons of water and residual sludge was removed, tested and disposed of as required. The top five feet of clean soil was removed and later used for backfill. A modular trench box was installed to prevent the need for shoring. The demolition and removal of the PSET occurred on June 5-6, 1995. Concrete debris for demolition of the PSET was classified as hazardous waste and transported to a permitted hazardous waste landfill. Soils surrounding the PSET were removed to a depth at which bedrock was encountered at approximately 10 feet below existing ground surface. Excavated soil was tested and disposed of as required.

Geotextile filter fabric was placed and fitted against the excavation bottom and side walls. The

sump pipe was positioned in place. The excavation was filled with coarse stone to the designed elevation. A section of filter fabric was placed on top. A layer of sand was placed atop the geotextile fabric followed by placement of HOPE liner. A soil cap was placed and compacted on top of the liner. Concrete pavement was replaced and extended to the west and south. A complete4 description of the tank removal process can be found in the Final Quality Control Summary Report for the Interim Remedial Action for the PSET, dated September 13, 1995.

Figure 1-3 is a geologic cross section of Site ST012. Figure 1-4 is a 1990 potentiometric surface and groundwater flow map. Figure 1-5 is a 20170~~4~~ potentiometric map.

A RCRA Post-closure Care Permit was issued to Vance AFB on August 8, 1996. The Permit incorporated the approved Closure Plan and subsequent amendment and a Draft Post-closure Plan. The Permit required corrective action and monitoring of specified monitoring wells at Site ST012 on a semi-annual basis, as set forth in Permit Conditions IV.C.2. and IV.C.3. A RCRA Facility Investigation was conducted in 1998 with a final report dated December 1998. A follow-on corrective measures study was conducted in 1998. In a report dated April 28, 1998, five corrective measure alternatives were developed, evaluated, and ranked. Alternative Number 2, Groundwater Extraction, was selected as the final remedy ~~and is shown in Figure 1-6~~. Field activity for the final remedy was completed on April 27, 2002 and a final report, dated October 18, 2002 was submitted to the Oklahoma DEQ for approval. The Oklahoma DEQ approval was obtained in a letter dated November 18, 2002.

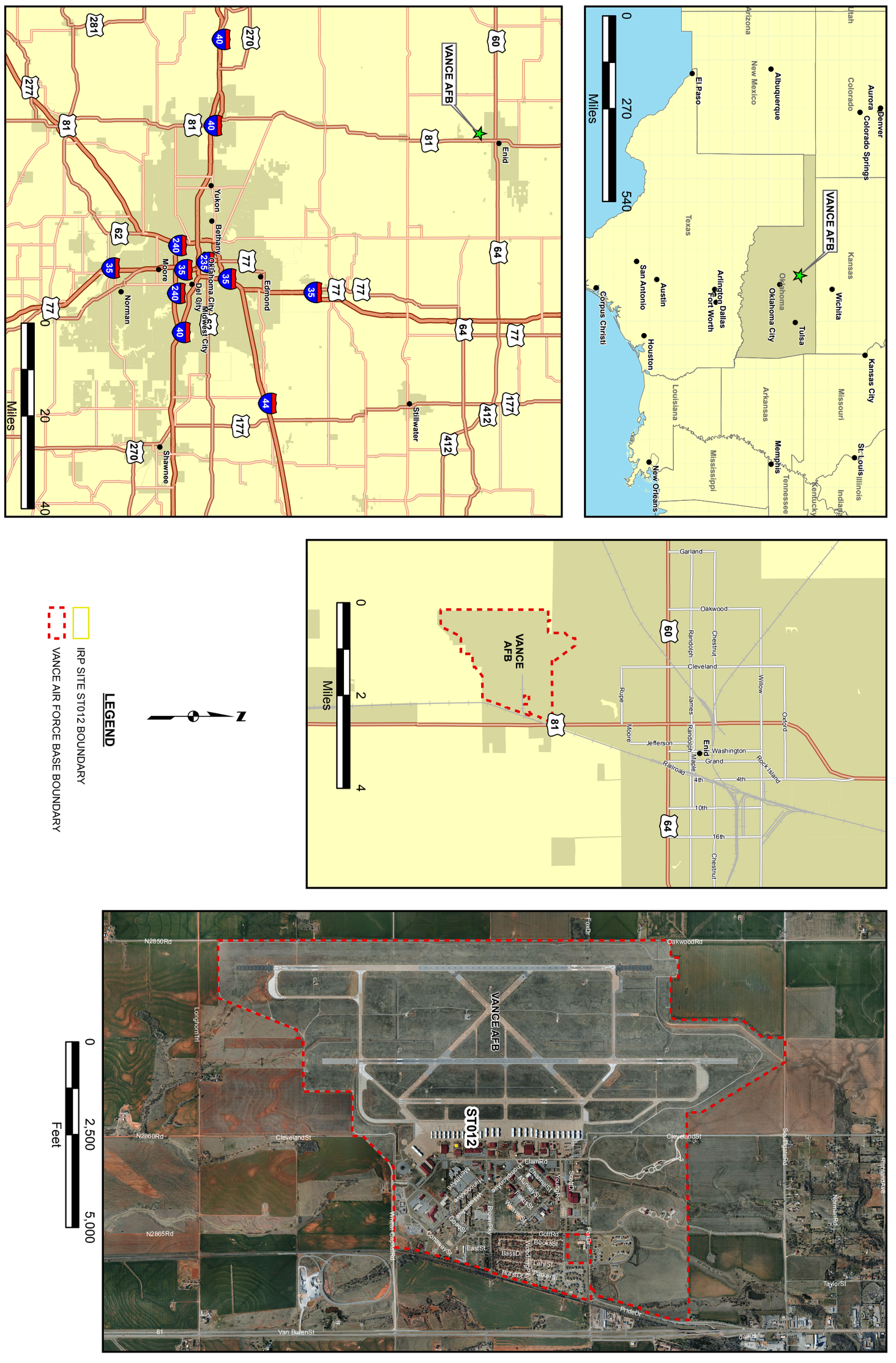
In April 2008, the Permit was modified to reduce groundwater monitoring frequency at Site ST-12 from semi-annual to annual.

