

Hazardous Waste Permit HW-020
for
Department of Defense
Grand Forks Air Force Base
EPA ID: ND3571924759

Pursuant to North Dakota Century Code ("NDCC") Chapter 23.1-04 (Hazardous Waste Management Act), and North Dakota Administrative Code ("NDAC") Article 33.1-24 (Hazardous Waste Management Rules), a permit is hereby issued by the North Dakota Department of Environmental Quality ("Department") to the Department of Defense (hereafter called the "Permittee") Grand Forks Air Force Base (hereafter referred to as the "Facility"), EPA ID: ND3571924759, to implement Corrective Action at Grand Forks Air Force Base in Grand Forks County North Dakota.

The Permittee must comply with all terms and conditions of this permit. This permit consists of the conditions contained in Modules I and II, all attachments, and applicable rules in NDAC Article 33.1-24. This permit is based on the premise of all information submitted in the permit renewal application dated August 15, 2024, is accurate. Any inaccuracies or misrepresentations found in the application may be grounds for the termination or modification of this permit in accordance with NDAC § 33.1-24-06-12 and 33.1-24-06-13. The Permittee must inform the Department of any deviations from, or changes in, the information or procedures described in the application which would affect the Permittee's ability to comply with the applicable rules or permit conditions.

This permit is effective as of March ##, 2025, and shall remain in effect until March ##, 2030, unless revoked and reissued in accordance with NDAC § 33.1-24-06-12 or terminated in accordance with NDAC § 33.1-24-06-13.

Signature: _____

Charles R. Hyatt, Director
Division of Waste Management

Date: _____

Table of Contents

MODULE I: STANDARD CONDITIONS	1
I.A. Effect of Permit.....	1
I.B. Permit Actions	1
I.C. Severability	1
I.D. Duties & Requirements.....	2
I.E. Definitions.....	6
I.F. Reports, Notifications, and Submissions to the Department.....	6
I.G. Documents to be Maintained at the Facility.....	7
MODULE II: CORRECTIVE ACTION	8
II.A. Applicability.....	8
II.B. Definitions.....	8
II.C. Notification and Assessment Requirements for Newly Identified SWMUs and AOCs	9
II.D. Notification Requirements for Newly Discovered Releases at Previously Identified SWMUs and AOCs.....	10
II.E. RCRA Facility Investigation (“RFI”)	11
II.F. Interim Measures (“IM”).....	13
II.G. Corrective Measure Study (“CMS”).....	15
II.H. Remedy Approval and Permit Modification.....	17
II.I. Approved Remedies for Specific SWMUs and AOCs.....	17
II.J. Corrective Measures Implementation (“CMI”)	17
II.K. Modification of the Corrective Action Compliance Schedule.....	18
II.L. Imminent Hazards.....	18
II.M. Plan and Report Requirements	19
Attachment A: SWMUs and AOCs	20
Attachment B: Scope of Work for a RCRA Facility Investigation (“RFI”)	26
Attachment C: Scope of Work for a Corrective Measure Study (“CMS”)	51
Attachment D: Scope of Work for the Corrective Measure Implementation.....	62
Attachment E: Corrective Action Compliance Schedule	72
Attachment F: Approval remedies for specific SWMUs and AOC	75

SWMU-1.....	76
SWMU-2.....	80
SWMU-3.....	115
SWMU-4.....	132
SWMU-5.....	168
SWMU-6.....	170
SWMU-7.....	172
SWMU-8.....	204
SWMU-9.....	206
SWMU-10.....	208
SWMU-11.....	240
SWMU-12.....	242
SWMUs-13 and 14.....	244
SWMU-15.....	255
SWMU-16.....	257
SWMU-17.....	259
SWMU-18.....	261
SWMU-19.....	263
SWMU-20.....	292
AOC A.....	294
AOC B.....	310
AOC C.....	321
Attachment G Hazardous Waste Permit Application – Part A.....	324

MODULE I: STANDARD CONDITIONS

I.A. Effect of Permit

The Permittee is allowed to implement corrective action activities in accordance with conditions of this permit. Compliance with this permit constitutes compliance, for purposes of enforcement, with Chapter 23.1-04 of the North Dakota Century Code (NDCC) and Article 33.1-24 of the North Dakota Administrative Code (NDAC) except for those requirements not included in the permit which become effective by statute or which are promulgated.

Issuance of this permit does not convey property rights of any sort or any exclusive privilege, nor does it authorize any injury to persons or property, any invasion of other private rights, or any infringement of state or local law or regulations.

Compliance with the terms of this permit (NDAC 33.1-24-06-10) does not constitute a defense to any order issued or any action brought under NDCC 23.1-04, NDAC 33.1-24, Sections 3008(a), 3007, 3013, 3004(v), 3008(c) or Section 7003 of Resource Conservation and Recovery Act (RCRA), Sections 104, 106(a), 106(e), 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.

I.B. Permit Actions

I.B.1. Permit Modification, Revocation, Re-Issuance, & Termination

This permit may be modified, revoked and reissued, or terminated for cause as specified in NDAC § 33.1-24-06-12 through 33.1-24-06-14. The filing of a request for a permit modification, revocation and re-issuance, 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.

I.B.2. Permit Renewal

This permit may be renewed as specified in NDAC § 33.1-24-06-04(2) and Permit Module I.D.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.

I.C. Severability

The provisions of this permit are severable, as specified in NDAC § 33.1-24-07-12, 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.

I.D. Duties & Requirements

I.D.1. Duty to Comply

The Permittee must comply with all conditions of this permit. Any permit noncompliance constitutes a violation of the NDCC and is grounds for enforcement action, for permit termination, revocation and re-issuance or modification, or for denial of a permit renewal application. However, the Permittee need not comply with the conditions of this permit to the extent and for the duration such noncompliance is authorized in an emergency permit pursuant to NDAC § 33.1-24-06-04(1).

I.D.2. Duty to Reapply

If the Permittee wishes to continue an activity regulated by this permit after the expiration date of this permit, the Permittee shall submit a complete application for a new permit at least one hundred eighty (180) days before this permit expires pursuant to NDAC § 33.1-24-06-04(2).

I.D.3. Need to Halt or Reduce Activity

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 pursuant to NDAC § 33.1-24-06-04(3).

I.D.4. 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 any adverse impacts on human health or the environment pursuant to NDAC § 33.1-24-06-04(4).

I.D.5. Proper Operation & Maintenance

The Permittee shall at all times properly operate and maintain all facilities, systems and related appurtenances which are installed or used by the Permittee to achieve compliance with the conditions of this permit. Proper

operation and maintenance include effective performance, adequate funding, adequate operator staffing and training, and adequate laboratory and process controls, including appropriate quality assurance procedures. This provision requires the operation of backup or auxiliary facilities or similar systems only when necessary to achieve compliance with the conditions of this permit pursuant to NDAC § 33.1-24-06-04(5).

I.D.6. Duty to Provide Information

The Permittee shall furnish to the Department, within a reasonable time, any relevant information which the Department 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 Department, upon request, copies of records required to be kept by this permit pursuant to NDAC § 33.1-24-06-04(8).

I.D.7. Inspection & Entry

The Permittee shall allow the Department, or an authorized representative, upon the presentation of credentials and other documents as may be required by law to:

- a. Enter at reasonable times upon the Permittee's premises where a regulated 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, for the purposes of assuring permit compliance or as otherwise authorized, any substances or parameters at any location pursuant to NDAC § 33.1-24-06-04(9).

I.D.8. Monitoring & Records

Samples and measurements taken for the purposes of monitoring must be representative of the monitoring activity.

The Permittee shall retain, at the facility, records of all monitoring information including all calibration and maintenance records, all original

strip chart recordings for continuous monitoring instrumentation, copies of all reports and records required by this permit, the certification required by NDAC § 33.1-24-05-40(2)(i), and records of all data used to complete the application for this permit, for a period of at least three years from the date of the sample, measurement, report, certification or application. This period may be extended by the request of the Department at any time and is automatically extended during the course of any unresolved enforcement action regarding this facility pursuant to NDAC § 33.1-24-06-04(10).

Records of monitoring information must include:

- a. The date, exact place, and time of sampling or measurements;
- b. The names of individuals who performed the sampling or measurements;
- c. The dates analyses were performed;
- d. The names of individuals who performed the analyses;
- e. The analytical techniques or methods used; and
- f. The results of such analyses.

I.D.9. Signatory Requirements

All applications, reports or information submitted to the Department must be signed and certified, as described in NDAC § 33.1-24-06-03, pursuant to NDAC § 33.1-24-06-04(11).

I.D.10. Reporting Requirements

- a. *Planned Changes.* The Permittee shall give notice to the Department, as soon as possible, of any planned physical alterations or additions to the permitted facility pursuant to NDAC § 33.1-24-06-04(12)(a).
- b. *Anticipated Noncompliance.* The Permittee shall give advance notice to the Department of any planned changes in the permitted facility or activity which may result in noncompliance with permit requirements pursuant to NDAC § 33.1-24-06-04(12)(b).

I.D.11. Transfer of Permit

This permit may be transferred to a new owner or operator only if it is modified or revoked and reissued pursuant to NDAC § 33.1-24-06-11(2) or 33.1-24-06-12(2)(b). 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 NDAC Chapters 33.1-24-05 and 33.1-24-06 and this permit.

I.D.12. 24-Hour Reporting

The Permittee shall report to the Department any noncompliance with this permit which may endanger human health or the environment.

Any information shall be reported orally within twenty-four hours from the time the Permittee becomes aware of the circumstances. The following shall be included as information which must be reported orally:

- a. Information concerning the release of any hazardous waste that may cause an endangerment to public drinking water supplies; and
- b. Any information of a release or discharge of hazardous waste, or of a fire or explosion from the hazardous waste management units, which could threaten the environment or human health outside the facility. The description of the occurrence and its cause must include:
 1. Name, address, and telephone number of the owner or operator;
 2. Name, address, and telephone number of the facility;
 3. Date, time, and type of 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 outside the facility, where this is applicable; and
 7. Estimated quantity and disposition of recovered material that resulted from the incident.

A written submission must also be provided within five (5) days of the time the Permittee becomes aware of the circumstances. The written submission must contain a description of the noncompliance and its cause;

the period(s) of noncompliance, including exact dates and times, and if the noncompliance has not been corrected, the anticipated time it is expected to continue, and steps taken or planned to reduce, eliminate, and prevent recurrence of the noncompliance.

The Department may waive the five-day written notice requirement in favor of a written report within fifteen (15) days pursuant to NDAC § 33.1-24-06-04(12)(f).

I.D.13. Other Noncompliance

The Permittee shall report all other instances of noncompliance not otherwise required to be reported above, at the time written reports, as required by this permit, are submitted. The reports shall contain the information listed in Permit Module I.D.12. as appropriate pursuant to NDAC § 33.1-24-06-04(12)(g).

I.D.14. Other Information

Where the Permittee becomes aware that the Permittee failed to submit any relevant facts in a permit application or submitted incorrect information in a permit application or in any report to the Department, the Permittee shall promptly submit such facts or information pursuant to NDAC § 33.1-24-06-04(12)(k).

I.E. Definitions

For purpose of this permit, terms used herein shall have the same meaning as those in NDCC Chapter 23.1-04, NDAC Chapters 33.1-24-01, 33.1-24-02, 33.1-24-05, and 33.1-24-06 unless this permit specifically provides otherwise. Where terms are not defined in the regulation, the permit or EPA guidelines or publications, 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. "Department" means the North Dakota Department of Environmental Quality or authorized representative.

I.F. Reports, Notifications, and Submissions to the Department

All reports, notifications, or submissions which are required by this permit to be sent or given to the Department should be sent by certified mail or given to:

Derek Kannenberg, Manager
Hazardous Waste Program

NDDEQ Division of Waste Management
4201 Normandy Street
Bismarck, ND 58503-1324

I.G. Documents to be Maintained at the Facility

The Permittee shall maintain at the facility, until closure of the regulated waste management units is completed and certified by an independent, registered professional engineer, the following documents and all amendments, revisions and modifications to these documents:

1. A waste analysis plan as required by NDAC § 33.1-24-05-04(2) and this permit;
2. A closure plan as required by NDAC § 33.1-24-05-61(1) and this permit;
3. An operating record as required by NDAC § 33.1-24-05-40(1) and this permit;
4. A copy of the latest revision of the amended Part B application for the Facility and most current permit with attachments; and
5. All other documents required by this permit.

[End of Module I]

MODULE II: CORRECTIVE ACTION

II.A. Applicability

The conditions of Module II apply to the solid waste management units ("SWMUs") and areas of concern ("AOCs") identified in Attachment A tables, and any additional SWMUs or AOCs discovered during the course of ground water monitoring, field investigations, environmental audits, or other means.

II.B. Definitions

- II.B.1. Area of Concern ("AOC").* For purposes of this permit, the term includes any area at the Facility having a probable release of a hazardous waste or hazardous constituent which may or may not be from a SWMU and is determined by the Department to pose a current or potential threat to human health or the environment. AOCs identified in Attachment A Tables and any additional AOC identified in the future shall receive the same level of investigation and remediation as that of a SWMU.
- II.B.2. Corrective Action Management Unit ("CAMU").* An area within the Facility, designated by the Department, utilized for the purpose of implementing corrective action requirements of this permit. A CAMU shall be used only for the management of remediation wastes pursuant to implementing such corrective action requirements at the facility.
- II.B.3. Corrective Measures ("CM").* All corrective actions necessary to protect human health and the environment for all releases of hazardous waste or hazardous constituents from any SWMU or AOC at the Facility, regardless of the time at which waste was placed in the unit, as required under NDAC § 33.1-24-05-58. CM may address releases to air, soils, surface water or ground water.
- II.B.4. Hazardous Constituent.* Any constituent identified in NDAC Chapter 33.1-24-02 Appendix V or any constituent identified in NDAC Chapter 33.1-24-05 Appendix XII.
- II.B.5. Land Disposal.* For purposes of this permit and NDAC Chapter 33.1-24-05, means placement in or on the land and includes, but is not limited to, placement in a landfill, surface impoundment, waste pile, injection well, land treatment facility, salt dome formation, underground mine or cave or concrete vault or bunker intended for disposal purposes.

II.B.6. Release. For the purposes of this permit, a “release” includes both the escaping or leaching of solid or hazardous waste constituents into the environment, and the definition of “disposal” found in NDAC § 33.1-24-01-04(40).

II.B.7. Remediation Waste. All solid and hazardous wastes, all media (including ground water, surface water, soils and sediments), and debris which contain listed hazardous wastes or hazardous constituents, or which themselves exhibit a hazardous waste characteristic, that are managed for the purpose of implementing corrective action requirements. Remediation wastes may originate only from within the Facility boundary but may include waste managed in implementing corrective action beyond the Facility boundary.

II.B.8. Solid Waste Management Unit (“SWMU”). Any discernible unit which has been used for the treatment, storage, or disposal of solid wastes at any time, irrespective of whether the unit was intended for the management of solid or hazardous waste. SWMUs include RCRA-regulated hazardous waste management units. Such units include any area at the Facility in which solid wastes have been routinely or systematically released.

II.B.9. Unit. For the purposes of this permit, a “unit” includes, but is not limited to, any landfill, surface impoundment, waste pile, land treatment unit, incinerator, injection well, tank, container storage area, septic tank, drain field, waste water treatment unit, elementary neutralization system, transfer station or recycling system.

II.C. Notification and Assessment Requirements for Newly Identified SWMUs and AOCs

The Permittee shall notify the Department, in writing, within fifteen (15) calendar days of discovery of any additional SWMU or AOC as discovered under Permit Module II.A. The notification shall include, at a minimum, the location of the SWMU or AOC and all available information pertaining to the nature of the release (e.g., media affected, hazardous constituents released, magnitude of release, etc.).

II.C.1. 180-Day Written Assessment of SWMUs and AOCs

The Permittee shall prepare and submit to the Department, within one hundred eighty (180) calendar days of notification, a written assessment of

each SWMU or AOC identified under Permit Module II.C. At a minimum, this assessment shall include the following information:

- a. Location of unit(s) on a topographic map of appropriate scale size as required under NDAC § 33.1-24-06-17(2)(q);
- b. Designation of type and function of unit(s);
- c. A planar map of each SWMU or AOC which shows the approximate length and width dimension of the unit and two geologic cross-sections through each SWMU or AOC which show the vertical and lateral extent of contamination and/or thickness of the waste deposit, soils description, and the approximate location of the potentiometric surface and/or water table;
- d. Date that the unit(s) was operated;
- e. Specification of all wastes that have been managed at/in the unit(s) of the extent available. Include any available data on hazardous constituents in the wastes; and
- f. All available information pertaining to any release of hazardous waste or hazardous constituents from such units (ground water data, soil analysis, air, and/or surface water data).

II.C.2. Based on the results of the assessment, the Department shall determine the need for further investigations of the units addressed in the assessment. If the Department determines that such investigations are needed, the Permittee shall be required to prepare a plan for such investigations as outlined in Permit Module II.E.1(a).

II.C.3. If the Department determines that further investigation of the SWMU or AOC is required, the permit will be modified in accordance with NDAC § 33.1-24-06-12.

II.D. Notification Requirements for Newly Discovered Releases at Previously Identified SWMUs and AOCs

The Permittee shall notify the Department, in writing, of any newly discovered release(s) of hazardous waste or hazardous constituents discovered during the course of ground water monitoring, field investigations, environmental audits or other means within fifteen (15) calendar days of discovery. Such newly discovered releases may be from a SWMU or AOC identified in Permit Module II.A. for which

further investigation under Permit Module II.C.2 was not required. The notification shall include pertinent information regarding the release, including the location and extent of the release, the volume of material released, the type of hazardous waste and/or constituents released, the time and duration of the release, activities performed to contain and control the release, and the volume of the release recovered. In addition, an assessment of the actual and potential impacts of the releases on human health and the environment should also be provided.

1. If the Department determines that further investigation of the SWMU or AOC is needed, the Permittee shall be required to prepare a plan for such investigations as outlined in Permit Module II.E.1(a).

II.E. RCRA Facility Investigation ("RFI")

II.E.1. RFI Workplan(s)

- a. The Permittee shall prepare and submit to the Department, within one hundred twenty (120) calendar days of notification, a RFI workplan for those units identified under Permit Module II.C.2. or Permit Module II.D(1). This RFI workplan(s) shall be developed to meet the requirements of Permit Module II.E.1(b).
- b. The RFI workplan(s) shall meet the requirements of Attachment B at a minimum. The workplan(s) shall include schedules of implementation and completion of specific actions necessary to determine the nature and extent of releases and the potential pathways of contaminant releases to the air, land, surface water, and ground water. The Permittee must provide sufficient justification and/or documentation to exclude particular media or pathways associated with a unit (ground water, surface water, soil, subsurface gas or air). Such deletions of a unit, medium or pathway from the RFI is subject to the approval of the Department. The Permittee shall provide sufficient written justification for any omissions or deviations from the requirements of Attachment B. Such omissions or deviations are subject to approval by the Department. In addition, the scope of the RFI workplan(s) shall include all investigations necessary to ensure compliance with NDAC § 33.1-24-05-58.
- c. The RFI workplan(s) must be approved by the Department, in writing,

prior to implementation. The letter approving the RFI workplan(s) shall specify the start date of the RFI workplan schedule. If the Department disapproves the RFI workplan(s), the Department shall either: (1) notify the Permittee, in writing, of the RFI workplan's deficiencies and specify a due date for submission of a revised RFI workplan or (2) revise the RFI workplan and notify the Permittee of the revisions and the start date of the schedule within the approved RFI workplan.

II.E.2. RFI Implementation

The Permittee shall implement the RFI(s) in accordance with the approved RFI workplan(s). The Permittee shall notify the Department no less than seven (7) calendar days prior to any sampling activity.

II.E.3. RFI Reports

- a. The Permittee shall provide the Department with RFI progress reports every ninety (90) calendar days beginning thirty (30) calendar days from the start date specified in the RFI workplan approval letter. The progress reports shall contain the following information at a minimum:
 1. A description of the portion of the RFI completed;
 2. Summaries of findings;
 3. Summaries of all deviation from the approved RFI workplan during the reporting period;
 4. Summaries of all problems, or potential problems, encountered during the reporting period;
 5. Projected work for the next reporting period; and
 6. Changes in personnel during the reporting period.
- b. The Permittee shall prepare and submit to the Department draft and final RFI report(s) for the investigations conducted pursuant to the workplan(s) submitted under Permit Module II.E.1. The draft RFI report(s) shall be submitted to the Department for review in accordance with the schedule in the approved RFI workplan(s). The final RFI report(s) shall be submitted within sixty (60) calendar days of receipt of the Department's comments on the draft RFI report. The RFI report(s) shall include all analyses and summary of all required investigations of SWMUs and AOCs and their results. The summary

shall describe the type and extent of contamination at the Facility, including sources and migration pathways, and a description of actual or potential receptors. The report(s) shall also describe the extent of contamination (qualitative and quantitative) in relation to background levels indicative of the area. The objective of this task shall be to ensure that the data generated during the investigation are sufficient in quality (e.g., quality assurance procedures have been followed) and quantity to describe the nature and extent of contamination, potential threat to human health and/or the environment, and to support a Corrective Measures Study (CMS), if necessary.

- c. The Department shall review the final RFI report(s). The Department shall notify the Permittee of the need for further investigative action and/or the need for a CMS to meet the requirements of Permit Module II.G. and NDAC § 33.1-24-05-58. The Department shall also notify the Permittee if no further action is required.

II.F. Interim Measures (“IM”)

II.F.1. IM Workplan

- a. Upon notification by the Department, the Permittee shall prepare and submit an IM workplan for any SWMU or AOC which poses a current or potential threat to human health or the environment. The IM workplan shall be submitted within sixty (60) calendar days of such notification and shall include the elements listed in Permit Module II.F.1(b). Such IM may be conducted concurrently with investigations required under the terms of this permit.
- b. The IM workplan shall ensure that the IM are designed to mitigate any current or potential threat(s) to human health or the environment and is consistent with and integrated into any long-term solution at the facility. The IM workplan shall include the IM objectives, procedures for implementation (including any designs, plans, or specifications), and schedules for implementation.
- c. The IM workplan must be approved, in writing, by the Department prior to implementation. The written approval shall specify the starting date of the IM workplan schedule. If the Department disapproves the IM workplan, the Department shall either: (1) notify the Permittee, in writing, of the IM workplan's deficiencies and specify a due date for

submission of a revised IM workplan or (2) revise the IM workplan and notify the Permittee of the revisions and the start date of the schedule within the approved IM workplan.

II.F.2. IM Implementation

- a. The Permittee shall implement the IM in accordance with the approved IM workplan.
- b. The Permittee shall provide seven (7) calendar days' notice to the Department of any planned changes, deletions, or additions to the IM workplan.
- c. Final approval of corrective action required under NDAC § 33.1-24-05-58 which is achieved through interim measures shall be in accordance with NDAC § 33.1-24-06-12 and Permit Module II.H. as a permit modification.

II.F.3. IM Reports

- a. If the scheduled completion time of IM is greater than three (3) months, the Permittee shall provide the Department with progress reports every ninety (90) days beginning thirty (30) calendar days from the starting date specified in the IM workplan approval letter. The progress reports shall contain the following information, at a minimum:
 1. A description of the portion of the IM completed;
 2. Summaries of all deviations from the IM workplan during the reporting period;
 3. Summaries of all problems, or potential problems, encountered during the reporting period;
 4. Projected work for the next reporting period; and
 5. Copies of laboratory/monitoring data generated during the reporting period;
- b. The Permittee shall prepare and submit to the Department, within sixty (60) calendar days of completion of IM conducted under Permit Module II.F., an IM report. The IM report shall contain the following information at a minimum:
 1. A description of the IM implemented;

2. Summaries of results;
3. Summaries of all problems encountered;
4. Summaries of accomplishments and/or effectiveness of IM; and
5. Copies of all relevant laboratory/monitoring data in accordance with Permit Module I.D.8.

II.G. Corrective Measure Study (“CMS”)

II.G.1. CMS Plan

- a. The Permittee shall prepare and submit a CMS plan for those units requiring a CMS within ninety (90) calendar days following receipt of written notification of: (1) approval by the Department of the RFI report and (2) a requirement by the Department to perform a CMS. This CMS plan shall be developed to meet the requirements of Permit Module II.G.1(b).
- b. The CMS plan shall include schedules of implementation and completion of specific actions necessary to complete a CMS that will meet the requirements of Attachment C. The Permittee shall provide sufficient written justification for any omissions or deviations from the minimum requirements of Attachment C. Such omissions or deviations are subject to the approval of the Department. The scope of the CMS plan shall include all investigations necessary to ensure compliance with NDCC 23.1-04-05 or NDAC Chapter 33.1-24-05 and NDAC § 33.1-24-06-05. The Permittee shall implement corrective actions beyond the facility boundary, where necessary, to protect human health and the environment unless the Permittee demonstrates, to the satisfaction of the Department, 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 off-site access is denied. On-site measures to address such releases will be determined on a case-by-case basis.
- c. The Department shall either approve or disapprove, in writing, the CMS plan. If the Department disapproves the CMS plan, the Department shall either: (1) notify the Permittee, in writing, of the CMS plan's deficiencies and specify a due date for submittal of a revised CMS plan

or (2) revise the CMS plan and notify the Permittee of the revisions. This modified CMS plan becomes the approved CMS plan.

- d. The Permittee shall implement the CMS according to the schedules specified in the CMS plan. Pursuant to Permit Module II.G.1(b), the CMS shall be conducted in accordance with the approved CMS plan.

II.G.2. CMS Report

- a. The Permittee shall provide the Department with progress reports every ninety (90) days beginning thirty (30) calendar days from the starting date specified in the CMS plan. The progress reports shall, at a minimum, contain the information specified in Task IV.A. of Attachment C.
- b. The Permittee shall prepare and submit to the Department a draft and final CMS report for the study conducted pursuant to the approved CMS plan. The draft CMS report shall be submitted to the Department in accordance with the schedule specified in the CMS plan. The final CMS report shall be submitted to the Department within sixty (60) calendar days of receipt of the Department's comments on the draft CMS report. The CMS final report shall summarize any bench-scale or pilot tests conducted, include an evaluation of each remedial alternative, and present all information gathered under the approved CMS plan. The CMS final report must contain adequate information to support the Department's decisions on the recommended remedy, described under Permit Module II.H.
- c. If the Department determines that the CMS final report does not fully satisfy the information requirements specified under Permit Module II.G.2(b), the Department may disapprove the CMS final report. If the Department disapproves the CMS final report, the Department shall notify the Permittee, in writing, of any deficiencies and specify a due date for submittal of a revised CMS final report. The Department shall also notify the Permittee if no further action is required.
- d. As specified under Permit Module II.G.2(b) (based on preliminary results and the CMS final report) the Department may require the Permittee to evaluate additional remedies or particular elements of one or more proposed remedies.

II.H. Remedy Approval and Permit Modification

1. A remedy or remedies shall be approved by the Department from the remedial alternatives evaluated in the CMS. The remedy or remedies shall be based, at a minimum, on protection of human health and the environment, existing law and regulations, and guidance.
2. Pursuant to NDAC § 33.1-24-06-12, a permit modification shall be initiated by the Department after selection of a remedy under Permit Module II.H(1).

II.I. Approved Remedies for Specific SWMUs and AOCs

As required in Module II.H., the Department has selected remedies for SMWUs and AOC requiring corrective measures to be implemented. These selected remedies are found in Attachment F.

II.J. Corrective Measures Implementation ("CMI")

II.J.1. CMI Plan

- a. The Permittee shall prepare and submit a CMI plan for the selected corrective measure(s) within ninety (90) calendar days of receipt of the Department's approval of the CMS. The CMI plan shall be developed to meet the requirements of Permit Module II.J.1(b).
- b. The CMI plan shall include information to document the overall management strategy for performing the design, construction, operation, maintenance and monitoring of corrective measure(s). The CMI plan shall be developed to meet the requirements of Attachment D unless written justification for any omissions or deviations are provided by the Permittee. Such omissions or deviations are subject to the approval of the Department.
- c. The Department shall either approve or disapprove, in writing, the CMI plan. If the Department disapproves the CMI, the Department shall either: (1) notify the Permittee, in writing, of the CMI plan's deficiencies and specify a due date for submittal of a revised CMI plan or (2) revise the CMI plan and notify the Permittee of the revisions. This modified CMI plan becomes the approved CMI plan.
- d. The Permittee shall implement the CM according to the schedules specified in the CMI plan. Pursuant to Permit Module II.J.1(b), the CMI shall be conducted in accordance with the approved CMI plan.

- e. The Permittee may be required to conduct additional ground water monitoring to evaluate the effectiveness of the selected corrective measures.

II.J.2. CMI Report

- a. The Permittee shall provide the Department with progress reports every ninety (90) days beginning thirty (30) calendar days from the starting date specified in the CMI plan. The progress reports shall, at a minimum, contain the information specified in Task IV.A. of Attachment D.
- b. The Permittee shall prepare and submit to the Department a draft and final report at the completion of the construction of the project(s). The final CMI report shall be submitted to the Department within sixty (60) calendar days of receipt of the Department's comments on the draft CMI report. The CMI final report shall document that the project is consistent with the design specifications and that the corrective measure(s) is/are performing adequately.
- c. If the Department determines that the CMI final report does not fully satisfy the information requirements specified under Permit Module II.J.2(b), the Department may disapprove the CMI final report and the Department shall notify the Permittee, in writing, of any deficiencies and specify a due date for submittal of a revised CMI final report.

II.K. Modification of the Corrective Action Compliance Schedule

1. If at any time the Department determines that modification of the Compliance Schedule (Attachment E) is necessary, the Department may initiate a modification to this schedule.
2. Modifications that are initiated or finalized by the Department shall be carried out according to the procedures in NDAC § 33.1-24-06-12 or 33.1-24-06-14.
3. Modifications to the Compliance Schedule do not constitute a re-issuance of the permit.

II.L. Imminent Hazards

1. The Permittee shall report to the Department any imminent or existing hazard to public health or the environment from any release of hazardous waste or hazardous constituents. Such information shall be reported orally within 24

hours from such time the Permittee becomes aware of the circumstances, as specified under Permit Module I.D.12.

2. A written report shall also be provided to the Department within fifteen (15) calendar days of the time the Permittee becomes aware of the circumstances. The written report shall contain information specified under Permit Module I.D.12(b)(2).

II.M Plan and Report Requirements

1. All plans and schedules shall be subject to approval by the Department prior to implementation. The Permittee shall revise all submittals and schedules as specified by the Department. Upon approval the Permittee shall implement all plans and schedules as written.
2. The results of all plans and reports shall be submitted in accordance with the approved schedule. Extensions of the due date for submittals may be granted by the Department based on the Permittee's demonstration that sufficient justification for the extension exists.
3. If the Permittee at any time determines that the written assessment required under Permit Module II.C or RFI workplan(s) required under Permit Module II.E no longer satisfies the requirement of NDAC § 33.1-24-05-58, or this permit, for prior continuing releases of hazardous waste or hazardous constituents from SWMUs or AOC, the Permittee shall submit an amended RFI workplan(s) to the Department within sixty (60) calendar days of such determination.
4. All final reports shall be signed and certified in accordance with NDAC § 33.1-24-06-03.
5. One copy of all reports and plans shall be submitted by the Permittee to the Department at the following address:

Derek Kannenberg, Manager
Hazardous Waste Program
NDDEQ Division of Waste Management
4201 Normandy Street
Bismarck, ND 58503-1324

[End of Module II]

ATTACHMENT A: SWMUS AND AOCs

DRAFT

Table 1: SWMUs and AOCs at GFAFB				
Designation	Description	ERP Number	Status	Regulatory Documentation
SWMU-1	Explosive Ordnance Detonation Area	OT-05	Closed	Decision Document – August 13, 1991
SWMU-2 ¹	Fire Training Area/Old Sanitary Landfill Area	FT-02	Long-Term Corrective Measure (30-year surface and groundwater sampling)	NDDEQ concurrence with October 1995 Decision Document AR#181
SWMU-3	Building 306 (Oil Contamination)	ST-04	Closed (Building demolition in 2003, 1800 yards soil removal, 1993-2003 soil vapor extraction)	Statement of Basis March 14, 2007
SWMU-4 ¹	New Sanitary Landfill Area	LF-03	Long-Term Corrective Measure (Landfill cap w/ groundwater monitoring wells; 30-year surface and groundwater sampling)	Decision Document – October 1995, updated 2007, AR#173
SWMU-5	Stormwater Sewer System		NFA was expected in last SWMU Summary	January 1997 meeting between NDDEQ and GFAFB
SWMU-6	Wastewater Treatment Lagoons		NFA recommended in SWMU Summary (1990 investigation found no contaminants)	January 1997 meeting between NDDEQ and GFAFB
SWMU-7	Oil/Water Separators (7a-q)		Closed (If accessible in the future, remediate at that time)	Decision Document – March 2002
SWMU-8	Waste Satellite Accumulation Areas Outdoor (8a-e)		NFA required based on the results from confirmation sampling and Jan 1997 meeting between NDDEQ and GFAFB	January 1997 meeting between NDDEQ and GFAFB
SWMU-9	Building 622 Acid Dip Room		NFA required based on sump cleaned and inspected in January 1994 and filled with concrete	January 1997 meeting between NDDEQ and GFAFB

Table 1 (Continued)

Designation	Description	ERP Number	Status	Regulatory Documentation
SWMU-10 ¹	POL Unloading Area	ST-07	Long Term Corrective Measure DD selected MNA with LTM Recent injections to create more oxygen and enhance MNA rates	NDDEQ Concurs w/Decision Document Sep 1995, AR#182
SWMU-11	POL Tank Containment Systems		Closed	January 1997 meeting between NDDEQ and GFAFB
SWMU-12	Abandoned Fuel Lines		NFA required - No contamination detected in soil or groundwater	January 1997 meeting between NDDEQ and GFAFB
SWMU-13	Refueling Ramps and PADs	ST-08	Natural attenuation with No further long- term monitoring	Statement of Basis March 14, 2007, Addendum I Statement of Basis- Remedy update July 6, 2012
SWMU-14	Hydrant Fuel Supply System	ST-08	Natural attenuation with No further long-term monitoring	Statement of Basis March 14 2007, Addendum I Statement of Basis- Remedy update July 6, 2012
SWMU-15	Waste Oil Accumulation Tanks		NFA required since contamination below levels of concern	January 1997 meeting between NDDEQ and GFAFB
SWMU-16	Bowser Northeast of Building 602		NFA required. Analytes non-detect or below risk-based concentration.	January 1997 meeting between NDDEQ and GFAFB
SWMU-17	Pole Yard Storage Area		NFA required. Analytical results below regulatory standards.	NDDEQ NFA letter dated January 3, 2001
SWMU-18	Scrap Storage Area		NFA required, January 1997 NDDEQ and GFAFB agreed	January 1997 meeting between NDDEQ and GFAFB

Table 1 (Continued)

Designation	Description	ERP Number	Status	Regulatory Documentation
SWMU-19	Underground Waste Storage Tanks (19a-n)		NFA required based on January 1997 meeting between NDDEQ and GFAFB Lack of USTs at locations and inability to remove contaminant due to buildings, roads, utilities.	Decision Document, March 2002
SWMU-20	Former Helicopter Wash Area		Immunoassay analyses of surface soil samples collected at this site detected no contaminants of concern	January 1997 meeting between NDDEQ and GFAFB
AOC A ¹	Former Building 539	TU504	<p>Long Term Corrective Measure Original Corrective Measures Implementation included MNA with annual groundwater monitoring in conjunction with a phytoremediation tree plot to control groundwater flow from the site.</p> <p>In 2016, remedy modification included hydraulic fracturing and injections of emulsified vegetable oil to promote reductive de-chlorination of chlorinated solvents.</p> <p>In 2023, remedy modification included in situ chemical oxidation through soil blending of a mixture of sodium persulfate and calcium peroxide.</p>	Statement of Basis, March 14, 2007, Addendum I Statement of Basis -Remedy Modification dated March 11, 2016 and Addendum II Statement of Basis – Remedy Modification dated March 11, 2023.

Designation	Description	ERP Number	Status	Regulatory Documentation
AOC B ¹	Building 501	TU503	Long Term Corrective Measure Monitored Natural Attenuation with Biennial Sampling	Statement of Basis, March 14, 2007
AOC C	Former Building 619		Closed	NDDEQ NFA Letter January 26, 2001

¹Areas under LTM (SWMU-2, 4, 10, and AOCs A and B) have reached a goal in corrective action of having the contaminants of concern under control, that is, although the contaminants remain, they do not pose an unacceptable risk to human health nor the environment. This is because the contaminants are effectively immobilized, undergoing passive degradation by naturally occurring organisms or being controlled by active degradation and control in one case. In all cases the contaminants are being monitored for concentration, by-products of degradation and mobility. For more details on any SWMU or AOC please see the applicable site information in Attachments F and G.

SWMU Number	Building Number
7-a	303
7-b	304
7-c	415
7-d	416
7-e	524
7-f	525
7-g	600/602
7-h	601/603
7-i	605
7-j	607
7-k	611
7-l	612
7-m	613
7-n	661
7-o	701
7-p	822
7-q	314

Table 3. SWMUs 8-a through 8-e (Oil/Water Separators)	
SWMU Number	Building Number
8-a	517
8-b	519
8-c	520
8-d	649
8-e	661

Table 4. SWMUs 19-a through 19-n (Underground Storage Tanks)	
SWMU Number	Building Number
19-a	306
19-b	415
19-c	200
19-d	649
19-e	661
19-f	649
19-g	661
19-h	663
19-i	737
19-j	761
19-k	610
19-l	817
19-m	822
19-n	823

ATTACHMENT B: SCOPE OF WORK FOR A RCRA FACILITY INVESTIGATION (“RFI”)

DRAFT

Purpose

The purpose of this RCRA Facility Investigation (RFI) is to determine the nature and extent of releases of hazardous waste or constituents from regulated units, solid waste management units, and other source areas at the facility and to gather all necessary data to support the CMS. The Permittee shall furnish all personnel, materials, and services necessary for, or incidental to, performing the RCRA remedial investigation at this facility.