In 2014, the ST012 remedy was changed to aggressive treatment using injections of emulsified vegetable oil creating conditions conducive to enhanced reductive dechlorination of CVOC contamination. The groundwater system was also turned off and retrofitted to an SVE system in order to efficiently reduce contaminant mass in the subsurface by volatilizing VOCs in the vadose and “smear” zone soils. (AECOM 2014). The use of the SVE was discontinued in 2016 due to low mass removal rates and no significant concentrations methane being extracted by the system.

1.3 SCOPE OF POST-CLOSURE PLAN

The scope of appropriate post-closure activities described within this Post-closure Plan has been developed to satisfy the specific requirements of 40 CFR 264.117 to 264.120. This Post-closure Plan consists of the following sections:

Section 2: Groundwater Monitoring
Section 3: Inspection and Maintenance Activities
Section 4: Post-closure Care Implementation and Duration Post-closure Care
Section 5: Documentation and Certification
Section 6: References



VANCE AFB

VANCE AIR FORCE BASE, OKLAHOMA
Project No.: 60273629 Date: 03/2018

VANCE AIR FORCE BASE AND SITE ST012 LOCATION MAP
POST-CLOSURE PLAN

AECOM

Figure: 1-1

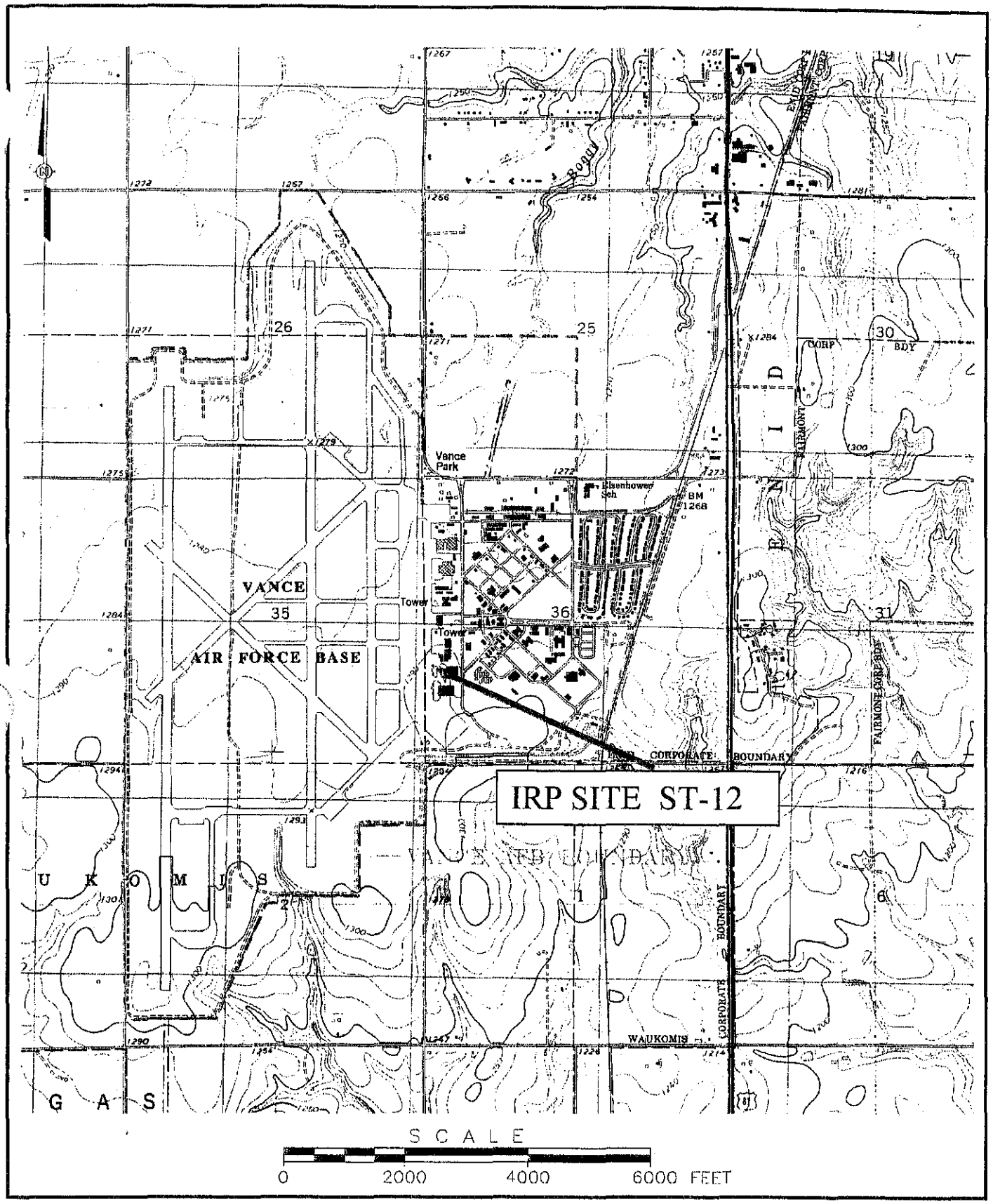


Figure 1-2 IRP Site 12 Location Map

2.0 GROUNDWATER MONITORING

The groundwater monitoring activities discussed in this section provide a description of the following items:

Existing conditions at Site ST012
Monitoring well network
Evaluation procedures and frequency for groundwater sampling
Types of laboratory analyses

2.1. EXISTING CONDITIONS

Site ST012 is one of four sites known as the Corrective Measures Implementation (CMI) sites. Even though only Site ST012 is the subject of this post-closure plan, information from the other sites is included because they are all part of one operable unit. Site WP-23, the Industrial Waste Pond, is located between buildings 182 and 183, approximately 250 feet north of the former PSET. It is believed that the waste pond was abandoned when the paint stripping operation moved to Building 192 in 1967. Site SS-24, the Jet Engine Shop, is located approximately 100 feet east of Site 12 and was a spill site for hazardous materials. Site SS-25, the COMBS Warehouse is located north and east of Site ST012. Contaminants from this site may have originated from outside the area since Site ST012 and SS-24 are upgradient.

Historically, ~~R~~recovered groundwater from the Site ST012 site has been pumped to the Central Groundwater Treatment Facility (CGTF) since May, 1998 via a gathering system. Recovered groundwater from Sites SS-24 and SS-25 has been pumped to the CGTF since May 2002. No extraction well was installed at Site WP-23. Treated groundwater is being discharged to the sanitary sewer and then to the City of Enid, Publicly Owned Treatment Works.

In 2014, the ST012 remedy was changed to aggressive treatment using injections of emulsified vegetable oil creating conditions conducive to enhanced reductive dechlorination of CVOC contamination in areas of elevated concentrations of chlorinated VOCs (i.e. hot spots) in the shallow, intermediate, and deep zones to reduce contaminant mass and mass flux. The remedy will also have flow through biobarrier walls to treat the downgradient portions of the plume.

In addition to ERD, the currently operating groundwater system was retrofitted as an SVE system in order to efficiently reduce contaminant mass in the subsurface by volatilizing VOCs in the vadose and “smear” zone soils. The system will also create a negative pressure beneath Building 192 that will mitigate/prevent soil vapors from entering the building through the sub-slab/foundation. The use of the SVE was discontinued in 2016 due to low mass removal rates and no significant concentrations methane being extracted by the system.

The existence of three water-bearing zones in the CMI area was determined by the RCRA Facilities Investigation in 1998. These zones are referred to as the shallow, intermediate and deep transmissive zones. The shallow transmissive zone occupies the lower portion of the unconsolidated overburden and the upper portion of the underlying weathered bedrock. It is the broadest of the three zones, averaging 15 to 20 feet thick. The direction of groundwater migration, as inferred from the potentiometric surface map, is generally from south to north. The intermediate transmissive zone averages l0 to 15 feet thick. The potentiometric surface of the intermediate transmissive zone is similar to the shallow transmissive zone in orientation, elevation and inferred flow direction. The deep transmissive zone is the thinnest of the three units, averaging 5 to 7 feet thick. The orientation of the potentiometric surface of the deep

transmissive zone is different. It exhibits high elevations and steep slopes beneath the western portion of the area and much lower elevations and a virtually flat gradient beneath the eastern portion of the CMI area. The difference in water level elevation between the two domains is as great as 25 feet. The inferred flow directions for potential contaminant migration is from Sites ST012 and WP-23 and from the southern portion of Site SS-24 into Site SS-25 and the eastern portion of Site SS-24. The groundwater flow velocities calculated for the shallow transmissive zone in 2004 were 40.29 ft/yr and 54.36 ft/yr respectively for May and November 2004 water level measurement events. Potentiometric surface maps of the shallow transmissive zone groundwater surface indicate the groundwater flow direction in the shallow transmissive zone continues to be to the north-northeast. ~~A photograph of the site is shown on Figure 2- 1.~~