Scope

The RFI consists of seven tasks:

Task I: Description of Current Conditions

- A. Facility Background
- B. Nature and Extent of Contamination
- C. Implementation of Interim Measures

Task II: Pre-Investigation Evaluation of Corrective Measure Technologies

Task III: RFI Workplan Requirements

- A. Project Management Plan
- B. Data Collection Quality Assurance Plan
- C. Data Management Plan
- D. Health and Safety Plan
- E. Community Relations Plan

Task IV: Facility Investigation

- A. Environmental Setting
- B. Source Characterization
- C. Contamination Characterization
- D. Potential Receptor Identification
- E. Risk Assessment

Task V: Investigation Analysis

- A. Protection Standards

Task VI: Laboratory and Bench-Scale Studies

Task VII: Reports

- A. Progress
- B. Draft and Final

Task I: Description of Current Conditions

The Permittee shall submit for Department approval a report providing the background information pertinent to the facility, contamination and IM as set forth below. The data gathered during any previous investigations or inspections and other relevant data shall be included.

A. Facility Background

The Permittee's report 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. The Permittee's report shall include:

1. Map(s) depicting the following:
 - a. General geographic location;
 - b. Property lines, with the owners of all adjacent property clearly indicated;
 - c. Topography and surface drainage (with a contour interval of two (2) feet and a scale of 1 inch = 100 feet) depicting all waterways, wetlands, floodplains, water features, drainage patterns, and surface water containment areas;
 - d. All tanks, buildings, utilities, paved areas, easements, rights-of-way, and other features;
 - e. All solid or hazardous waste treatment, storage or disposal areas active after November 19, 1980;
 - f. All known past solid or hazardous waste treatment, storage or disposal areas regardless of whether they were active on November 19, 1980;
 - g. All known past and present product and waste aboveground and underground tanks or piping directly related to SWMUs and AOC;
 - h. Surrounding land uses (residential, commercial, agricultural, recreational); and
 - i. The location of all production and ground water monitoring wells. These wells shall be clearly labeled and ground and top of casing elevations and construction details included (these elevations and details may be included as an attachment).

- j. All maps shall be consistent with the requirements set forth in NDAC § 33.1- 24-06-17 and be of sufficient detail and accuracy to locate and report all current and future work performed at the site.
2. A history and description of facility ownership and operation, solid and hazardous waste generation, treatment, storage and disposal activities at the facility;
3. Dates or periods of past product and waste spills, identification of the materials spilled, the amount spilled, the location where spilled, 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;
4. A summary of past permits requested and/or received, any enforcement actions and their subsequent responses, and a list of documents and studies prepared for the facility; and
5. A summary of all past and present product containers and tanks, including type of product, use, capacity of containers and tanks, and amounts present at facility.

B. Nature and Extent of Contamination

1. The Permittee shall prepare and submit for Department approval a report describing the existing information on the nature and extent of contamination.
2. The report shall summarize all possible source areas of contamination. This, at a minimum, should include all regulated units, SWMUs, spill areas, and other suspected source areas of contamination. For each area, the Permittee shall identify the following:
 - a. Location of unit/area (which shall be depicted on a facility map);
 - b. Quantities of solid and hazardous wastes;
 - c. Hazardous waste or constituents, to the extent known; and
 - d. Identification of areas where additional information is necessary.
3. The Permittee shall prepare an assessment and description of the existing degree and extent of contamination. This should include:
 - a. Available monitoring data and qualitative information on locations and levels of contamination at the facility;
 - b. All potential migration pathways including information on geology, pedology, hydrogeology, physiography, hydrology, water quality, meteorology, and air quality; and

- c. The potential impact(s) on human health and the environment, including demography, ground water and surface water use, flora, fauna, and land use.

C. *Implementation of Interim Measures*

The Permittee's report shall document IM which were or are being undertaken at the facility. This shall include:

1. Objectives of the IM: how the measure is mitigating a potential threat to human health and the environment and/or is consistent with and integrated into any long-term solution at the facility;
2. Design, construction, operation, and maintenance requirements;
3. Schedules for design, construction and monitoring; and
4. Schedule for progress reports.

Task II: Pre-Investigation Evaluation of Corrective Measure (CM) Technologies

Prior to starting the facility investigation, the Permittee shall submit to the Department a report that identifies the potential CM technologies that may be used on-site or off-site for the containment, treatment, remediation, and/or disposal of contamination. This report shall also identify any field data that needs to be collected in the facility investigation to facilitate the evaluation and selection of the final CM(s) (e.g., compatibility of waste and construction materials, information to evaluate effectiveness, treatability of wastes, etc.).

Task III: RFI Workplan Requirements

The Permittee shall prepare a RFI workplan. This RFI workplan shall include the development of several plans which shall be prepared concurrently. During the RFI, it may be necessary to revise the RFI workplan to increase or decrease the detail of information collected to accommodate the facility specific situation. The RFI workplan includes the following:

A. *Project Management Plan*

The Permittee shall prepare a project management plan which will include a discussion of the technical approach, schedules, budget, and personnel. The project management plan will also include a description of qualifications of personnel performing or directing the RFI, including contractor personnel. This plan shall also document the overall management approach to the RFI.

B. Data Collection Quality Assurance Plan

The Permittee shall prepare a plan to document all monitoring procedures: sampling, field measurements and sample analysis performed 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. Data Collection Strategy

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 these intended uses;
- b. Description of methods and procedures to be used to assess the precision, accuracy, and completeness of the measurement data;
- c. Description of the rationale used to assure that the data accurately and precisely represents a characteristic of a population, parameter variations at a sampling point, a process condition or an environmental condition. Examples of factors which shall be considered and discussed include:
 - i. Environmental conditions at the time of sampling;
 - ii. Number of sampling points;
 - iii. Representativeness of selected media; and
 - iv. Representativeness of selected analytical parameters.
- d. Description of the measures to be taken to assure that the following data sets can be compared to each other:
 - i. RFI data generated by the Permittee over some time period;
 - ii. RFI data generated by an outside laboratory or consultant versus data generated by the Permittee;
 - iii. Data generated by separate consultants or laboratories; and
 - iv. Data generated by an outside consultant or laboratory over some time period.
- e. Details relating to the schedule and information to be provided in quality assurance reports. The reports should include but not be limited to:

- i. Periodic assessment of measurement data accuracy, precision, and completeness;
- ii. Results of performance audits;
- iii. Results of system audits;
- iv. Significant quality assurance problems and recommended solutions; and
- v. Resolutions of previously stated problems.

2. Sampling

The sampling section of the Data Collection Quality Assurance Plan shall discuss:

- a. Selecting appropriate sampling location, depths, etc.;
- b. Providing a statistically sufficient number of sampling sites;
- c. Measuring all necessary ancillary data;
- d. Determining conditions under which sampling should be conducted;
- e. Determining which media are to be sampled (e.g., ground water, air, soil, sediment, etc.);
- f. Determining which parameters are to be measured and where;
- g. Selecting the frequency of sampling and length of sampling period;
- h. Selecting the types of sample (e.g., composites vs. grabs) and number of samples to be collected;
- i. Measures to be taken to prevent contamination of the sampling equipment and cross contamination between sampling points;
- j. Documenting field sampling operations and procedures, including:
 - i. Documentation of procedures for preparation of reagents or supplies which become an integral part of the sample (e.g., filters and absorbing reagents);
 - ii. Procedures and forms for recording the exact location and specific considerations associated with sample acquisition;
 - iii. Documentation of specific sample preservation method;
 - iv. Calibration of field devices;
 - v. Collection of replicate samples;

- vi. Submission of field-biased blanks, where appropriate;
 - vii. Potential interferences present at the facility;
 - viii. Construction materials and techniques associated with monitoring wells and piezometers;
 - ix. Field equipment listing and sample containers;
 - x. Sampling order; and
 - xi. Decontamination procedures.
- k. Selecting appropriate sample containers;
 - l. Sample preservation; and
 - m. Chain-of-custody, including:
 - i. Standardized field tracking reporting forms to establish sample custody in the field prior to and during shipment; and
 - ii. Pre-prepared sample labels containing all information necessary for effective sample tracking.

3. Field Measurements

The field measurements section of the Data Collection Quality Assurance Plan shall discuss:

- a. Selecting appropriate field measurement locations, depths, etc.;
- b. Providing a statistically sufficient number of field measurements;
- c. Measuring all necessary ancillary data;
- d. Determining conditions under which field measurement should be conducted;
- e. Determining which media are to be addressed by appropriate field measurements (e.g., ground water, air, soil, sediment, etc.);
- f. Determining which parameters are to be measured and where;
- g. Selecting the frequency of field measurement and length of field measurement period; and
- h. Documenting field measurement operations and procedures, including:

- i. Procedures and forms for recording raw data and the exact location, time, and facility-specific considerations associated with the data acquisition;
- ii. Calibration of field devices;
- iii. Collection of replicate measurements;
- iv. Submission of field-biased blanks, where appropriate;
- v. Potential interferences present at the facility;
- vi. Construction materials and techniques associated with monitoring wells and piezometers used to collect field data;
- vii. Field equipment listing;
- viii. Order in which field measurements were made; and
- ix. Decontamination procedures.

4. Sample Analysis

The sample analysis section of the Data Collection Quality Assurance Plan shall specify the following:

- a. Chain-of-custody procedures, including:
 - i. Identification of a responsible party to act as sample custodian at the laboratory facility authorized to sign for incoming field samples, obtain documents of shipment, and verify the data entered onto the sample custody records;
 - ii. Provision for a laboratory sample custody log consisting of serially numbered standard lab-tracking report sheets; and
 - iii. Specification of laboratory sample custody procedures for sample handling, storage, and disbursement for analysis.
- b. Sample storage procedures and storage times;
- c. Sample preparation methods;
- d. Analytical procedures, including:
 - i. Scope and application of the procedure;
 - ii. Sample matrix;
 - iii. Potential interferences;

- iv. Precision and accuracy of the methodology; and
- v. Instrumentation detection limits.
- e. Calibration procedures and frequency;
- f. Data reduction, validation, and reporting;
- g. Internal quality control checks, laboratory performance, and systems audits and frequency, including:
 - i. Method blank(s);
 - ii. Laboratory control sample(s);
 - iii. Calibration check sample(s);
 - iv. Replicate sample(s);
 - v. Matrix-spiked sample(s);
 - vi. "Blind" quality control sample(s);
 - vii. Control charts;
 - viii. Surrogate samples;
 - ix. Zero and span gases; and
 - x. Reagent quality control checks.
- h. Preventive maintenance procedures and schedules;
- i. Corrective action (for laboratory problems); and
- j. Turnaround time.

C. *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, project file requirements, and project-related progress reporting procedures and documents. The plan shall also provide the format to be used to present the raw data and conclusions of the investigation.

1. Data Record

The data record shall include the following:

- a. Unique sample or field measurement code;

- b. Sampling or field measurement location and sample or measurement type;
 - c. Sampling or field measurement raw data;
 - d. Laboratory analysis ID number;
 - e. Property or component measured; and
 - f. Result of analysis (e.g., concentration).
2. Tabular Displays
- The following data shall be presented in tabular displays:
- a. Unsorted (raw) data;
 - b. Results for each medium or for each constituent monitored;
 - c. Data reduction for statistical analysis;
 - d. Sorting of data by potential stratification factors (e.g., location, soil layer, topography); and
 - e. Summary data.
3. Graphical Displays
- The following data shall be presented in graphical formats (e.g., bar graphs, line graphs, area or plan maps, isopleth plots, cross-sectional plots or transects, three-dimensional graphs, etc.):
- a. Display sampling location and sampling grid;
 - b. Indicate boundaries of sampling area and areas where more data are required;
 - c. Displays levels of contamination at each sampling location;
 - d. Display geographical extent of contamination;
 - e. Display contamination levels, averages, and maxima;
 - f. Illustrate changes in concentration in relation to distance from the source, time, depth or other parameters; and
 - g. Indicate features affecting intramedia transport and show potential receptors.

D. Health and Safety Plan

The Permittee shall prepare a facility health and safety plan.

1. Major elements of the health and safety plan shall include:
 - a. Facility description including availability of resources such as roads, water supply, electricity, and telephone service;
 - b. Describe the known hazards and evaluate the risks associated with the incident and with each activity conducted;
 - c. List key personnel and alternates responsible for site safety, responses operations, and for protection of public health;
 - d. Delineate work area;
 - e. Describe levels of protection to be worn by personnel in work area;
 - f. Establish procedures to control site access;
 - g. Describe decontamination procedures for personnel and equipment;
 - h. Establish site emergency procedures;
 - i. Address emergency medical care for injuries and toxicological problems;
 - j. Describe requirements for an environmental surveillance program;
 - k. Specify any routine and special training required for responders; and
 - l. Establish procedures for protecting workers from weather-related problems.
2. The facility health and safety plan shall be consistent with:
 - a. NIOSH Occupational 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. Facility contingency plan;
 - e. EPA Standard Operating Safety Guide (1984);
 - f. OSHA regulations, particularly in 29 CFR 1910 and 1926;
 - g. State and local regulations; and
 - h. Other EPA guidance as provided.

E. *Community Relations Plan*

The Permittee shall prepare a plan for the dissemination of information to the public regarding investigation activities and results.

Task IV: Facility Investigation

The Permittee shall conduct those investigations necessary to characterize the facility (environmental setting); define the source (source characterization); define the degree and extent of contamination (contamination characterization); identify actual or potential receptors, and determine the impact(s) of contamination on human health and/or ecological receptors (risk assessment). For reporting of the ecological assessment, refer to "The Risk Assessment Volume II Manual" [EPA/540/1-89/002 AND 001, March 1989].

The investigations should result in data of adequate technical quality to support the development and evaluation of the CM alternative or alternatives during the CMS.

The investigation activities shall follow the plans set forth in Task III of Attachment B. 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.

A. *Environmental Setting*

The Permittee shall collect information to supplement and verify existing information on the environmental setting at the facility. The Permittee shall characterize the following:

1. Hydrogeology

The Permittee shall conduct a program to evaluate hydrogeologic conditions at the facility. This program shall provide the following information:

- a. A description of the regional and facility-specific geologic and hydrogeologic characteristics affecting ground water flow beneath the facility, including:
 - i. Regional and facility-specific stratigraphy: description of strata including strike and dip, identification of stratigraphic contacts;
 - ii. Structural geology: Description of local and regional structural features (e.g., folding, faulting, tilting, jointing, etc);
 - iii. Depositional history;
 - iv. Identification and characterization of areas and amounts of recharge and discharge;
 - v. Regional and facility-specific ground water flow patterns; and

- vi. Characterize seasonal and temporal variations in the ground water flow regime.
- b. An analysis of any topographic features that might influence the ground water flow system. (Note: Stereographic analysis of aerial photographs may aid in this analysis).
- c. Based on field data, test, and cores, a representative and accurate classification and description of the hydrogeologic units which may be part of the migration pathways at the facility (i.e., the aquifers and any intervening saturated and unsaturated units), including:
 - i. Hydraulic conductivity and porosity (total and effective);
 - ii. Lithology, grain size, sorting, degree of cementation;
 - iii. An interpretation of hydraulic interconnections between saturated zones;
 - iv. The attenuation capacity and mechanisms of the natural earth materials (e.g., ion exchange capacity, organic carbon content, mineral content, etc.); and
 - v. Recording the depth to the immiscible layer(s) and the thickness of the immiscible layer(s) when immiscible contaminants are present, either floating on or at the bottom of the water column.
- d. Based on field studies and cores, structural geology and hydrogeologic cross- sections showing the extent (depth, thickness, lateral extent) of hydrogeologic units which may be part of the migration pathways identifying:
 - i. Sand and gravel deposits in unconsolidated deposits;
 - ii. Zones of fracturing or channeling in consolidated or unconsolidated deposits;
 - iii. Zones of higher permeability or low permeability that might direct and restrict the flow of contaminants;
 - iv. The uppermost aquifer: geologic formation, group of formations or part of a formation capable of yielding a significant amount of ground water to wells or springs; and
 - v. Water-bearing zones above the first confining layer that may serve as a pathway for contaminant migration including perched zones of saturation.

- e. Based on data obtained from ground water monitoring wells and piezometers installed upgradient and downgradient of the potential contaminant source, a representative description of water level or fluid pressure monitoring including:
 - i. Water-level contour and/or potentiometric maps;
 - ii. Hydrologic cross-sections showing vertical gradients;
 - iii. The flow system, including the vertical and horizontal components of flow; and
 - iv. Any temporal changes in hydraulic gradients, for example, due to tidal or seasonal influences.
- f. A description of manmade influences that may affect the hydrogeology of the site, identifying:
 - i. Active and inactive local water supply and production wells with an approximate schedule of pumping; and
 - ii. Manmade hydraulic structures (pipelines, french drains, ditches, unlined ponds, septic tanks, North Dakota Pollutant Discharge Elimination System outfalls, retention areas, etc.).

2. Soils

The Permittee shall conduct a program to characterize the soil and rock units above the water table in the vicinity of the contaminant release(s). Such characterization shall include, but not be limited to, the following information:

- a. Surface soil distribution;
- b. Hydraulic conductivity (saturated and unsaturated);
- c. Relative permeability;
- d. Porosity;
- e. Soil sorptive capacity;
- f. Cation Exchange Capacity (CEC);
- g. Soil organic content;
- h. Effect of stratification on unsaturated flow;
- i. Infiltration;
- j. Storage capacity;

- k. Vertical flow rate; and
 - l. Depth of water table.
3. Surface Water and Sediment

The Permittee shall conduct a program to characterize the surface water bodies in the vicinity of the facility. Such characterization shall include, but not be limited to, the following activities and information:

- a. Description of the temporal and permanent surface water bodies including:
 - i. For impoundments: location, elevation, surface area, depth, volume, freeboard, and purpose of impoundment;
 - ii. For rivers, streams, ditches, drains, swamps and channels: location, elevation, flow, velocity, depth, width, seasonal fluctuations, and flooding tendencies (i.e., 100-year event); and
 - iii. Drainage patterns.
 - b. Description of the chemistry of the natural surface water and sediments. This includes determining the pH, total dissolved solids, total suspended solids, biological oxygen demand, alkalinity, conductivity, dissolved oxygen profiles, nutrients (NH_3 , $\text{NO}_3^-/\text{NO}_2^-$, PO_4^{-3}), chemical oxygen demand, total organic carbon, specific contaminant concentrations, etc.
 - c. Description of sediment characteristics including:
 - i. Deposition area;
 - ii. Thickness profile; and
 - iii. Physical and chemical parameters (e.g., grain size, density, organic carbon content, ion exchange capacity, pH, etc.).
4. Air

The Permittee shall provide information characterizing the climate in the vicinity of the facility. Such information shall include, but not be limited to:

- a. A description of the following parameters:
 - i. Annual and monthly rainfall averages;
 - ii. Monthly temperature averages and extremes;
 - iii. Wind speed and direction;

- iv. Relative humidity/dew point;
 - v. Atmospheric pressure;
 - vi. Evaporation data;
 - vii. Development of inversions; and
 - viii. Climate extremes that have been known to occur in the vicinity of the facility, including frequency of occurrence.
- b. A description of topographic and manmade features which affect air flow and emission patterns, including:
- i. Ridges, hills or mountain areas;
 - ii. Canyons or valleys;
 - iii. Surface water bodies (e.g., rivers, lakes, bays, etc.);
 - iv. Wind breaks and forests; and
 - v. Buildings.

B. Source Characterization

The Permittee shall collect analytic data to completely characterize the wastes and the areas where wastes have been placed, collected or removed including: type, quantity, physical form, disposition (containment or nature of deposits), and facility characteristics affecting release (e.g., facility security, and engineered barriers). This shall include quantification of the following specific characteristics at each source area:

1. Unit/Disposal Area characteristics:
 - a. Location of unit/disposal area;
 - b. Type of unit/disposal area;
 - c. Design features;
 - d. Operating practices (past and present);
 - e. Period of operation;
 - f. Age of unit/disposal area;
 - g. General physical conditions;
 - h. Method used to close the unit/disposal area; and

- i. Determine if there is potential for continuing release by any closed unit/area.
2. Waste Characteristics:
 - a. Type of waste:
 - i. Hazardous classification (e.g., flammable, reactive, oxidizing or reducing agent);
 - ii. Quantity; and
 - iii. Chemical composition.
 - b. Physical and chemical characteristics:
 - i. Physical form (solid, liquid, gas);
 - ii. Physical description (e.g., powder, oily sludge);
 - iii. General chemical class (e.g., acid, base, solvent);
 - iv. Density and molecular weight;
 - v. Viscosity;
 - vi. Cohesiveness of the waste;
 - vii. Solubility in water;
 - viii. Flash point; and
 - ix. Boiling point.
 - c. Migration and dispersal characteristics of the waste:
 - i. Sorption;
 - ii. Biodegradability, bioconcentration, biotransformation;
 - iii. Photodegradation rates;
 - iv. Hydrolysis rates; and
 - v. Chemical transformations.

The Permittee shall document the procedures used in making the above determinations.

C. *Contamination Characterization*

The Permittee shall collect analytical data on ground water, soils, surface water, sediment, and subsurface gas contamination in the vicinity of the facility. This data shall

be sufficient to define the extent, origin, direction, and rate of movement of contaminant plumes. Data shall include time and location of sampling, media sampled, concentrations found, conditions during sampling, and the identity of the individuals performing the sampling and analysis. The Permittee shall address the following types of contamination at the facility:

1. Ground Water Contamination

The Permittee shall conduct a ground water investigation to characterize any plumes of contamination at the facility. This investigation shall, at a minimum, provide the following information:

- a. A description of the horizontal and vertical extent of any immiscible or dissolved plume(s) originating from the facility;
- b. Available monitoring data and qualitative information on locations and levels of contamination at the facility;
- c. The horizontal and vertical direction of contamination movement;
- d. The velocity of contaminant movement;
- e. The horizontal and vertical concentration profiles of Appendix XII of NDAC Chapter 33.1-24-05 constituents in the plume(s);
- f. An evaluation of factors influencing the plume movement;
- g. An extrapolation of future contaminant movement;
- h. All potential migration pathways including information on geology, pedology, hydrogeology, physiography, hydrology, and water quality;
- i. Completely characterize the contaminants; and
- j. Determine if contaminants are the same in all areas of facility. If not, delineate the areas that contain different types of contaminants.

The Permittee shall document the procedures used in making the above determinations (e.g., well design, well construction, geophysics, modeling, etc.).

2. Soil Contamination

The Permittee shall conduct an investigation to characterize the contamination of the soil and rock units above the water table in the vicinity of the contaminant release. The investigation shall include the following information:

- 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 and plume. This includes contaminant solubility, speciation, adsorption, leachability, exchange capacity, biodegradability, hydrolysis, photolysis, oxidation, and other factors that might affect contaminant migration and transformation.
- c. Specific contaminant concentration.
- d. The velocity and direction of contaminant movement.
- e. The extrapolation of future contaminant movement.

The Permittee shall document the procedures used in making the above determinations.

3. Surface Water and Sediment Contamination

The Permittee shall conduct a surface water investigation to characterize contamination in surface water bodies resulting from contaminant releases at the facility.

The investigation shall include, but not be limited to, the following information:

- a. A description of the horizontal and vertical extent of any immiscible or dissolved plume(s) originating from the facility and the extent of contamination in underlying sediments;
- b. The horizontal and vertical direction of contaminant movement;
- c. The contaminant velocity;
- d. An evaluation of the physical, biological, and chemical factors influencing contaminant movement;
- e. An extrapolation of future contaminant movement; and
- f. A description of the chemistry of the contaminated surface waters and sediments. This includes determining the pH, total dissolved solids, specific contaminant concentration, etc.;

The Permittee shall document the procedures used in making the above determinations.

4. Air Contamination

The Permittee shall conduct an investigation to characterize the particulate and gaseous contaminants released into the atmosphere. This investigation shall provide the following information:

- a. A description of the horizontal and vertical direction and velocity of contaminant movement;
- b. The rate and amount of the release; and
- c. The chemical and physical composition of the contaminant(s) released, including horizontal and vertical concentration profiles.

The Permittee shall document the procedures used in making the above determinations.

5. Subsurface Gas Contamination

The Permittee shall conduct an investigation to characterize subsurface gases emitted from buried hazardous waste and hazardous constituents in the ground water. This investigation shall include the following information:

[NOTE: If this is not applicable to the buried wastes on-site, document the procedures used in making this determination.]

- a. A description of the horizontal and vertical extent of subsurface gases mitigation;
- b. The chemical composition of the gases being emitted;
- c. The rate, amount, and density of the gases being emitted; and
- d. Horizontal and vertical concentration profiles of the subsurface gasses emitted.

The Permittee shall document the procedures used in making the above determinations.

D. Potential Receptor Identification

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

1. Local uses and possible future uses of ground water:
 - a. Type of use (e.g., drinking water source: municipal or residential, agricultural, domestic/non-potable, and industrial); and
 - b. Location of ground water users, including wells and discharge areas.

2. Local uses and possible future uses of surface waters draining the facility:
 - a. Domestic and municipal (e.g., potable and lawn/gardening watering);
 - b. Recreational (e.g., swimming, fishing);
 - c. Agricultural;
 - d. Industrial; and
 - e. Environmental (e.g., fish and wildlife propagation).
3. Human use of or access to the facility and adjacent lands, including, but not limited to:
 - a. Recreation;
 - b. Hunting;
 - c. Residential;
 - d. Commercial;
 - e. Zoning;
 - f. Relationship between population locations and prevailing wind direction; and
 - g. The potential impact(s) on human health including demography, ground water and surface water use, and land use.
4. A description of the biota on/in surface water bodies on, adjacent to, or affected by the facility.
5. A description of the ecology overlying and adjacent to the facility.
6. A demographic profile of the people who use or have access to the facility and adjacent land, including, but not limited to; age, sex, and sensitive subgroups.
7. A description of any endangered or threatened species near the facility.

E. Risk Assessment

The baseline risk assessment is an analysis of the potential adverse health effects caused by hazardous substance releases from a site in the absence of any actions to control or mitigate these releases (under the assumption of no action). The baseline risk assessment contributes to the site characterization and subsequent development, evaluation, and selection of appropriate response alternatives. There are four steps in the risk assessment process.

1. Determine contaminants of concern: Data collection and evaluation involve the gathering and analyzing of site data relevant to the human health evaluation and identifying the substances present at the site that are the focus of the risk assessment process.
2. Exposure assessment: Using the procedure outlined in Section D for determining potential receptors, estimate the magnitude of actual and/or potential human exposures, the frequency and duration of these exposures, and the pathways by which humans are potentially exposed. In the exposure assessment, reasonable maximum estimates of exposure are developed for both current and future land-use assumptions.
3. Toxicity assessment: This component of the risk assessment considers the types of adverse health effects associated with chemical exposures and the relationship between the magnitude of exposure and adverse effects.
4. Risk Characterization: This summarizes and combines outputs of the exposure and toxicity and assessments to characterize baseline risk, both in quantitative expressions and qualitative statements.

Task V: Investigation Analysis

The Permittee shall prepare an analysis and summary of all facility investigations and their results. The objective of this task shall be to ensure that the investigation data are sufficient in quality (e.g., quality assurance procedures have been followed) and quantity to describe the nature and extent of contamination, potential threat to human health and/or the environment, and to support the CMS.

A. Protection Standards

1. Ground Water Protection Standards

For the facility, the Permittee shall provide information to support the Department's selection/development of Ground Water Protection Standards for all of the Appendix XII of NDAC Chapter 33.1-24-05 constituents found in the ground water during the Facility Investigation (TASK IV of Attachment B).

- a. The Ground Water Protection Standards shall consist of:
 - i. For any constituents listed in Table 1 of NDAC § 33.1-24-05-51, the respective value (MCL) given in that table the background level of the constituent is below those given in Table 1; or
 - ii. The background level of that constituent in the ground water; or
 - iii. A Department-approved Alternate Concentration Limit (ACL).

- b. Information to support the Department's subsequent selection of ACLs shall be developed by the Permittee in accordance with U.S. EPA guidance. For any proposed ACLs, the Permittee shall include a justification based upon the criteria set forth in NDAC § 33.1-24-05-51(2).
2. Other Relevant Protection Standards

The Permittee shall identify all relevant and applicable standards for the protection of human health and the environment (e.g., federally-approved state water quality standards, etc.).

Task VI: Laboratory and Bench-Scale Studies

The Permittee shall conduct laboratory and/or bench-scale studies to determine the applicability of a corrective measure technology or technologies to facility conditions. The Permittee shall analyze the technologies, based on literature review, vendor contracts, and past experience to determine the testing requirements.

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

Upon completion of the 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.

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

[NOTE: Submit any future and/or previous laboratory and bench-scale studies using the above criteria.]

Task VII: Reports

A. Progress

The Permittee shall provide the Department with RFI progress reports every ninety (90) calendar days beginning sixty (60) calendar days from the start date specified in the RFI workplan approval letter. The progress reports shall contain the following information at a minimum:

1. A description of the portion of the RFI completed;
2. Summaries of findings;
3. Summaries of all deviations from the approved RFI workplan during the reporting period;
4. Summaries of all problems or potential problems encountered during the reporting period;

5. Projected work for the next reporting period;
6. Changes in personnel during the reporting period.

B. Draft and Final

The Permittee shall prepare and submit to the Department draft and final RFI report(s) for the investigations conducted, pursuant to the workplan(s) submitted under Permit Module II.E.1. The draft RFI report(s) shall be submitted to the Department for review in accordance with the schedule in the approved RFI workplan(s). The final RFI report(s) shall be submitted within sixty (60) calendar days of receipt of the Department's comments on the draft RFI report. The RFI report(s) shall include all analyses and summary of all required investigations of SWMUs and AOC and their results. The summary shall describe the type and extent of contamination at the facility, including sources and migration pathways, and a description of actual or potential receptors. The report(s) shall also describe the extent of contamination (qualitative and quantitative) in relation to background levels indicative of the area.

The objective of this task shall be to ensure that the data generated during the investigation are sufficient in quality (e.g., quality assurance procedures have been followed) and quantity to describe the nature and extent of contamination, potential threat to human health and/or the environment, and to support a CMS, if necessary.

ATTACHMENT C: SCOPE OF WORK FOR A CORRECTIVE MEASURE STUDY (“CMS”)

DRAFT

Purpose

The purpose of this Corrective Measure Study (CMS) is to develop and evaluate the corrective action alternative or alternatives and to recommend the corrective measure or measures to be taken at the facility. The Permittee will furnish the personnel, materials, and services necessary to prepare the CMS, except as otherwise specified.

Scope

The CMS consists of four tasks:

Task I: Identification and Development of the Corrective Measure Alternative or Alternatives

- A. Description of Current Situation
- B. Establishment of Corrective Action Objectives
- C. Screening of Corrective Measures Technologies
- D. Identification of the Corrective Measure Alternative or Alternatives

Task II: Evaluation of the Corrective Measure Alternative or Alternatives

- A. Technical/Environmental/Human Health/Institutional
- B. Cost Estimate

Task III: Justification and Recommendation of the Corrective Measure or Measures

- A. Technical
- B. Environmental
- C. Human Health

Task IV: Reports

- A. Progress
- B. Draft
- C. Final

Task I: Identification and Development of the Corrective Action Alternative or Alternatives

Based on the results of the RFI and consideration of the identified preliminary corrective measure technologies (Task II of Attachment B), the Permittee shall identify, screen and develop the alternative or alternatives for removal, containment, treatment and/or other remediation of the contamination based on the objectives established for the corrective action.

A. *Description of Current Situation*

The Permittee shall submit an update to the information describing the current situation at the facility and the known nature and extent of the contamination as documented by the RFI report. The Permittee shall provide an update to information presented in Task I of Attachment B of the RFI to the Department regarding previous response activities and any interim measures which have or are being implemented at the facility. The Permittee shall also make a facility-specific statement of the purpose for the response, based on the results of the RFI. The statement of purpose should identify the actual or potential exposure pathways that should be addressed by corrective measures.

B. *Establishment of Corrective Action Objectives*

The Permittee, in conjunction with the Department, shall establish site-specific objectives for the corrective action. These objectives shall be based on public health, environmental and ecological criteria, information gathered during the RFI, EPA guidance, and the requirements of any applicable federal and state statutes. At a minimum, all corrective actions concerning ground water releases must be consistent with, and as stringent as, those required under NDAC § 33.1-24-05-57.

C. *Screening of Corrective Measure Technologies*

The Permittee shall review the results of the RFI and reassess the technologies specified in Task II of Attachment B and to identify additional technologies which are applicable at the facility. The Permittee shall screen the preliminary corrective measure technologies identified in Task II of Attachment B of the RFI and any supplemental technologies to eliminate those that may prove infeasible to implement, that rely on technologies unlikely to perform satisfactorily or reliably or that do not achieve the corrective measure objective within a reasonable time period. This screening process focuses on eliminating those technologies which have severe limitations for a given set of waste and site-specific conditions. The screening step may also eliminate technologies based on inherent technology limitations. Site, waste, and technology 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 that 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 these waste characteristics should be eliminated from consideration.

Waste characteristics particularly affect the feasibility of in-situ methods, direct treatment methods, and land disposal (on/off-site); and

3. Technology Limitations

During the screening process the level of technology development performance record and inherent construction, operation, and maintenance problems should be identified for each technology considered. Technologies that are unreliable, perform poorly, or are not fully demonstrated may be eliminated in the screening process. For example, certain treatment methods have been developed to a point where they can be implemented in the field without extensive technology transfer or development.

D. Identification of the Corrective Measure Alternative or Alternatives

The Permittee shall develop the corrective measure alternative or alternatives based on the corrective action objectives and analysis of preliminary corrective measure technologies, as presented in Task II of Attachment B of the RFI and as supplemented following the preparation of the RFI report.

The Permittee shall rely on engineering practice to determine which of the previously identified technologies appear most suitable for the site. Technologies can be combined to form the overall corrective action alternative or alternatives. The alternative or alternatives developed should represent a workable number of option(s) that each 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, identified in Task II of Attachment B, as supplemented in the development of the alternative or alternatives.

Task II: Evaluation of the Corrective Measure Alternative or Alternatives

The Permittee shall describe each corrective measure alternative that passes through the initial screening in Task I of Attachment C and evaluate each corrective measure alternative and its component. The evaluation shall be based on technical, environmental, human health, and institutional concerns. The Permittee shall also develop cost estimates of each corrective measure.

A. Technical/Environmental/Human Health/Institutional

The Permittee shall provide a description of each corrective measure 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:

1. Technical

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

- a. The Permittee shall evaluate performance based on the effectiveness and useful life of the corrective measure:
 - i. 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; and
 - ii. Useful life is defined as the length of time the level of effectiveness can be maintained. Most corrective measure technologies, with the exception of destruction, deteriorate with time. Often, deterioration can be slowed through proper system operation and maintenance, but the technology eventually may require replacement. 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.
- b. The Permittee shall provide information on the reliability of each corrective measure including their operation and maintenance requirements and their demonstrated reliability:
 - i. Operation and maintenance requirements include the frequency and complexity of necessary 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; and
 - ii. Demonstrated and expected reliability is a way of measuring the risk and effect of failure. The Permittee should evaluate whether the 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.

- c. The Permittee shall describe the implementability of each corrective measure including the relative ease of installation (constructability) and the time required to achieve a given level of response:
 - i. Constructability is determined by conditions both internal and external to the facility conditions and includes such items as location of underground utilities, depth to water table, heterogeneity of subsurface materials, and location of the facility (i.e., remote location vs. a congested urban area). The Permittee shall evaluate what measures can be taken to facilitate construction under these 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; and
 - ii. Time has two components that shall be addressed: the time it takes to implement a corrective measure and the time it takes to actually see beneficial results. Beneficial results are defined as the reduction of contaminants to some acceptable, pre-established level.
- d. The Permittee shall evaluate each corrective measure 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 are fire, explosion, and exposure to hazardous substances.

2. Environment

The Permittee shall perform an environmental assessment for each alternative. The environmental assessment shall focus on the facility conditions and pathways of contamination actually addressed by each alternative. The environmental 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, any adverse effects on environmentally sensitive areas, and an analysis of measures to mitigate adverse effects.

3. Human Health

The Permittee shall assess each alternative in terms of the extent of 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 of characterizations of contaminants on-site, potential exposure routes, and potentially affected population. 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 guidelines acceptable to the Department.

4. 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.

B. Cost Estimate

The Permittee shall develop an estimate of the cost of each corrective measure alternative (and for each phase or segment of the alternative). The cost estimate shall include both capital and operation and maintenance costs.