2.2 MONITORING WELL NETWORK

The compliance monitoring well network for Site ST012 and other sites inside the CMI area consists of 11~~2~~ monitoring wells. Five~~Six~~ of the monitoring wells are screening in the shallow transmissive zone (10 to 30 feet below ground level (bgl)). Five~~Three~~ monitoring wells are screening in the intermediate transmissive zone (35 to 50 feet bgl), and ~~three~~one monitoring wells are screened in the deep transmissive zone (55 to 75 feet bgl). The monitoring well network has been realigned such that all monitoring wells used to monitor groundwater contamination originating from Site ST012 have been moved under the site heading regardless of the previous well designation. To keep the integrity of the historical data intact the individual monitoring well names will not change.

2.3 EVALUATION PROCEDURES

All compliance monitoring well samples are taken semiannually in the spring and fall. During each sampling event, wells are purged and sampled according to the Sampling and Analysis Plan (SAP) provided in Attachment A of the 2006 Permit Renewal Application and updated in 2018.

2.4 TYPES OF LABORATORY ANALYSIS

Groundwater is sampled for volatile organic compounds, RCRA metals, and semivolatile organic compounds. Methods and procedures are outlined in detail in the SAP provided in Attachment A to the 2006 Permit Renewal Application and updated in 2018.

FIGURE 2-3
COMPLIANCE MONITORING WELL NETWORK
CMI AREA

The following monitoring wells are sampled as shown:

Well ID	Well Type	Monitoring Frequency
Site ST012		
12-9	Shallow	Annual
12-13	Deep	Annual
~~12-20~~	~~Deep~~	~~Annual~~
~~12-21~~	~~Deep~~	~~Annual~~
12-30	Intermediate	Annual
~~12-33~~	~~Shallow~~	~~Annual~~
12-34	Intermediate	Annual
~~12-35~~	~~Shallow~~	~~Annual~~
~~12-37~~	~~Shallow~~	~~Annual~~
12-38	Intermediate	Annual
~~12-43~~	~~Shallow~~	~~Annual~~
~~12-45~~	~~Shallow~~	~~Annual~~
~~**Site WP023**~~		
23-5	Shallow	Annual
~~23-14~~	~~Shallow~~	~~Annual~~
23-21	Intermediate	Annual
23-22	Intermediate	Annual
25-1	Shallow	Annual
25-2	Shallow	Annual
25-4	Shallow	Annual

Wells sampled for volatile organic compounds and in some cases semivolatile organic compounds in accordance with the analytes laid out in the Sampling and Analysis Plan

3.0 INSPECTION AND MAINTENANCE ACTIVITIES

Throughout the post-closure care period, the integrity and effectiveness of the corrective action will be monitored and maintained. Inspection and maintenance activities for the Site ST012 remedial infrastructure, ~~extraction wells, gathering systems,~~ and monitoring well equipment are listed in Figure 31. Monitoring wells/equipment are inspected ~~semi-~~annually and the remedial infrastructure ~~extraction, wells/gathering systems~~ are checked monthly or on an as needed basis depending on the level of remediation occurring at the site. ~~more often as required~~.

The appropriateness and effectiveness of the corrective action will be evaluated every five years and modified throughout the post-closure care period as required.

Records of all maintenance and repair activities conducted during the post-closure care period will be kept at the facility.

Figure 3-1

INSPECTION AND MAINTENANCE ACTIVITIES

Items	Potential Problems	Maintenance Response
~~Extraction Wells/ Gathering System~~SVE and Injection Wells	~~Wells not pumping~~ ~~Clogged Pipes~~ Broken Risers, Well covers	~~and~~ Repair or Replace equipment
Monitoring Well Equipment	Broken Risers	Repair or Replace
	Tampered, Broken or Stolen Locks	Replace Locks
	Broken, Stolen or Lost Bailers	Replace Dedicated Bailers
	Minimal or No Recovery of Samples	Replace Monitoring Well
	Damaged Well Cap/Casing	Replace Well Cap or Monitoring Well
Surveyed Benchmarks or markers	Physical Damage	
	Severe Weathering	Repair or replace
	Evidence of Tampering	Repair or replace
	Physically Obstructed	Repair or replace
		Uncover and Provide Protection

NOTE: Vance AFB's perimeter fence is routinely inspected and repaired as necessary.