1. Capital costs consist of direct (construction) and indirect (non-construction and overhead) costs.

a. Direct capital costs include:

- i. Construction costs: costs of materials, labor (including fringe benefits and worker's compensation), and equipment required to install the corrective measure;
- ii. Equipment costs: costs of treatment, containment disposal and/or service equipment necessary to implement the action; these materials remain until the corrective action is complete;
- iii. Land and site-development costs: expenses associated with purchase of land and development of existing property; and
- iv. Buildings and services costs: costs of process and non-process buildings, utility connections, purchased services, and disposal costs.

b. Indirect capital costs include:

- i. Engineering expenses: costs of administration, design, construction supervision, drafting, and testing of corrective measure alternatives;

- ii. Legal fees and license or permit costs: administrative and technical costs necessary to obtain licenses and permits for installation and operation;
 - iii. Startup and shakedown costs: costs incurred during corrective measure startup; and
 - iv. Contingency allowances: funds to cover costs resulting from unforeseen circumstances, such as adverse weather conditions, strikes, and inadequate facility characterization.
2. 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:
- a. Operating labor costs: wages, salaries, training, overhead, and fringe benefits associated with the labor needed for post-construction operations;
 - b. Maintenance materials and labor costs: costs for labor, parts, and other resources required for routine maintenance of facilities and equipment;
 - c. Auxiliary materials and energy: costs of such items as chemicals and electricity for operations, water and sewer service, and fuel;
 - d. Purchased services: sampling costs, laboratory fees, and professional fees for which the need can be predicted;
 - e. Disposal and treatment costs: costs of transporting, treating, and disposing of waste materials such as residues, recovered product, sludges from tanks the recovered product may produce, etc., generated during operations;
 - f. Administrative costs: costs associated with administration of corrective measure operations and maintenance not included under other categories;
 - g. Insurance, taxes, and licensing costs: costs of such items as liability and sudden accidental insurance, real estate taxes on purchased land or rights-of-way, licensing fees for certain technologies, and permit renewal and reporting costs;
 - h. Maintenance reserve and contingency funds: annual payments into escrow funds to cover: (1) costs of anticipated replacement or rebuilding of equipment and (2) any large, unanticipated operation and maintenance costs; and

- i. Other costs. Items that do not fit any of the above categories.

Task III: Justification and Recommendation of the Corrective Measure(s)

The Permittee shall justify and recommend a corrective measure alternative using technical, human health, and environmental criteria. This recommendation shall include summary tables which allow the alternative or alternatives to be understood easily. Tradeoffs among health risks, environmental effects, and other pertinent factors shall be highlighted. The Department will select the corrective measure alternative or alternatives to be implemented based on the results of Tasks II and III of Attachment C. At a minimum, the following criteria will be used to justify the final corrective measure or measures.

A. Technical

1. Performance: Corrective measure or measures which are most effective at performing their intended functions and maintaining the performance over extended periods of time will be given preference;
2. Reliability: Corrective measure or measures which do not require frequent or complex operation and maintenance activities and that have proven effective under waste and facility conditions similar to those anticipated will be given preference;
3. Implementability: Corrective measure or measures which can be constructed and operating to reduce levels of contamination to attain or exceed applicable standards in the shortest period of time will be preferred; and
4. 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.

B. Human Health

The corrective measure or measures must comply with existing U.S. EPA/Department criteria, standards or guidelines 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.

C. Environmental

The corrective measure or measures posing the least adverse impact (or greatest improvement) over the shortest period of time on the environment will be favored.

Task IV: Reports

The Permittee shall prepare a CMS report representing the results of Task I through Task III of Attachment C and recommending a corrective measure alternative. Two copies of the preliminary report shall be provided by the Permittee.

A. Progress

The Permittee shall, at a minimum, provide the Department with signed progress reports every ninety (90) calendar days containing:

1. A description and estimate of the percentage of the CMS completed;
2. Summaries of all findings;
3. Summaries of all changes made in the CMS during the reporting period;
4. Summaries of all contacts with representatives of the local community, public interest groups or state government during the reporting period;
5. Summaries of all problems or potential problems encountered during the reporting period;
6. Actions being taken to rectify problems;
7. Changes in personnel during reporting period;
8. Projected work for the next reporting period.

B. Draft

The Report shall, at a minimum, include:

1. A description of the facility;
 - a. Site topographic map and preliminary layouts.
2. The corrective measure or measures:
 - a. Description of the corrective measure or measures and rationale for selection;
 - b. Performance expectations;
 - c. Preliminary design criteria and rationale;
 - d. General operation and maintenance requirements; and
 - e. Long-term monitoring requirements.
3. A summary of the RFI and impact of the selected corrective measure or measures;

- a. Field studies (ground water, surface water, soil, air); and
 - b. Laboratory studies (bench-scale, pick-scale).
4. Design and implementation precautions;
- a. Special technical problems;
 - b. Additional engineering data required;
 - c. Permits and regulatory requirements;
 - d. Access, easements, right-of-way;
 - e. Health and safety requirements; and
 - f. Community relations activities.
5. Cost estimates and schedules;
- a. Capital cost estimate;
 - b. Operation and maintenance cost estimate; and
 - c. Project schedule (design, construction, operation). One copy of the draft shall be provided by the Permittee to the Department.

C. *Final*

The Permittee shall finalize the CMS report, incorporating comments received from the Department on the draft CMS report.

**ATTACHMENT D: SCOPE OF WORK FOR THE CORRECTIVE MEASURE
IMPLEMENTATION**

DRAFT

Purpose

The purpose of this Corrective Measure Implementation (CMI) program is to design, construct, operate, maintain, and monitor the performance of the corrective measure or measures selected to protect human health and the environment. The Permittee will furnish all personnel, materials, and services necessary for the implementation of the corrective measure or measures.

Scope

The Corrective Measure Implementation program consists of four tasks:

Task I: Corrective Measure Implementation Program Plan

- A. Program Management Plan

Task II: Corrective Measure Design

- A. Design Plans and Specifications
- B. Operation and Maintenance Plan
- C. Cost Estimate
- D. Project Schedule
- E. Construction Quality Assurance Objectives
- F. Design Phases

Task III: Corrective Measure Construction

- A. Responsibility and Authority
- B. Construction Quality Assurance Personnel Qualifications
- C. Inspection Activities
- D. Sampling Requirements
- E. Documentation

Task IV: Reports

- A. Progress
- B. Draft
- C. Final

Task I: Corrective Measure Implementation Program Plan

The Permittee shall prepare a CMI program plan. This program will include the development and implementation of several plans, which require concurrent preparation. It may be necessary to revise plans as the work is performed to focus efforts on a particular problem. The program plan includes the following:

A. Program Management Plan

The Permittee shall prepare a program management plan which will document the overall management strategy for performing the design, construction, operation, maintenance, and monitoring of corrective measure(s). The plan shall document the responsibility and authority of all organizations and key personnel involved with the implementation. The program management plan will also include a description of qualifications of key personnel directing the CMI program, including contractor personnel.

Task II: Corrective Measure Design

The Permittee shall prepare final construction plans and specifications to implement the corrective measure(s) at the facility as defined in the CMS.

A. Design Plans and Specifications

The Permittee shall develop clear and comprehensive design plans and specifications which include, but are not limited to, the following:

1. Discussion of the design strategy and the design basis, including:
 - a. Compliance with all applicable or relevant environmental and public health standards; and
 - b. Minimization of environmental and public impacts.
2. Discussion of the technical factors of importance, including:
 - a. Use of currently accepted environmental control measures and technology;
 - b. Methods used to determine location of proposed corrective measure(s);
 - c. The constructability of the design; and
 - d. Use of currently acceptable construction practices and techniques.
3. Description of assumptions made and detailed justification of these assumptions;
4. Discussion of the possible sources of error and references to possible operation and maintenance problems;

5. Detailed drawings of the proposed design, including:
 - a. Qualitative flow sheets; and
 - b. Quantitative flow sheets.
6. Tables listing equipment and specifications;
7. Tables listing monitoring wells used during corrective measure(s);
8. Tables giving material and energy balances;
9. Appendices including:
 - a. Sample calculations (one example presented and explained clearly for significant or unique design calculations);
 - b. Derivation of equations essential to understanding the report; and
 - c. Results of laboratory or field tests.

B. *Operation and Maintenance Plan*

The Permittee shall prepare an operation and maintenance plan to cover both implementation and long-term maintenance of the corrective measure. The plan shall be composed of the following elements:

1. Description of normal operation and maintenance (O&M);
 - a. Description of tasks for operation;
 - b. Description of tasks for maintenance;
 - c. Description of prescribed treatment or operation conditions; and
 - d. Schedule showing frequency of each O&M task.
2. Description of potential operating problems;
 - a. Description and analysis of potential operation problems;
 - b. Sources of information regarding problems; and
 - c. Common and/or anticipated remedies.
3. Description of routine monitoring and laboratory testing;
 - a. Description of monitoring tasks;
 - b. Description of required laboratory tests and their interpretation;
 - c. Required QA/QC; and

- d. Schedule of monitoring frequency and date, if appropriate, when monitoring may cease.
4. Description of alternate O&M;
 - a. Should systems fail, alternate procedures to prevent undue hazard; and
 - b. Analysis of vulnerability and additional resource requirements should a failure occur.
5. Safety plan;
 - a. Description of precautions, of necessary equipment, etc., for site personnel; and
 - b. Safety tasks required in event of system's failure.
6. Description of equipment;
 - a. Equipment identification;
 - b. Installation of monitoring components using RCRA Ground Water Technical Enforcement Guidance Document;
 - c. Maintenance schedule of site equipment; and
 - d. Replacement schedule for equipment and installed components.
7. Records and reporting mechanisms required.
 - a. Daily operating logs;
 - b. Laboratory records;
 - c. Records for operating costs;
 - d. Mechanism for reporting emergencies;
 - e. Personnel and maintenance records; and
 - f. Monthly/annual reports to the Department.

C. *Cost Estimate*

The Permittee shall develop cost estimates. The cost estimate developed in the CMS shall be refined to reflect the more detailed/accurate design plans and specifications being developed. The cost estimate shall include both capital and operation and maintenance costs.

D. Project Schedule

The Permittee shall develop a project schedule for construction and implementation of the corrective measure or measures which identifies timing for initiation and completion of all critical path tasks. Permittee shall specifically identify dates for completion of the project and major interim milestones.

E. Construction Quality Assurance Objectives

The Permittee shall identify and document the objectives and framework for the development of a construction quality assurance program including, but not limited to, the following: responsibility and authority, personnel qualifications, inspection activities, sampling requirements, and documentation.

F. Design Phase

The design of the corrective measure(s) should include the phases outlined below:

1. Preliminary design.

The Permittee shall submit the preliminary design when the design effort reflects a level such that the technical requirements of the project have been addressed and outlined. The submittal will be reviewed to determine if the final design will provide an operable and useable corrective measure. Supporting data and documentation shall be provided with the design documents defining functional aspects of the program.

2. Correlating plans and specifications.

General correlation between drawings and technical specifications is a basic requirement of any set of working construction plans and specifications.

Before submitting the project specifications, the Permittee shall:

- a. Coordinate and cross-check the specifications and drawings; and
- b. Complete the proofing of the edited specifications and required cross-checking of all drawings and specifications.

3. Equipment startup and operator training.

The Permittee shall prepare, and include in the technical specifications governing treatment systems, contractor requirements for providing appropriate service visits by experienced personnel to supervise the installation, adjustment, startup and operation of the treatment systems, and training covering appropriate operational procedures once the startup has been successfully accomplished.

4. Final design.

The Permittee shall execute the required revisions and submit the final documents 100 percent complete with reproducible drawings and specifications.

The final design submittal consists of the final design plans and specifications (100 percent complete), the Permittee's final construction cost estimate, the final operation and maintenance plan, final quality assurance plan, and final project schedule. The quality of the design documents should be such that the Permittee would be able to include them in a bid package and invite contractors to submit bids for the construction project.

Task III: Corrective Measure Construction

Following Department approval of the final design, the Permittee shall develop and implement a Construction Quality Assurance (CQA) program to ensure, with a reasonable degree of certainty, that a completed corrective measure(s) meets or exceeds all design criteria, plans, and specifications. The CQA plan is a facility-specific document which must be submitted to the Department for approval prior to the start of construction. At a minimum, the CQA plan should include the elements which are summarized below.

Upon Department approval of the CQA plan, the Permittee shall construct and implement the corrective measures in accordance with the approved design, schedule, and the CQA plan. The Permittee shall also implement the elements of the approved operation and maintenance plan.

A. *Responsibility and Approval*

The responsibility and authority of all organizations (i.e., technical consultants, construction firms, etc.) and key personnel involved in the construction of the corrective measure shall be described fully in the CQA plan. The Permittee must identify a CQA officer and the necessary supporting inspection staff.

B. *Construction Quality Assurance Personnel Qualifications*

The qualifications of the CQA officer and supporting inspection personnel shall be presented in the CQA plan to demonstrate that they possess the training and experience necessary to fulfill their identified responsibilities.

C. *Inspection Activities*

The observations and tests that will be used to monitor the construction and/or installation of the components of the corrective measure(s) shall be summarized in the CQA plan. The plan shall include the scope and frequency of each type of inspection. Inspections shall verify compliance with all environmental requirements and include, but not be limited to, air quality and emissions monitoring records, waste disposal records (e.g., RCRA transportation manifests), etc. The inspection should also ensure compliance

with all health and safety procedures. In addition to oversight inspections, the Permittee shall conduct the following activities:

1. Preconstruction inspection and meeting.

The Permittee shall conduct a preconstruction inspection and meeting to:

- a. Review methods for documenting and reporting inspection data;
- b. Review methods for distributing and storing documents and reports;
- c. Review work area security and safety protocol;
- d. Discuss any appropriate modifications of the construction quality assurance plan to ensure that site-specific considerations are addressed; and
- e. Conduct a site walk-around to verify that the design criteria, plans, and specifications are understood and to review material and equipment storage locations.

The preconstruction inspection and meeting shall be documented by a designated person and minutes should be transmitted to all parties.

2. Pre-final inspection.

Upon preliminary project completion, the Permittee shall notify the Department for the purposes of conducting a pre-final inspection. The pre-final inspection will consist of a walk-through inspection of the entire project site. The inspection is to determine whether the project is complete and consistent with the contract documents and the Department-approved corrective measure. Any outstanding construction items discovered during the inspection will be identified and noted. Additionally, treatment equipment will be operationally tested by the Permittee. The Permittee will certify that the equipment has performed to meet the purpose and intent of the specifications. Retesting will be completed where deficiencies are revealed. The pre-final inspection report should outline the outstanding construction items, actions required to resolve items, completion date for these items, and date for final inspection.

3. Final inspection.

Upon completion of any outstanding construction items, the Permittee shall notify the Department for the purposes of conducting a final inspection. The final inspection will consist of a walk-through inspection of the project site. The pre-final inspection report will be used as a checklist with the final inspection focusing on the outstanding construction items identified in the pre-final

inspection. Confirmation shall be made that outstanding items have been resolved.

D. Sampling Requirements

The sampling activities, sample size, sample locations, frequency of testing, acceptance and rejection criteria, and plans for correcting problems as addressed in the project specifications should be presented in the CQA plan.

E. Documentation

Reporting requirements for CQA activities shall be described in detail in the CQA plan. This should include such items as daily summary reports, inspection data sheets, problem identification and corrective measures reports, design acceptance reports, and final documentation. Provisions for the final storage of all records also should be presented in the CQA plan.

Task IV: Reports

The Permittee shall prepare plans, specifications, and reports as set forth in Task I through Task IV of Attachment D to document the design, construction, operation, maintenance, and monitoring of the corrective measure. The documentation shall include, but not be limited to, the following:

A. Progress

The Permittee shall, at a minimum, provide the Department with signed progress reports every ninety (90) days beginning thirty (30) days after the start of the design and construction phases and frequency to-be-determined progress reports for operation and maintenance activities containing:

1. A description and estimate of the percentage of the CMI completed;
2. Summaries of all findings;
3. Summaries of all changes made in the CMI during the reporting period;
4. Summaries of all contacts with representatives of the local community, public interest groups or state government during the reporting period;
5. Summaries of all problems or potential problems encountered during the reporting period;
6. Actions being taken to rectify problems;
7. Changes in personnel during the reporting period;

8. Projected work for the next reporting period.

B. Draft

1. The Permittee shall submit a draft CMI program plan.
2. The Permittee shall submit draft construction plans and specifications, design reports, cost estimates, schedules, operation and maintenance plans, and study reports.
3. The Permittee shall submit a draft CQA program plan and documentation.
4. At the "completion" of the construction of the project, the Permittee shall submit a CMI report to the Department. The report shall document that the project is consistent with the design specifications and that the corrective measure is performing adequately. The report shall include, but not be limited to, the following elements:
 - a. Synopsis of the corrective measure and certification of the design and construction;
 - b. Explanation of any modifications to the plans and why these were necessary for the project;
 - c. Listing of the criteria, established before the corrective measure was initiated, for judging the functioning of the corrective measure and also explaining any modification to these criteria;
 - d. Results of facility monitoring, indicating that the corrective measure will meet or exceed the performance criteria; and
 - e. Explanation of the operation and maintenance (including monitoring) to be undertaken at the facility.

This report should include all of the daily inspection summary reports, inspection summary reports, inspection data sheets, problem identification and corrective measure reports, block evaluation reports, photographic reporting data sheets, design engineers' acceptance reports, deviations from design and material specifications (with justifying documentation), and as-built drawings.

C. Final

The Permittee shall finalize the CMI program plan, construction plans and specifications, design reports, cost estimates, project schedule, operation and maintenance plan, study reports, CQA program plan/documentation, and the CMI report incorporating comments received on draft submissions.

ATTACHMENT E: CORRECTIVE ACTION COMPLIANCE SCHEDULE

DRAFT

Permit Module	Activity	Due Date
II.C.	Notification of newly identified SWMU or AOC	Within 15 days of discovery.
II.C.1	Submittal of SWMU/AOC assessment report	Within 180 days of notification.
II.D	Notification of newly discovered releases at previously identified SWMUs and AOC	Within 15 days of discovery.
II.C.2 II.D.1 II.E.1.a	Submittal of RFI Workplan(s) for SWMUs and AOC	Within 120 days after receipt of notification by the NDDEQ.
II.E.3.a	Submittal of RFI progress reports	Every 90 days, beginning 30 days from the start date of RFI.
II.E.3.b	Submittal of draft RFI report	In accordance with the approved RFI workplan.
II.E.3. b	Submittal of final RFI report	Within 60 days after receipt of NDDEQ comments on draft RFI report.
II.F.1. a	Submittal of Interim Measures Workplan	Within 60 days of notification by the NDDEQ
II.F.3. a	Submittal of Interim Measures Progress reports	Every 90 days, 30 days from the start date of interim measures activities provided the completion time is more than 3 months.
II.F.3. b	Submittal of Interim Measures report	Within 60 days of completion of Interim Measures.
II.G.1. a	Submittal of CMS plan	Within 90 days of notification by the NDDEQ that a CMS is needed.
II.G.2. a	Submittal of CMS Progress Reports	Every 90 days, beginning 30 days after the start of CMS implementation.
II.G.2. b	Submittal of draft CMS report	In accordance with the CMS plan
II.G.2. b	Submittal of final CMS report	Within 60 days after receipt of NDDEQ comments on draft CMS report.
II.J.1. a	Submittal of CMI plan	Within 90 days after receipt of NDDEQ approval of the CMS report.
II.J.2. a	Submittal of CMI Progress reports	Every 90 days, 30 days after the start of CMI implementation
II.J.2. b	Submittal of draft CMI report	At the completion of the construction of the project(s).
II.J.2. b	Submittal of final CMI report	Within 60 days of receipt of NDDEQ comments on draft

II.L.1. II.L.2.	Imminent Hazard report	Oral notification within 24 hours, written notification within 15 days.
--------------------	------------------------	---

DRAFT

ATTACHMENT F: APPROVAL REMEDIES FOR SPECIFIC SWMUs AND AOC

DRAFT

SWMU-1

Explosive Ordnance Detonation Area

ERP Site OT-05

Closure Documentation

DRAFT



DEPARTMENT OF THE AIR FORCE
 HEADQUARTERS 319TH BOMBARDMENT WING (SAC)
 GRAND FORKS AIR FORCE BASE, NORTH DAKOTA 58205-5000



13 AUG 1991

REPLY TO
 ATTN OF: CV

SUBJECT: Installation Restoration Program, Site Decision Document
 Memorandum, Explosive Ordnance Disposal Area, Grand Forks
 AFB, ND

TO: North Dakota State Department of
 Health and Consolidated Laboratories
 1200 Missouri Avenue
 PO Box 5520
 Bismarck, ND 58502-5520
 Attn: Mr Burgess

1. The decision document memorandum for the EODA is submitted for your review and approval. The IRP site OT-05, Explosive Ordnance Disposal Area, having gone through two stages of investigation has shown no contamination. Based on the results of the Remedial Investigation, it is proposed that no further action is necessary.
2. Upon your approval, please forward to EPA for their approval. The document can be sent to US Environmental Protection Agency, Region VIII, Waste Management Division, 999 18th Street, Suite 500 (8HWM-SM) Denver, Colorado 80202-2405, ATTN: Pat Smith. If document is not approved, return to Grand Forks AFB along with your comments.
3. Our POC for any questions is Mr Domm at 701-747-4774.

F. J. PLEDGER JR, Colonel, USAF
 Vice Commander

1 Atch
 IRP Decision
 Document



INSTALLATION RESTORATION PROGRAM SITE
DECISION DOCUMENT MEMORANDUM
EODA

Installation
Grand Forks Air Force Base
Grand Forks, North Dakota

SITE LOCATION AND DESCRIPTION

The Explosive Ordnance Disposal Area (EODA) is a 90-acre area located in the southwest portion of Grand Forks Air Force Base (GFAFB).

The EODA is in an area of low topographic relief. Within the EODA is a burn area, mostly free of vegetation. Surface drainage is to the northeast toward the runway where it is intercepted by the west drainage ditch and directed into the Turtle River.

Population centers include Base residents within a 4 mile radius and the City of Grand Forks approximately 15 miles to the east. Adjacent land uses include the base runway and alert apron to the east and undeveloped land to the north, south, and west.

SITE HISTORY

This area is used to explode, by burning or detonation, unserviceable munitions, starter cartridges (pre-1980), and other small unserviceable devices. The EODA consists of two areas: an active area kept free of vegetation by herbicides where current detonations occur, and an inactive area which is overgrown with vegetation. The EODA is heavily secured, and access is restricted.

The EODA Remedial Investigation (RI) was conducted under two stages. Stage 1 was conducted in February, 1989 and Stage 2 field work was completed in December, 1989. The Stage 1 investigation involved acquisition of geophysical data, completion of soil borings, installation of monitoring wells and collection of chemical data on both soils and ground water at the referenced sites. This study characterized geology, hydrogeology and contaminant extent for each site and suggested that further investigation was necessary to delineate and quantify contamination at the EODA.

In response, Stage 2 field work was conducted at the EODA between November 6, 1989 and December 17, 1989. The scope of this investigation included drilling three borings and six test holes to collect soil samples, install monitoring wells and collect ground water samples. The ground water sampling phase of the field investigation included analytical testing of old monitoring wells only, as new monitoring wells were basically dry. Results of the field program concluded that no contamination exists in either soil or ground water at the EODA.

ALTERNATIVES EVALUATED

Based on the results of the RI, the no action alternative was evaluated and selected as protective of human health and the environment. No contamination has been detected after two stages of investigation. No further action is necessary.

CONCLUSIONS

Based upon existing data, no action is necessary at the EODA and it should be dropped from further consideration.

Signature: Robert Reid LTCOL, USAF Date: 28 SEP 90
BAZ CSG/CD

Signature: _____ Date: _____

Signature: _____ Date: _____

SWMU-2

Fire Training Area/ Old Sanitary Landfill Area

ERP Site FT-02

Closure Documentation

DECISION DOCUMENT
FIRE TRAINING AREA/OLD SANITARY LANDFILL AREA
IRP SITE FT-02



GRAND FORKS AIR FORCE BASE, NORTH DAKOTA

Oct 95

EXECUTIVE SUMMARY

The following Decision Document was written to fulfill the requirements of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). The purpose of a Decision Document is to highlight key aspects of Remedial Investigation/Feasibility Study (RI/FS) reports, provide a brief analysis of remedial alternatives under consideration, and identify the selected alternative.

The Decision Document described herein summarizes the remedial alternatives evaluated for the Fire Training Area/Old Sanitary Landfill Area (FTA/OSLA), site FT-02, at Grand Forks AFB. The FTA/OSLA occupies 28 acres and is the southern most landfill unit within a two-unit sanitary landfill area located in the north central section of Grand Forks AFB. The FTA is a 5-acre area located within the boundary of the OSLA which contains two deactivated fire training areas and one abandoned underground storage tank. Since the FTA is located within the boundary of the OSLA, these areas were combined into one site. Investigations performed at FT-02 have detected dissolved fuel and solvent-related volatile organic compounds (VOCs) in the shallow clay aquifer above Federal maximum contaminant limits (MCLs). A summary of the levels and types of contamination found are listed in Section 10, Table 1 of the Decision Document.

Four alternatives were identified as remedial alternatives for FT-02: 1) No Further Action and Institutional Controls; 2) Landfill Cap; 3) Landfill Cap/Cell Water Extraction/Treatment by Oil/Water Separation; and 4) Landfill Cap/Cell Water Extraction/Treatment by Oil/Water Separation and Air Stripping. These alternatives are described in Section 13.0 of the Decision Document.

A comparative analysis of the four alternatives was conducted to evaluate the alternatives with respect to their relative performance concerning nine criteria. These evaluation criteria are described in Section 13.2 of the Decision Document. The selected alternative for FT-02 is alternative 2, landfill cap. This alternative includes construction of a landfill cap and long term cap maintenance, groundwater monitoring, and a five-year review prescribed by the National Contingency Plan (NCP) when contaminants remain on site above levels that allow unlimited use (40 CFR 300.430 (f)(4)(ii)). Analysis of the selected action indicates the landfill cap alone will sufficiently protect human health and the environment by reducing and potentially eliminating recharge by precipitation into the landfill cells. Additionally, a landfill cap will effectively drain water off the site, eliminating percolation of surface water into the soils, and decreasing the mobility of groundwater at the site. This will effectively isolate the waste.

Technical Review Committee (TRC) meetings, held since Dec 91, have been one avenue in which the base has informed the community of IRP activities. The TRC, as a whole, has agreed that a landfill cap must be constructed over the site. In Dec 94, the TRC was replaced by a Restoration Advisory Board (RAB) in order to increase community involvement. The RAB members were also informed of the proposed landfill cap and have since concurred on the action. There has been very little public interest in this activity, based on the lack of questions and/or comments posed by the community members of the former TRC and current RAB. A Proposed Plan, RAB meetings, and the IR have all provided an opportunity for public comment/ involvement in this and other base IRP activities. The Proposed Plan was placed in the IR at the Grand Forks Public Library for a 30-day comment period. An article inviting the community to review and comment on the Plan was placed in the Grand Forks Herald, a local newspaper. A Public Hearing to discuss the Proposed Plan was held on 27 Jul 95 at Grand Forks AFB. No comments were received from the public.

**DECISION DOCUMENT
FIRE TRAINING AREA/OLD SANITARY LANDFILL AREA
INSTALLATION RESTORATION PROGRAM SITE FT-02
GRAND FORKS AIR FORCE BASE, NORTH DAKOTA**

1.0 INSTALLATION NAME AND LOCATION

- 1.1 Grand Forks AFB
Grand Forks, North Dakota

2.0 STATEMENT OF BASIS

2.1 The Decision Document described herein concerning the remedial alternative at the Fire Training Area/Old Sanitary Landfill Area (FTA/OSLA) is based on an evaluation of the results received from investigations performed under the U.S. Air Force Installation Restoration Program (IRP).

2.2 Documented studies include:

- IRP Phase I: Records Search (Apr 85)
- IRP Phase II Stage 1 Remedial Investigation Report for Potentially Hazardous Waste Sites (Feb 89)
- IRP Remedial Investigation Phase II Stage 2 (Mar 91)
- Landfill Cell Subsurface Investigation Report (Jan 92)
- Tank Letter Report (Jan 92)
- Pilot Study Report (Dec 92)
- Feasibility Study Report (Jun 93)
- Remedial Investigation Supplemental Data Report (Jun 94).

3.0 DESCRIPTION OF THE SELECTED REMEDY

3.1 The selected remedial alternative for this site is a landfill cap constructed over the existing landfill cells, fire training area, and a portion of the New Sanitary Landfill Area, an IRP site located directly north of FT-02. Once the landfill cap is operational, the site will be monitored by groundwater wells to determine the effectiveness of the system. The remedial alternative is supported by an evaluation of the results of all IRP investigations. This includes evaluation of human health risks, risks to the ecological community, and the potential for future contamination of groundwater.

4.0 DECLARATION OF CONSISTENCY WITH CERCLA AND THE NCP

4.1 This document presents the selected remedy for the FTA/OSLA developed in accordance with the Resource Conservation and Recovery Act (RCRA) of 1976, Comprehensive Environmental Response, Compensation, and Liability Act [(CERCLA), Section 117(a)], as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA), the National Contingency Plan (NCP), and the North Dakota Solid Waste Management Regulations. It has been concluded that utilizing a landfill cap in conjunction with a groundwater monitoring program is the most effective way of remediating the site.

5.0 SITE IDENTIFICATION

5.1 Grand Forks, ND is located on the North Dakota-Minnesota border at the junction of the Red Lake River and the Red River of the North, 75 miles north of Fargo, ND and 145 miles south of

Winnipeg, Manitoba, Canada. Grand Forks Air Force Base is located on U.S. Highway 2, approximately 15 miles west of Grand Forks and 10 miles west of the Mark Andrews International Airport.

5.2 Grand Forks AFB is situated in a subhumid climate characterized by a wide temperature range, variable precipitation, and rigorous winters. Base records indicate the coldest recorded temperature was -36 degrees Fahrenheit (°F) and the warmest was 106°F. The average annual daily maximum temperature is about 50°F with the highest temperatures occurring during July and August. The average annual daily minimum temperature is about 30°F with the lowest temperature occurring during January. The annual average daily temperature is 40°F.

5.3 The average monthly precipitation ranges from greater than 3.0 inches during June to less than 0.5 inches during February (rainfall). The average annual rainfall precipitation is about 18.5 inches, three-fourths of which occurs from May to September. Snowfall averages slightly less than three feet annually. The prevailing wind direction is from the northwest.

5.4 The FTA/OSLA which occupies 28 acres, is the southern most landfill unit within a two-unit sanitary landfill area (SLA) located in the north central section of Grand Forks AFB (Figure 1, Sites FT-02 and LF-03). The FTA is a 5-acre area located within the boundary of the OSLA which contains two deactivated fire training areas and one abandoned underground storage tank (UST). Since the FTA is located within the boundary of the OSLA, these areas were combined into one site.

5.5 The FTA/OSLA is an area of low topographic relief. An old railroad car, which simulates an aircraft, and a small concrete block building are located in the northeast quadrant of the site. The remainder of the OSLA has an irregular surface composed of shallow depressions and low mounds as a result of previous landfill activity. Surface drainage is radially outward from the FTA, but is eventually intercepted by a drainage ditch system and channeled north toward the Turtle River.

5.6 The FTA/OSLA, in general, is surrounded by open land and scattered base facilities. Facilities in the immediate vicinity of the FTA/OSLA include a recreational vehicle storage area to the east, a missile maintenance area to the southwest, a small arms firing range to the northwest, and a second landfill unit to the north. This second landfill unit (LF-03) is referred to as the New Sanitary Landfill Area (NSLA). Base facilities within one-half mile of the FTA/OSLA include runways to the west, a large three-bay hangar to the south, and a base residential area to the east.

5.7 Physical features adjacent to and paralleling the OSLA boundaries include a paved access road to the west, an unpaved access road to the north (Malmstrom Avenue), and Eielson Street to the east. Additionally, unpaved drainage ditches surround the OSLA boundaries.

6.0 PHYSIOGRAPHY AND LAND USE

6.1 Grand Forks AFB lies within the Agassiz Lake Plain District of the Western Ground Drift section of the Central Lowland Physiographic Province. The Western Ground Drift section is a lowland prairie upon a gently rolling glacial ground moraine. It is occasionally interrupted by ridges of end moraine and flat outwash plains. Strandline deposits associated with Glacial Lake Agassiz form low, narrow linear ridges with a northwesterly trend. The average elevation above sea level is about 890 feet with a maximum local relief of about 25 feet.

6.2 Grand Forks AFB is also located in the Red River Valley topographic area which corresponds to the Agassiz Lake Plain physiographic division. Geologic processes include the movement of groundwater through underlying rock strata, differential erosion, modification by glaciers, and recent wind and stream-forming events. Prior to glaciation, the river became incised until it reached Precambrian rock, then shifted its course westward as it eroded away Cretaceous shale and sand, thereby forming the Pembina Escarpment. When glaciers deposited a layer of till over the area, the river erosion temporarily ceased. Lake Agassiz sediment now covers the Red River Valley. The modern Red River of the North flows on this lake plain. The Pembina Escarpment was probably altered by glacial

processes but exists today as the western extent of Glacial Lake Agassiz sediments, about 10 miles west of Grand Forks AFB. The present location of the Red River of the North is 18 miles east of Grand Forks AFB, representing the North Dakota-Minnesota state line.

6.3 Land use in Grand Forks County consists primarily of cultivated crops with remaining land used for pasture and hay, urban development, recreation and wildlife habitat. Principal crops are spring wheat, barley, sunflowers, potatoes and sugar beets. Turtle River State Park, located about five miles west of the Base, is one of the major recreational areas in Grand Forks County. Several watershed protection dams are being developed for recreational activities. Kellys Slough National Wildlife Refuge, located approximately 5 miles east of the base, and the adjacent National Waterfowl Production Area are managed for wetland wildlife and migratory waterfowl, but they also include a significant acreage of openland wildlife habitat in the county.

7.0 GEOLOGY

7.1 Geological data obtained from soil boring logs during the Stage 1 Remedial Investigation (RI) distinguished between in situ soils (till and lacustrine sediments), disturbed soil (fill material), solid waste, and non-aqueous phase liquids (NAPL). Figures 2A through 2E show east-west and north-south cross sections across the site delineating the units described above.

7.2 In situ surface soils at the FTA consist of olive brown to dark brown or black sandy silt to silty clay up to five feet thick. Beneath this layer lies an olive brown to gray sandy clay to clay with sand and gravel. The clay appears to be relatively impermeable, but mottling encountered at depths as shallow as two feet indicate occasional saturation of soils. Euhedral, tabular, transparent, selenite crystals occur in voids and along fracture surfaces. Iron concretions are also present. In general, the soils were classified as sandy lean clay or fat clay.

8.0 HYDROGEOLOGY

8.1 Hydrogeologic information obtained from the Stage 1 and Stage 2 RI determined that the shallow groundwater at the FTA/OSLA is mounded and flows radially outward toward undisturbed soils at the southern, eastern, and western perimeters (see Figure 3). Horizontal gradients for the shallow groundwater range from 0.018 to 0.002 across the site. The geometric mean conductivity value of 2.3×10^{-5} cm/sec was determined during the Stage 1 RI for the shallow monitoring wells. Also, an effective porosity of 30% was determined to be the maximum expected effective porosity for the clayey materials existing at the FTA/OSLA. Utilizing the hydraulic gradient, hydraulic conductivity and effective porosities as discussed above, a groundwater velocity of up to 37 inches per year at the site was calculated.

8.2 The Emerado Aquifer is confined beneath till and lacustrine sediments at the site. The potentiometric surface of the Emerado Aquifer is above the shallow groundwater table in all well nests at the FTA/OSLA except one. At this nest, a downward gradient of 0.036 is present between the shallow groundwater and the Emerado Aquifer. Vertical gradients range from 0.036 downward, as previously described, to 0.046 upward.

8.3 Groundwater at the site has a tendency to move horizontally toward the boundaries of the landfill and vertically either upward or downward depending upon the gradient present. If groundwater were to leak from the deep aquifer, it would travel upward to the potentiometric surface. Shallow groundwater may not have a vertical flow component if the potentiometric surface of the Emerado is equal to or above the shallow water table. In the case of a downward gradient, shallow groundwater may migrate downward until the deep upward gradient (pressure) equals the shallow downgradient pressure. At this point, the vertical gradient will become zero and migration will stagnate. Groundwater flow will become horizontal at this point. The depth below grade where the vertical gradient is zero at the FTA/OSLA was determined to be approximately 55 feet.

8.4 Groundwater flow velocity potential from the Emerado Aquifer to the shallow groundwater was determined to range from 0.15 feet per year downward at one well nest to 0.19 feet per year upward at another well nest.

9.0 SURFACE HYDROLOGY

9.1 Natural surface water features on Grand Forks AFB are limited to small wetlands, including prairie potholes, and a small stretch of the Turtle River that flows across the northwestern portion of the Base approximately 1.5 miles northwest of the FTA/OSLA. In general, surface water runoff west of the taxiway and drainage from the maintenance apron (just east of the runway) and the FTA/OSLA are routed through drainage ditches that flow north and into the Turtle River. The low flow in this drainage channel (0-0.1 million gallons per day) suggests that the ditch exerts a negligible effect on Turtle River water quality. The remaining surface water on the Base is directed to the north and south drainage ditches which flow into Kellys Slough National Wildlife Refuge.

9.2 The Turtle River channel is very sinuous and generally flows in a northeasterly direction. It eventually empties into the Red River of the North which flows north to Lake Winnipeg in Canada. The Red River drainage basin is part of the Hudson River drainage system. At Manvel, North Dakota, approximately 10 miles northeast of Grand Forks AFB, the mean discharge of the Turtle River is 50.3 cubic feet per second. Peak flows result from spring runoff in April, and minimum flows (or no flow in some years) occur in January and February.

10.0 BACKGROUND

10.1 A records search was performed at Grand Forks AFB in 1985 to identify the potential for environmental contamination resulting from past waste disposal practices and to assess the potential for contaminant migration. The records search concluded there was a potential for environmental contamination at the FTA/OSLA and recommended further investigation to adequately characterize the site. The FTA/OSLA was entered into the IRP upon completion of this investigation.

10.2 The FTA/OSLA RI was conducted under two stages. Stage 1 was completed in Feb 89 and Stage 2 was completed in Mar 91. The Stage 1 investigation involved acquisition of geophysical data, completion of soil borings, installation of monitoring wells, and collection of chemical data on both soils and groundwater. This study characterized geology, hydrogeology and contaminant extent and suggested that further investigation was necessary to delineate and quantify contamination at the site.