4.0 POST-CLOSURE CARE IMPLEMENTATION AND DURATION

4.1 POINT OF CONTACT

A copy of the approved Post-Closure plan will be kept at the facility throughout the post- closure care period. The current point of contact at the facility for matters concerning the post-closure care of the site is as follows:

Ms. Marilyn Wells
Remedial Project Manager
AFCEC/CZO
Vance AFB, Building 288
Enid, Oklahoma 13705-5000
(580) 213-6303

~~71 LRS/CEVR~~
~~Vance AFB, OK 73705-5610~~
~~(580) 213-6303~~

In addition, the facility contact would be responsible for updating the post-closure plan as needed and ensuring that Oklahoma DEQ copies are kept current.

If operations at Vance AFB were to cease before the end of the post-closure period, another contact point will be provided to DEQ 180 days prior to operations ceasing at Vance.

4.2 SITE SECURITY

Vance AFB is a Department of Defense facility with restricted access to the property. Vance AFB is fenced, secured, and patrolled by security personnel 24 hours per day. The ongoing security program includes daily inspection of all perimeter fences and gates for damage caused by intruders, accidents, or natural events. Damaged fencing is repaired or replaced as soon as practically possible.

4.3 DURATION OF POST-CLOSURE CARE PERIOD

The post-closure care period will be 30 years from the date of the final closure of the PSET which was November 18, 2002. In a letter from Oklahoma DEQ the implementation of the corrective action was approved.

4.4 MODIFICATION OF POST-CLOSURE CARE PERIOD

The Oklahoma DEQ Administrative Authority may shorten or lengthen the post-closure care period applicable to the hazardous waste management unit, or facility in accordance with 40 CFR 264.117(a)(2)(i) and (ii).

Vance AFB may submit a written notification or request to the Oklahoma DEQ Administrative Authority for a permit modification to amend the post-closure plan at any time during the active life of the facility or during the post-closure care period in accordance with 40 CFR 264.118(d)(1)(2).

5.0 POST-CLOSURE CARE DOCUMENTATION AND CERTIFICATION

5.1 POST-CLOSURE DOCUMENTATION

The post-closure documentation to be retained by the designated point of contact specified in Section 4.1 will include the following items.

- Groundwater monitoring records of sampling, analyses, and results
- Copies of the all approved Post-Closure Plans and modifications used during the post-closure care period
- Copies of any field notes, site photographs, survey data, or field reports that have been generated during the semiannual/monthly inspection activities
- Records of all maintenance and repair activities conducted at the site during the post-closure care period

5.2 POST-CLOSURE CERTIFICATION

Inspections, to be conducted throughout the 30-year post-closure care period, will result in information associated with over ~~6~~30 inspections. Copies of all the post-closure documentation items listed in Section 5.1 will be made available for review.

Upon completion of the post-closure period, an independent professional engineer registered in Oklahoma and a Vance AFB official will certify that the post-closure care activities have been conducted in accordance with the approved Post-Closure Plan and any approved modifications to the plan.

Certification documents will be submitted to the Oklahoma DEQ Administrative Authority within 60 days of completion of the established post-closure care period. When Vance AFB submits the certification documents, it will request that DEQ confirm the end of post-closure care period for the PSET.

6.0 REFERENCES

AECOM, 2014. Draft Final Remedial Design/Corrective Measures Implementation Plan for ST012, Vance Air Force Base, Oklahoma. January.

Title 40 CFR Part 264, Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal

Title 40 CFR Part 270, Hazardous Waste Permit Program

Vance AFB, 1996 Post-Closure Permit for Hazardous Waste Landfill Units and all subsequent modifications

Vance AFB, 1990 Approved Closure Plan, UST No. 106 at Building 106 (IRP Site No.8) and all subsequent modifications

Vance AFB, 1990 Approved Post-Closure Plan, UST No. 106 at Building 106 (IRP Site No. 8) and all subsequent modifications

Vance AFB, RCRA Facilities Investigation, IRP Sites ST012, WP-23, SS-24 and SS-25, December 4, 1998

Vance AFB, Corrective Measures Study, IRP Sites ST012, WP-23, SS-24 and SS-25, April 28, 2000

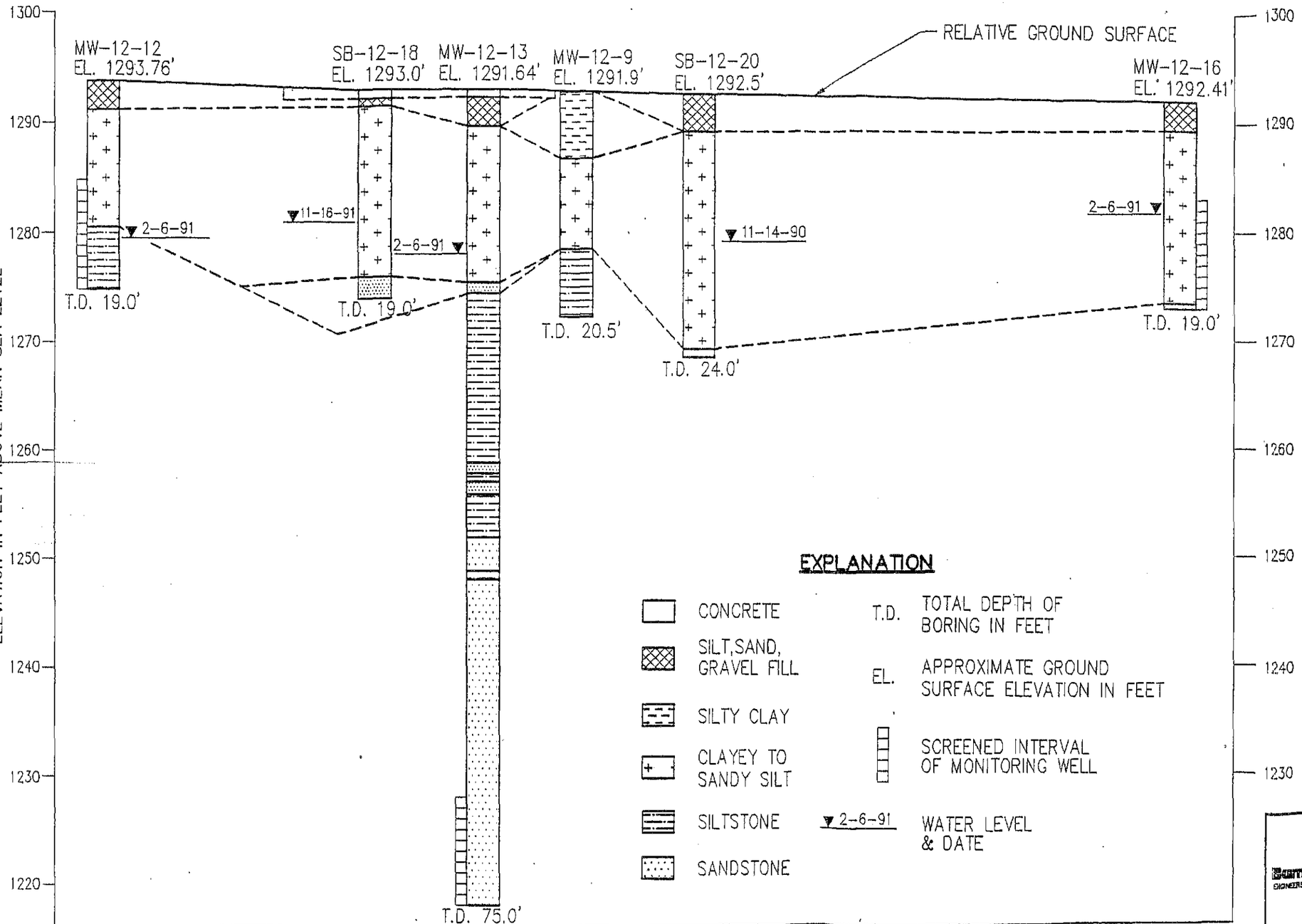
Vance AFB, Corrective Measures Implementation, IRP Sites ST012, WP-23, SS-24 and SS-25, October 18, 2002

NORTHWEST

A

SOUTHEAST

A'