10.3 In response, Stage 2 field work was conducted at the FTA/OSLA. The scope of this investigation included drilling two borings to obtain soil samples and installing monitoring wells to obtain groundwater samples. The groundwater sampling phase of the field investigation included analytical testing of new and old monitoring wells.

10.4 As a result of Stage 1 and Stage 2 RIs, four separate sources of contamination were identified. The FTA/OSLA's history will be addressed by these individual sources.

10.5 OSLA: The OSLA was operated from 1958 to 1980. According to the Phase I Records Search Report, the OSLA may have received sludges, cleaning residues, solvents, and solid waste, prior to the 1980 promulgation of hazardous waste disposal regulations under the Resource Conservation and Recovery Act (RCRA). However, little to no information is provided on the nature and quantity of landfilled materials. Soil and groundwater samples collected from the OSLA have revealed the presence of solid waste, free-phase petroleum non-aqueous phase liquids (NAPL), and several chlorinated hydrocarbons. The NAPL is similar in nature to JP-4, jet fuel.

10.6 FTA: The FTA consists of the old and modern burn pit areas. Fire fighter training exercises were conducted in these areas from at least 1970 to 1988. During this time, the old burn pit

was operated without a drainage system to collect the excess petroleum from fire fighting training activities. An estimated 12,000 gallons per year (gal/yr) of JP-4 containing waste petroleum products, oils, and lubricants were used in the old burn pit, of which an estimated 50 percent infiltrated into the ground. In the early to mid 1970s, fire fighting training activities were transferred to the modern burn pit, an area that was reportedly graded to collect and reuse the excess petroleum. In 1988, fire fighting training activities were discontinued in the FTA's old and modern burn areas and transferred to a new "state of the art" training area constructed at a different location on base.

10.7 Underground Storage Tank (UST): The UST was used to store petroleum products for the fire fighting training activities at the FTA. A 10,000-gallon UST was installed at the FTA in 1972 to store waste POL fluids for use in fire training activities. The use of the tank was terminated in 1980 when a leak was discovered. The tank was drained, filled with sand, and abandoned in place.

10.8 Fire Suppressants: An additional possible source of contamination in the FTA/OSLA stems from the past use of chlorinated fire suppressants at the FTA during fire fighting training activities. Chlorobromomethane is believed to have been used as a fire suppressant from 1976 to 1985. Prior to 1987, carbon tetrachloride is reported to have been used.

10.9 The four sources identified above have created several problems.

a. During the 18 years the FTA was active, approximately half of the 12,000 gal/yr of fuel used in the burn areas soaked into the surface soils and leached to the water table within the landfill cells producing a contaminated groundwater plume.

b. The leaking UST, during its operation, also contributed to the soil and groundwater contamination at the site.

c. Groundwater within the landfill cells at the FTA/OSLA has migrated NW toward the drainage ditch bordering the site causing a leachate seep. This seep has been confirmed by sediment samples and signs of stressed vegetation. This ditch empties into the Turtle River approximately 1½ miles NW of the site.

d. The landfill does not have a cap that prevents infiltration or provides proper drainage and coverage for the site.

10.10 To gain a better understanding of the sources and the problems they created, a landfill cell subsurface investigation was performed at the site to estimate the lateral extent of the FTA/OSLA, interpret the distribution and thickness of landfill cells or trenches, measure the presence and extent of floating NAPL, and determine the location and size of the UST within the FTA/OSLA (see Figure 4).

10.11 Once the landfill cell subsurface was characterized, a pilot-scale pump and treat system was performed at the site during Sep 91 through Oct 91 and again in May 92 to assess the feasibility of NAPL recovery via extraction wells from one or more landfill cells. The pilot treatment test demonstrated that geological and physical barriers at this site (i.e. low conductivity of soils) will hinder the collection and treatment of landfill water (James M. Montgomery, 1992).

10.12 A Feasibility Study (FS), was also performed in two stages for Site FT-02. The development and screening of alternatives was provided in Jan 92 and the detailed analysis of the four alternatives selected for the site was finalized Jun 93. The recommended Remedial Action for Site FT-02, as specified by the FS, is a landfill cap in conjunction with a groundwater monitoring program.

10.13 Investigations performed at Site FT-02 have detected dissolved fuel and solvent-related volatile organic compounds (VOCs) in the shallow clay aquifer above Federal maximum contaminant limits (MCLs). A summary of the levels and types of contamination found are listed in Table 1.

10.14 Investigations performed at Site FT-02 also detected fuel contamination in soils with total recoverable petroleum hydrocarbon (TRPH) concentrations up to 5500 mg/kg. Additionally, samples collected at the leachate seep showed fuel related constituents in the sediment. The investigation concluded, however, that surface water samples did not show consistent or significant contamination.

10.15 An exposure assessment was performed on the FTA/OSLA during the Stage 2 RI. The pathways identified are: direct contact with sediments in the drainage ditch the leachate seep intersects and direct contact/accidental ingestion of surface water at the drainage ditch and Turtle River.

CONTAMINANT	CONCENTRATION DETECTED (µg/l)	MCL* (µg/l)
Dichloromethane	14	5
1,1,2-Trichloroethane	160	5
Toluene	10,300	1000
Benzene	3540	5
Ethylbenzene	1200	700
Vinyl Chloride	280	2
1,1,1-Trichloroethane	400	200
Total Recoverable Petroleum Hydrocarbons (TRPH)	1000	500

* Safe Drinking Water Act, 40 CFR141-149

10.16 The air pathway is not considered to be a viable pathway since air monitoring at the site revealed background conditions throughout the field investigation. Additionally, volatilization of VOCs from the subsurface of the site is unlikely because of tight soils and good vegetative cover across most of the site.

10.17 A groundwater pathway is also not considered a viable pathway. The potential yield of shallow groundwater from the shallow till surrounding the FTA/OSLA is very low and it is uncertain whether a well could yield sufficient water for domestic use. The groundwater from the shallow till is expected to remain unexplored as a water source since the Emerado aquifer is easily accessible, has good yield, and is less saline than the shallow groundwater.

10.18 The groundwater in the surficial till is not used as a water source at Grand Forks AFB. The water to Grand Forks AFB is supplied by two sources. The City of Grand Forks extracts its water from both the Red River and the Red Lake River and delivers approximately eighty percent of the water used by the base. The second supplier of water to the base is Grand Forks-Traill Water Users, Inc., located in Thompson, ND. The water from this supplier is drawn from twelve wells, approximately 300 feet deep, between Arvilla and Northwood, ND. The Emerado aquifer beneath the till has not been impacted from previous FTA/OSLA activities and will not be impacted without drastic changes in site conditions.

10.19 It should be emphasized that the constituents of concern are only detected within the landfill boundaries; a release of constituents to groundwater beyond the landfill has not occurred based on results of sampling activities. In addition water levels in all but one of the monitoring well nests show a strong upward gradient. The downward groundwater gradient in the one well nest is very slight due to an overall upward gradient in the remaining wells. This situation results in a stagnation point, which is estimated to be above the top of the aquifer in the confining layer. Therefore, a viable groundwater pathway has not been found. Since constituent migration to the Emerado is not practical or reasonably possible, a groundwater pathway exposure is not viable.

10.20 The soils and surface water/sediments pathways are considered to be viable pathways due to contamination of drainage ditch surface water/sediments in the leachate seep area. There may be a potential for exposure to contaminated surface water/sediments by direct contact, which includes incidental ingestion as well as dermal contact.

10.21 The contamination of sediments at the leachate seep consists of 4-methyl-2-pentanone [methyl isobutyl ketone (MIBK)] at 2.2 mg/kg, xylenes at 1.3 mg/kg, toluene at 1.2 mg/kg, and TPH at 340 mg/kg. Analyses of the surface water in the leachate seep area has also shown contamination by acetone (45 µg/L), methyl ethyl ketone (110 µg/L), MIBK (140 µg/L), 1,1,2,2-tetrachloroethane (47 µg/L), vinyl chloride (13 µg/L) and xylenes (22 µg/L).

10.22 There are two potential pathways for surface water impact due to contamination at the FTA/OSLA. Seepage of contaminated landfill cell water to the drainage ditch via the leachate seep may impact the surface water. Also, leaching of the contaminated sediments at the leachate seep may impact the surface water in the drainage ditch. Impacts to Turtle River via groundwater pathways are not considered plausible since groundwater in the glacial till has a low hydraulic velocity, ranging from 2 to 37 inches per year.

10.23 A health risk estimate for surface water exposure was performed during the Stage 2 RI. Since adequate analytical data did not exist for potential concentrations in surface water, the constituents detected in sediments were used to estimate exposure point concentrations.

10.24 The health risk estimate indicated a potential for receptors to be exposed to surface water through recreational activities. It should, however, be emphasized that the assumed level of recreational use is unlikely due to the characteristics of the runoff water and the location of the ditch. Contaminated surface water/sediments at the leachate seep are approximately 1.5 miles south of the Turtle River. In addition, the outfall at Turtle River runs through base property and is less frequented by the public than the part of the river that flows through Turtle River Park.

11.0 PUBLIC RELATIONS - Administrative Record and Information Repository

11.1 An Administrative Record (AR) is a legal record of the physical situation at an installation, by which response actions are reviewed and defended. An AR must be established at each installation which has conducted or is conducting IRP activities and must be available to the public at or near the installation. The AR at GFAFB is maintained at the following location and is updated as needed by the base Remedial Project Manager:

319 CES/CEVR
525 6th Ave
Grand Forks AFB ND 58205-6434

11.2 An Information Repository (IR) is a project file on IRP activities at AF installations. The repository is to be established for all remedial action sites and for all sites where removal actions last longer than 120 days. It is located either on or off base at a place convenient to the community and contains site information, investigatory reports, information about the sources and nature of the contaminants, and a schedule for cleanup operations. The IR is intended to address community relations requirements and is a source of reading material for the public. Many, if not all of the documents may be the same in the IR and the AR. In Jan 93, GFAFB established an IR which is maintained at the Grand Forks City Library, in the reference section, to insure public access. Following is the location of the IR:

Grand Forks Public Library
2100 Library Circle
Grand Forks, ND 58201

b. Landfill cap modification represents the placement of a volume of cover materials towards achieving the remedial objectives. The specified landfill area would be regraded with a common fill to within a 3% grade, then capped in accordance with the North Dakota municipal landfill closure requirements. These requirements would include a vent layer followed by a geomembrane covering, on top of which would be placed an 18-inch thick layer of clay rich soil followed by a 0.5-foot thick layer of plant growth material for a total thickness of greater than 2.0 feet. The top layer would be hydroseeded with a shallow-root grass seed and mulched. The cap modification alternative would also include a long-term (30-year) cap inspection program.

3. Landfill Cap/Cell Water Extraction/Treatment by Oil/Water Separation

a. In this response action, shallow groundwater and landfill cell water would be extracted from the shallow aquifer and landfill cells using collection trenches. Discharge from the leachate seep would be collected by a recovery trench that is either localized adjacent to the seep or that extends across the entire northern boundary of the landfill cells. Extracted water would be treated by oil/water separation to remove free-floating product and discharged to the lagoon on base if the water is determined to be nonhazardous. In addition, groundwater monitoring would be implemented as an institutional control. If the water is determined to be hazardous, it will be disposed of according to state and federal regulations.

4. Landfill Cap/Cell Water Extraction/Treatment by Oil/Water Separation and Air Stripping

a. This response action is similar to Alternative 3 with the exception that an additional treatment technology, air stripping, would be added to the treatment train. Air stripping is a mass transfer process used to move volatile organic contaminants from water to air. Offgases may require treatment to recapture contaminants.

13.2 Screening of Control Measures

a. The comparative analysis of the four alternatives was conducted to evaluate the alternatives with respect to their relative performance concerning nine criteria. These evaluation criteria are divided into three categories and have been developed by the EPA to address the technical and policy considerations that have proven important for selecting remedial alternatives. The nine criteria are [40 CFR 300.430 (f)(1)(i)]:

- b. THRESHOLD CRITERIA
 - 1. Overall protection of human health and the environment
 - 2. Compliance with Applicable or Relevant and Appropriate Requirements (ARARs)
- PRIMARY BALANCING CRITERIA
 - 3. Long term effectiveness and permanence
 - 4. Reduction of toxicity, mobility, or volume (TMV)
 - 5. Short term effectiveness
 - 6. Implementability
 - 7. Cost
- MODIFYING CRITERIA
 - 8. State acceptance
 - 9. Community acceptance

c. The objectives of the comparison are to assess the relative advantages and disadvantages among the alternatives and to identify the key tradeoffs which must be balanced in selecting a preferred alternative.

12.0 TECHNICAL REVIEW COMMITTEE/RESTORATION ADVISORY BOARD

12.1 A Technical Review Committee (TRC) was established at Grand Forks AFB in Dec 91 to review and comment on Department of Defense actions and proposed actions with respect to releases or threatened releases of hazardous substances into the environment at Grand Forks AFB. The TRC was also established to ensure open communication and exchange of ideas with the general public about the Grand Forks AFB IRP and CERCLA (1980), SARA (1986), and RCRA (1976).

12.2 The TRC was a body comprised of members from Grand Forks AFB, U.S. Environmental Protection Agency, North Dakota State Department of Health, Grand Forks Health Department, and community representatives. All TRC members understood and agreed that the primary purpose and function of the TRC was informational, specifically to foster community and interagency awareness and understanding of Grand Forks AFB IRP remedial actions related to the releases or threatened releases of hazardous substances at Grand Forks AFB.

12.3 In Dec 94, the TRC was replaced by a Restoration Advisory Board (RAB) to enhance community involvement. The RAB provides an environment for an open exchange of ideas, opinions, and information and includes a more thorough representation of the community. The purpose of the RAB is to promote community awareness and obtain constructive community review and comment on environmental restoration actions to accelerate the overall cleanup and subsequent community reuse of portions of Grand Forks AFB. It is used to disseminate information about the IRP and to ensure opinions about environmental restoration reflect diverse interests within the community. The RAB serves in an advisory capacity to Grand Forks AFB, US Environmental Protection Agency Region VIII, and the North Dakota Department of Health.

12.4 As part of the Grand Forks AFB community relations plan, news releases and newsletters are periodically distributed to the local media and RAB members to inform the public about past, present, and future IRP events.

13.0 ALTERNATIVES EVALUATED

13.1 The following four alternatives were identified for Site FT-02:

1. No Further Action and Institutional Controls

a. The no action response is allowable only if the remedial action objectives can be achieved in an acceptable period of time without remedial action. Institutional controls include prohibiting shallow groundwater use until ARARs are met. Monitoring can be used to track the direction and rate of movement of the contaminant plume. As an institutional control, fencing of the leachate seep may be used to prevent contact with contaminated surface water and sediments until remedial action objectives are met. The no action and institutional controls scenario may achieve ARARs as a response action through the natural attenuation of contaminants, but the restoration time frame would be extensive. Under this alternative, groundwater and landfill seep water quality monitoring would be the only activity conducted.

2. Landfill Cap

a. A cap is intended to physically contain the waste in a landfill by reducing surface infiltration and limiting landfill cell water flow thus minimizing continued migration of contaminants into the landfill cell water. Under this alternative, water quality monitoring and landfill cap modifications by regrading and new cap construction would be conducted. In addition, the landfill cap will extend over the north drainage ditch, covering the existing leachate seep.

13.3 Criterion 1: Overall Protection of Human Health and the Environment

a. Protectiveness is the primary requirement that remedial actions must meet under CERCLA. A remedy is protective if it adequately eliminates, reduces, or controls all current and potential risks posed through each pathway at the site. To ensure the overall protection of human health and the environment in this remedial response, three objectives need to be addressed: mitigation of the leachate seep, waste isolation and future maintenance of the landfill cap, and non-degradation of the Emerald Aquifer and the glacial till water table aquifer groundwater qualities. All of the alternatives, with the exception of Alternative 1 (No Further Action), provides for overall protection of human health and the environment.

b. Alternative 1 - This alternative does not provide for overall protection of human health and the environment because it would not reduce the potential of contaminant migration. By implementing this alternative, risk may actually increase over time, even if biodegradation is considered, as a result of unmitigated contaminant releases from the leachate seep.

c. Alternative 2 - The landfill cap should effectively mitigate the seep by covering the drainage ditch and reducing, and possibly eliminating, recharge to the landfill cells by percolation of precipitation. As a result, water levels within the cells should become lower, possibly to the point of being completely dewatered, significantly reducing the leaching of contaminants from soils and waste material. The cap will also reduce, if not completely eliminate, direct contact to the waste and contaminated soil and groundwater. However, in itself, this alternative will not reduce the amount of contamination within the landfill.

d. Alternatives 3 and 4 - These alternatives do not satisfy all of the objectives necessary to ensure the overall protection of human health and the environment. The option of using extraction trenches within landfill cells allows for a pathway from the waste stream to receptors and, therefore, this option has been eliminated for human and environmental health concerns. These alternatives would, in theory, reduce the concentrations of contaminants; however, geological and physical barriers at this site (i.e. low conductivity of soils) will hinder the collection and treatment of landfill water, as was demonstrated by a pilot-scale treatment test (James M. Montgomery, 1992). Although the landfill cap modifications, as stated in the discussion for Alternative 2, will reduce direct contact to the waste and contaminated soil and landfill cell water, the extraction trenches will not.

13.4 Criterion 2: Compliance with ARARs

a. Compliance with ARARs is one of the statutory requirements of remedy selection. The primary ARARs at the landfill are MCLs, landfill closure requirements, and storm water and sewage drainage requirements. Attachment 1 provides a detailed list of chemical-specific ARARs for the media of concern (groundwater, surface water, and air) and for action-specific ARARs.

b. Alternative 1 - This alternative does not comply with Federal or State ARARs.

c. Alternative 2 - The primary ARARs at the landfill are the MCLs, landfill closure requirements (RCRA and North Dakota Guidelines) and stormwater discharge and drainage requirements (Clean Water Act [CWA] and National Pollutant Discharge Elimination System [NPDES]). This alternative meets the ARARs identified as applicable to the landfill. Because wastes were disposed of in the landfill prior to 1980, the RCRA hazardous waste landfill closure requirements are not applicable. However, because hazardous waste may have been disposed of in the landfill, the RCRA hazardous waste closure requirements that address the primary remedial objectives (seep mitigation, waste isolation, and aquifer non-degradation) are relevant and appropriate. This alternative should achieve these objectives by preventing groundwater recharge and subsequent mounding of water within and over the landfill cells. This should result in reduced flow from the leachate seep and isolation and reduction of the quantity of water within the landfill cells. The cap will also satisfy the ARARs identified as applicable to the landfill under CWA requirements by grading the site to a positive grade thus

minimizing surface water ponding. These options will also ensure stormwater runoff is diverted away from the landfill via existing drainage routes.

d. Alternative 3 - The primary ARARs at the landfill are MCLs, landfill closure requirements (RCRA and North Dakota Guidelines) and stormwater and sewage discharge requirements (CWA and NPDES). The cap modification meets applicable ARARs, as described for Alternative 2. In order to comply with the base's NPDES permit for pretreatment standards, a permit modification may be necessary for discharge of generated wastewaters from both the landfill cell water interception, extraction, and treatment alternative options to the base wastewater treatment lagoons. This may prompt the State to impose pretreatment and influent quality standards for the alternatives. Consequently, the alternatives may not comply with future CWA and NPDES requirements.

e. Alternative 4 - In addition to the ARARs for Alternative 3, this alternative would also have to comply with North Dakota Air Pollution Control Regulations and the Federal Clean Air Act due to the use of an air stripper.