EXPLANATION

- CONCRETE
- SILT, SAND, GRAVEL FILL
- SILTY CLAY
- CLAYEY TO SANDY SILT
- SILTSTONE
- SANDSTONE

T.D. TOTAL DEPTH OF BORING IN FEET

EL. APPROXIMATE GROUND SURFACE ELEVATION IN FEET

SCREENED INTERVAL OF MONITORING WELL

▼ 2-6-91 WATER LEVEL & DATE

40 0 40 80
SCALE IN FEET
HORIZONTAL

10 0 10 20
SCALE IN FEET
VERTICAL

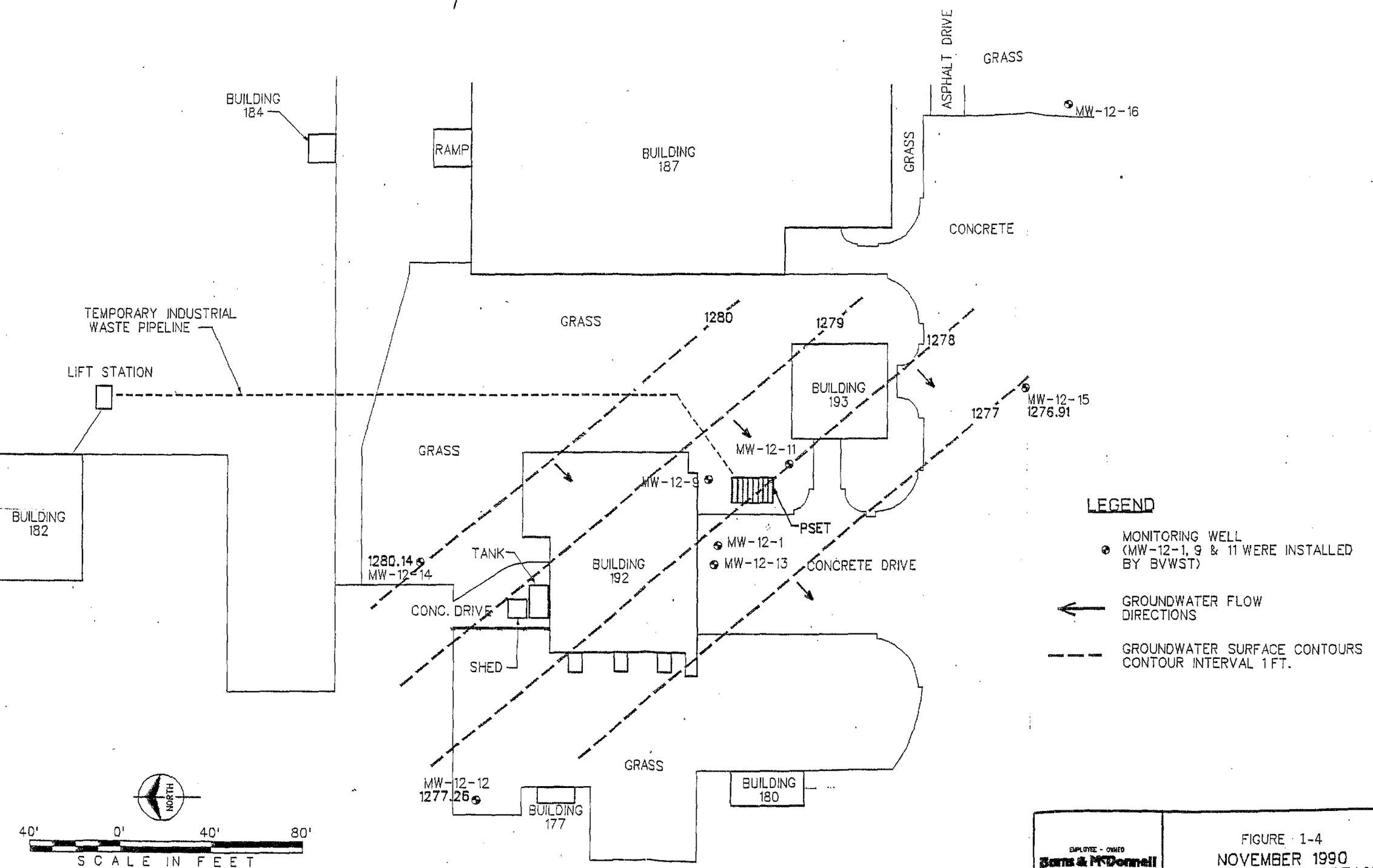
VERTICAL EXAGGERATION 4:1

EMPLOYEE - OWNED
Burns & McDonnell
ENGINEERS - ARCHITECTS - CONSULTANTS
Kansas City, Missouri

FIGURE 1-3
SITE 12
GEOLOGIC PROFILE
A – A'

01-03-1992 14:24 TRF(SOS)

SITE2



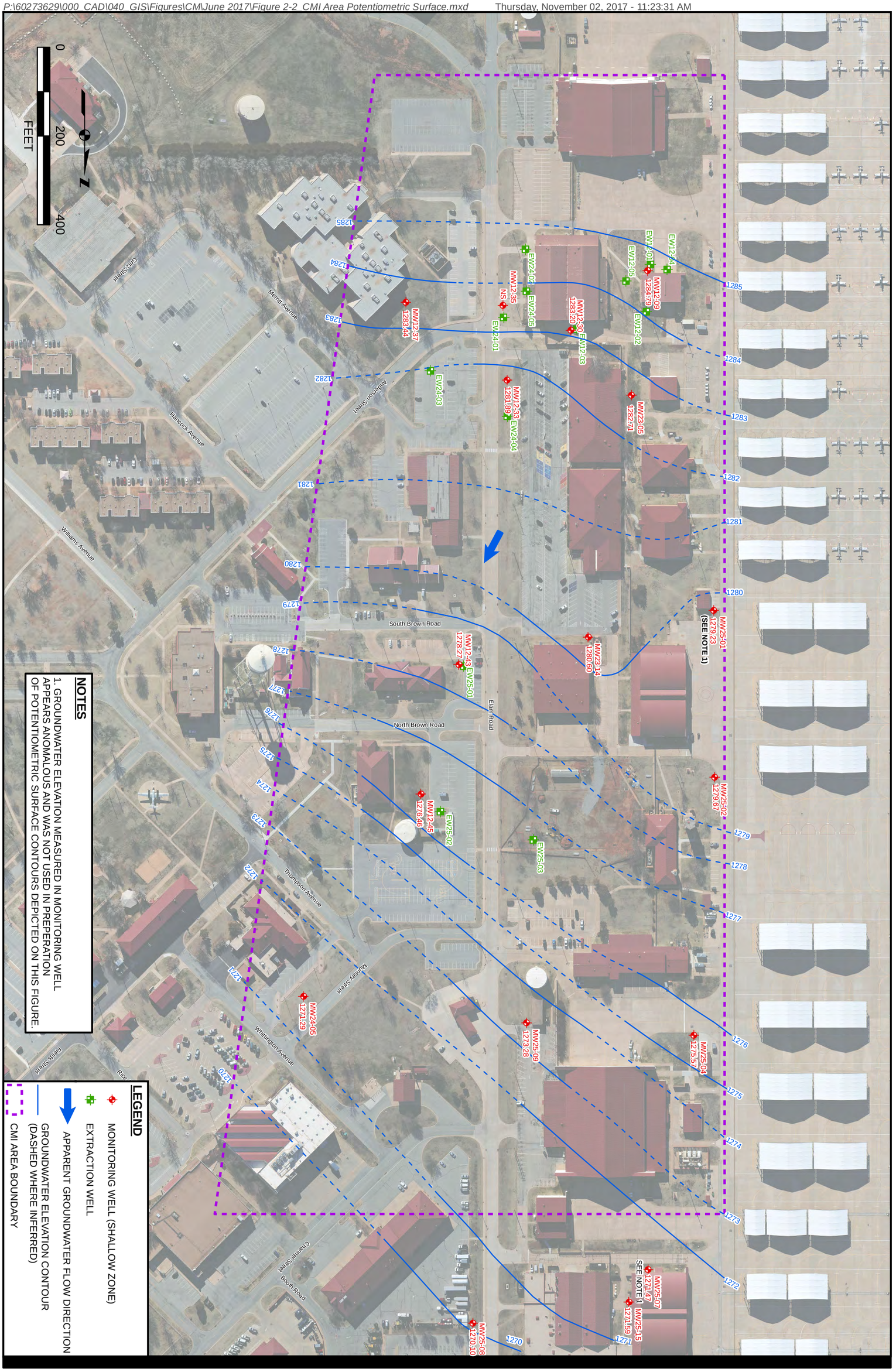
EMPLOYEE - OWNED
Burns & McDonnell
ENGINEERS - ARCHITECTS - CONSULTANTS
Kansas City, Missouri

FIGURE 1-4
NOVEMBER 1990
GROUNDWATER SURFACE AND FLOW DIRECTIONS

18.20-22.35-36

USFPLA23.

USFPLA23.DGN/12-MAR-92 11:54/SOS



VANCE AFB

VANCE AIR FORCE BASE, OKLAHOMA
Project No.: 60273629 Date: 2017/10

SHALLOW TRANSMISSIVE ZONE
POTENTIOMETRIC MAP
JUNE 2017

AECOM

Figure: 1-5

NORTHING:486785
EASTING:1995766

ST012

NORTHING:487051
EASTING:1995767

MW12-13
MW12-48
MW12-09
MW12-20
MW12-21
MW12-49

NORTHING:486785
EASTING:1996021

NORTHING:487053
EASTING:1996022

MW12-30

MW25-01

NORTHING:487152
EASTING:1995939

NORTHING:487192
EASTING:1995939

MW23-22
MW23-05

WP023

MW23-21

NORTHING:487152
EASTING:1995977

NORTHING:487192
EASTING:1995977

MW23-14

MW12-35
MW12-34
MW12-33
MW12-38

Elam Road

MW24-14

MW12-43

South Brown Road

MW12-37

Anderson Street

N

0 100 200

FEET

LEGEND

WELLS

- SHALLOW MONITORING WELL
- INTERMEDIATE ZONE MONITORING WELL
- DEEP ZONE MONITORING WELL
- SITE ST012 AND WP023 BOUNDARIES

COMPLIANCE MONITORING WELL NETWORK
POST-CLOSURE PLAN

VANCE AFB

VANCE AIR FORCE BASE, OKLAHOMA
Project No.: 60273629 Date: 03/2018

AECOM

Figure: 2-1

P:\60273629\000_CAD\040_GIS\Figures\2018 Post Closure Report\ST008\Figure2-1_Compliance Monitoring Well Network.mxd Friday, March 23, 2018 - 1:24:57 PM