13.5 Criterion 3: Long Term Effectiveness and Permanence

a. This criterion reflects CERCLA's emphasis on implementing remedies that will ensure protection of human health and the environment in the long term. The assessment of alternatives against this criterion evaluates the residual risks at a site after completion of a remedial action or enactment of a no action alternative.

b. Alternative 1 - This alternative will not achieve long term effectiveness and permanence because it does not provide for isolation of waste and maintenance nor will it limit exposure to the leachate seep.

c. Alternative 2 - This alternative will achieve long-term effectiveness and permanence with respect to seep mitigation and limiting exposure to landfill waste within a foreseeable time frame. In conjunction with groundwater monitoring, this alternative will ensure that long term effects of groundwater degradation do not occur.

d. Alternatives 3 and 4 - These alternatives will achieve long-term effectiveness and permanence with respect to seep mitigation and limiting exposure to landfill waste within a foreseeable time frame. In theory, landfill cell water interception and extraction via the drainage trench will help to dewater and decrease contaminant concentrations over time within the landfill cell water. However, geological and physical barriers at this site (i.e. low conductivity of soils) will hinder the collection and treatment of landfill water, as was demonstrated by a pilot scale treatment test (James M. Montgomery, 1992). Also, implementation of Alternatives 3 and 4 would possibly result in a wastewater discharge to the base lagoon, if it were considered nonhazardous, which may therefore require a modification to the current base National Pollutant Discharge Elimination System (NPDES) permit. If the water were determined to be hazardous, it would be disposed of according to state and federal regulations. In conjunction with groundwater monitoring, these alternatives will ensure that long term effects of groundwater degradation will not occur.

13.6 Criterion 4: Reduction of Toxicity, Mobility, and Volume (TMV)

a. This criterion addresses the statutory preference for remedies that employ treatment as a principal element. The assessment against this criterion evaluates the anticipated performance of the specific treatment technologies an alternative may employ.

b. Alternative 1 - This alternative does not reduce the TMV of contaminants present in the FTA/OSLA. By implementing this alternative, immediate TMV may actually increase as a result of unmitigated contaminant releases from the leachate seep. The toxicity will eventually decrease as a result of natural attenuation. However, it is uncertain as to whether the contaminants will degrade to

nontoxic concentrations before reaching the Turtle River, which is approximately one mile away from the site.

c. Alternative 2 - This alternative will have a partial effect on the reduction of TMV of contaminants present in the landfill. The cap should effectively reduce cell water recharge by percolation. This will consequently reduce the mounded landfill cell water and effectively decrease the flow of contaminants to the leachate seep and reduce downward and lateral flow to the groundwater. Leaching of contaminated soils above the landfill cell water will also be reduced, minimizing the amount of contaminants that could migrate into the landfill cell water.

d. Alternatives 3 and 4 - These alternatives will, in theory, help reduce the amount and the TMV of contaminants present in the landfill. However, geological and physical barriers at this site (i.e. low conductivity of soils) will hinder the collection and treatment of landfill water, as was demonstrated by a pilot scale treatment test (James M. Montgomery, 1992). Installation of the cap should effectively reduce groundwater recharge from percolation, reduce contaminant mobility, and reduce water levels. The drainage trench should remove available contaminated landfill cell water and further reduce water levels in the landfill cells. Leaching of contaminated soils above the landfill cell water will also be reduced, minimizing the amount of contaminants migrating to the landfill cell water.

13.7 Criterion 5: Short Term Effectiveness

a. This criterion addresses short-term impacts of the alternative. The assessment against this criterion examines the effectiveness of alternatives in protecting human health and the environment during the construction and implementation of a remedy.

b. Alternative 1 - The current land use at this site defines the short-term effectiveness of this alternative. Short-term risks associated with this alternative include potential contaminant exposure at the landfill seep and during the installation and sampling of monitoring wells.

c. Alternative 2 - Short term risks associated with this alternative include potential contaminant exposure at the landfill seep, during the installation and sampling of monitoring wells, and during cap modifications.

d. Alternatives 3 and 4 - Short-term risks associated with these alternatives include potential for contaminant exposure during sampling of monitoring wells and at both the landfill seep and along the northern boundary during the installation of the drainage trench. In addition, exposure to contaminants may occur during cap modifications.

13.8 Criterion 6: Implementability

a. The assessment against this criterion evaluates the technical and administrative feasibility of the alternatives and the availability of the goods and services needed to implement them.

b. Alternative 1 - This alternative would be easily implemented but most likely would not be permitted administratively because risks exist due to the leachate seep discharge.

c. Alternative 2 - Landfill caps have been successfully used at many waste sites and are easily implemented, where clay soils are available, as in Grand Forks.

d. Alternatives 3 and 4 - Alternatives 3 and 4 are viable alternatives and have been successfully used at many waste sites. However, the existing clay soils may hinder extraction of the landfill cell water, thus limiting implementability. These alternatives may also require minor quantitative changes to the NPDES discharge permit for flowrates and influent wastewater quality. However, no requirements presently exist that would hinder implementation.

13.9 Criterion 7: Cost

a. Cost encompasses all engineering, construction, and operation and maintenance costs incurred over the life of the project. The assessment against this criterion is based on the present worth of these costs for each alternative. In ranking costs from least to most expensive, Alternative 1 would be the least expensive choice, followed by Alternatives 2, 3, and 4, respectively.

b. Alternative 1 - Costs associated with this alternative are incurred under the 30-year post-closure monitoring period. The total present worth cost of this alternative, over 30 years, is estimated at \$400K.

c. Alternative 2 - The cost of this alternative is based on the area of landfill to be capped and that only State municipal waste landfill regulations for landfill closures are applicable. The cost of the cap is estimated at \$7M in addition to the \$400K for the 30-year post-closure monitoring period.

d. Alternative 3 - The cost for this alternative is based on the assumptions that discharge under a modified NPDES permit will be allowed, that the trenching lengths will be 200 or 1200 feet, depending on the location of the trench, and that oil/water separation will be sized for discharges ranging between 5 and 15 gallons per minute (gpm). The total present worth cost of each scenario to be maintained for a 30-year period is approximately \$450K and \$910K, respectively. These costs are in addition to the \$7M for the cap and the \$400K for the 30-year post-closure monitoring period.

e. Alternative 4 - In addition to the cost factors mentioned in Alternative 3, this alternative may require additional money for the extra unit operations in the treatment train. Startup costs for this alternative are estimated at \$2M to \$3M depending on the treatment capacity, the length of the interception trench, and the type of air stripper system. Operating costs for these systems generally range from \$10K to \$150K per gallon of contaminant removed. In addition, the cost for this alternative is based on the assumptions that discharge under a modified NPDES permit will be allowed and do not include treatability studies which would be required prior to installation at the site.

13.10 Criterion 8: State Acceptance

a. This criterion, which is an ongoing concern throughout the remedial process, reflects the statutory requirement to provide for substantial and meaningful State involvement.

b. Alternative 1 - The North Dakota Department of Health (NDDH) would accept no less than a RCRA landfill cap as the remedial action at the site. Therefore Alternative 1 is not acceptable.

c. Alternative 2 - NDDH has determined that a landfill cap is an acceptable remedial action. A Proposed Plan was submitted to the NDDH and the US Environmental Protection Agency (EPA). Comments made by the NDDH are incorporated into this Decision Document. Grand Forks AFB received no comments from the EPA.

d. Alternatives 3 and 4 - NDDH may possibly accept these alternatives as acceptable remedial actions. However, concerns may arise over the effect of pumping on the subsurface and the disposal of the effluent from the treatment systems. The state may be reluctant to grant additional permit modifications for NPDES (Alternatives 3 and 4) or air emissions (Alternative 4).

13.11 Criterion 9: Community Acceptance

a. This criterion reflects the community's apparent preferences or concerns about alternatives.

b. The TRC, RAB, and IR have been the avenues in which the base has informed the community of IRP activities. TRC meetings were held from Dec 91 to Dec 94. In Dec 94, the TRC was


converted to a RAB, which meetings are held quarterly. Both the former TRC and current RAB members agreed that a landfill cap must be constructed over the site. Community members would most likely accept Alternatives 3 and 4 as well; however, they would most likely not accept Alternative 1. Overall, there has been very little public interest in this activity, based on the lack of questions and/or comments posed by the community members of the TRC and RAB.

c. A Proposed Plan, RAB meetings, and the IR have all provided an opportunity for public comment/involvement in this and other base IRP activities. The Proposed Plan was placed in the IR at the Grand Forks Public Library for a 30-day period during which the community was invited to review and comment on the Plan. An article advertising the Plan's availability at the Library was placed in the Grand Forks Herald, a local newspaper. A Public Hearing to discuss the Proposed Plan was held on 27 Jul 95 at Grand Forks AFB. No comments were received from the public.

14.0 CONCLUSION

14.1 The selected alternative for the FTA/OSLA is alternative 2, landfill cap modification. This alternative includes construction of a landfill cap, long term cap maintenance, groundwater monitoring, and a five-year review prescribed by the NCP when contaminants remain on site above levels that allow unlimited use (40 CFR 300.430 (f)(4)(ii)). Analysis of the selected action indicates the landfill cap alone will sufficiently protect human health and the environment by reducing and potentially eliminating recharge by precipitation into the landfill cells. Additionally, a landfill cap will reduce percolation of surface water into the soils thereby decreasing the mobility of groundwater at the site and will effectively isolate the waste, eliminating the seep. Primary ARARs for the FTA/OSLA as they pertain to alternative 2 include MCLs, landfill closure requirements, and storm water drainage requirements, all of which will be met. The alternative also includes sufficient provisions for long term effectiveness and reduction in TMV.

14.2 Alternative 2 is a viable and pragmatic approach to remediating the site and is based on materials that are readily available and technologies that have been used successfully at other hazardous waste sites.


JAMES E. ANDREWS
Brigadier General, USAF
Commander, 319th Air Refueling Wing

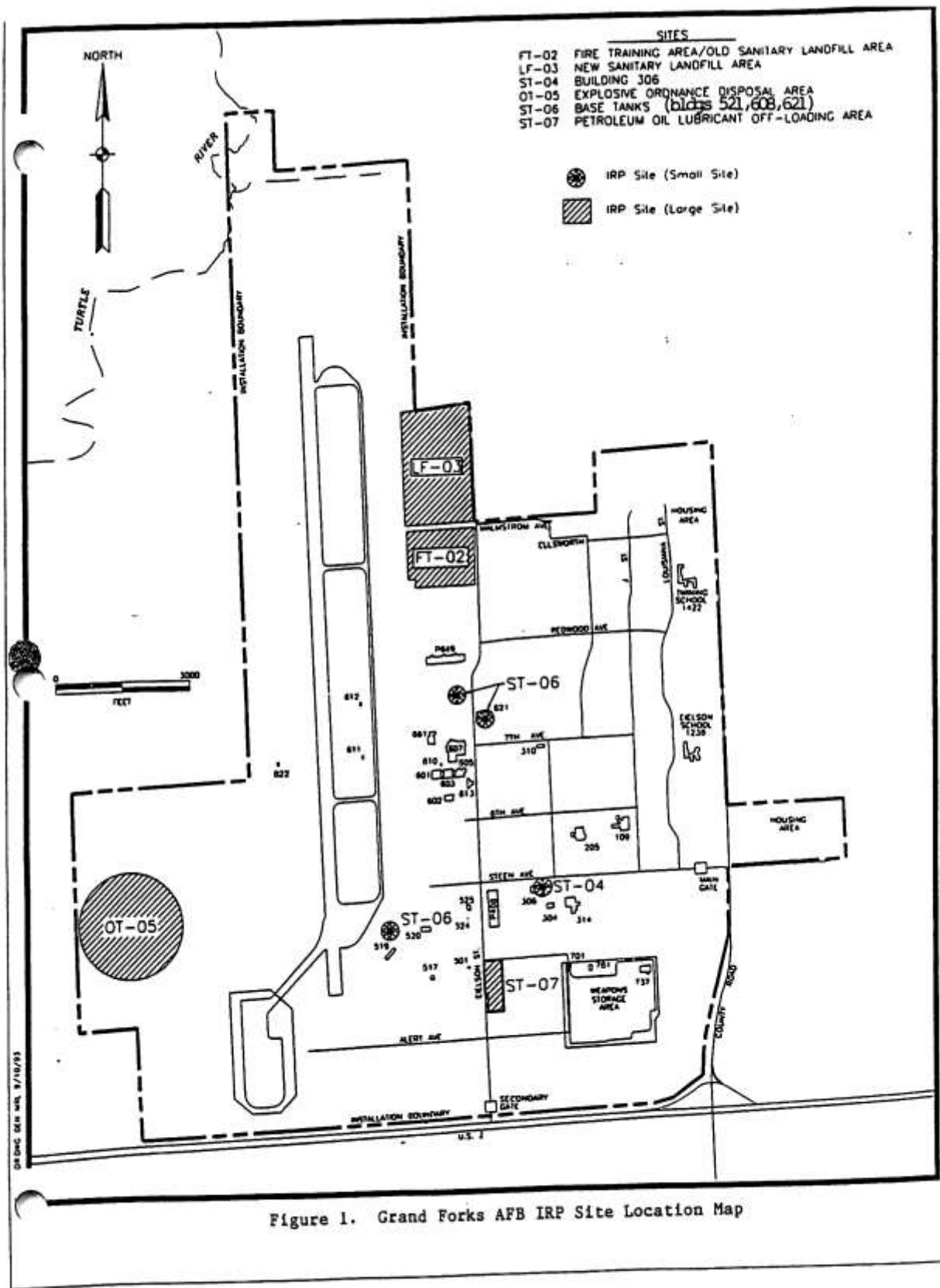
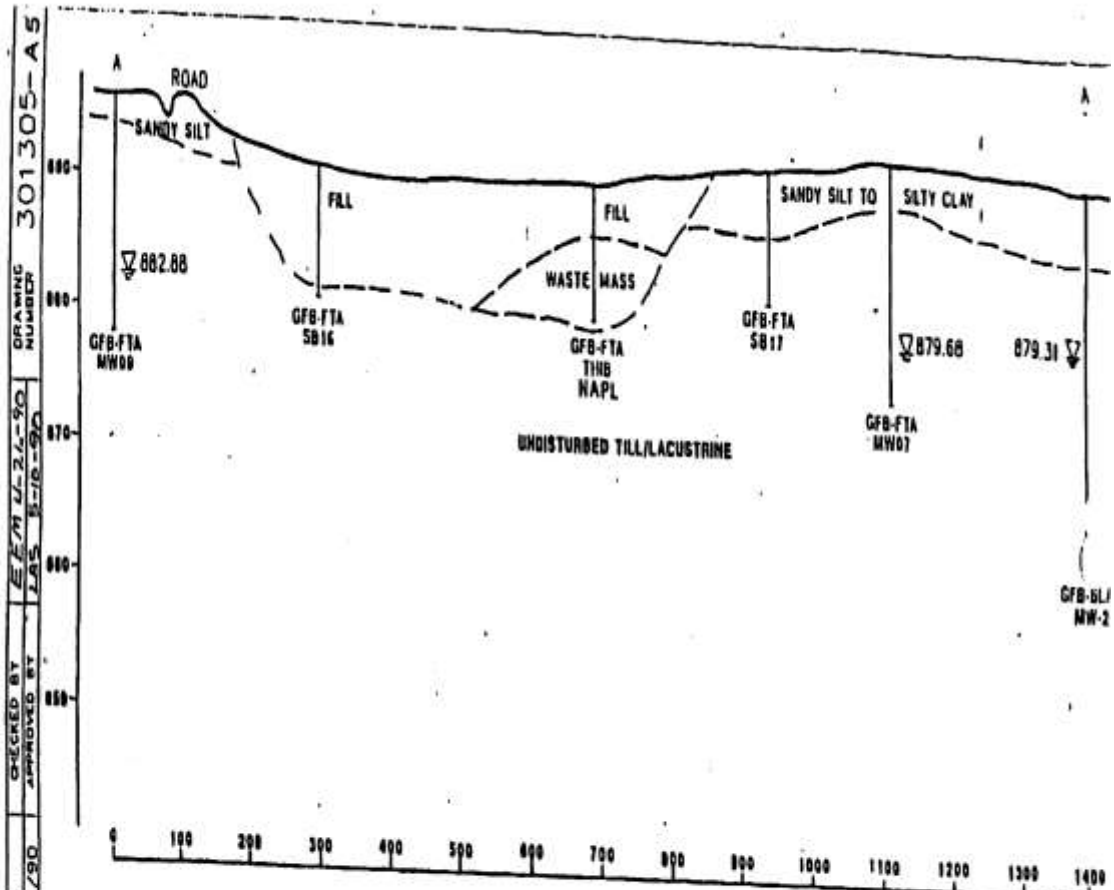


Figure 1. Grand Forks AFB IRP Site Location Map



DRAWN BY: LBS 4/6/90
 CHECKED BY: ELM L-27-90
 APPROVED BY: LBS 5-18-90
 DRAWING NUMBER: 301305-A5

NAPL:NON AQUEOUS PHASE LIQUID
 ▽ 882.88 GROUND WATER ELEVATION

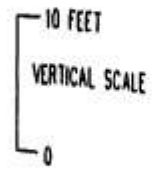
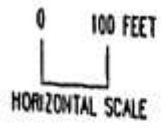
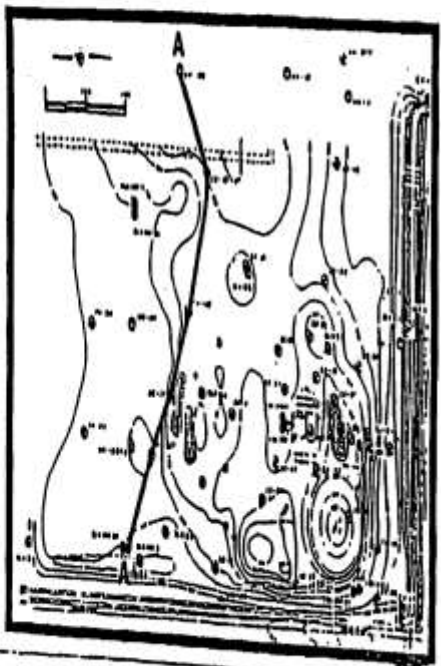
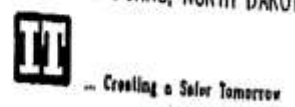
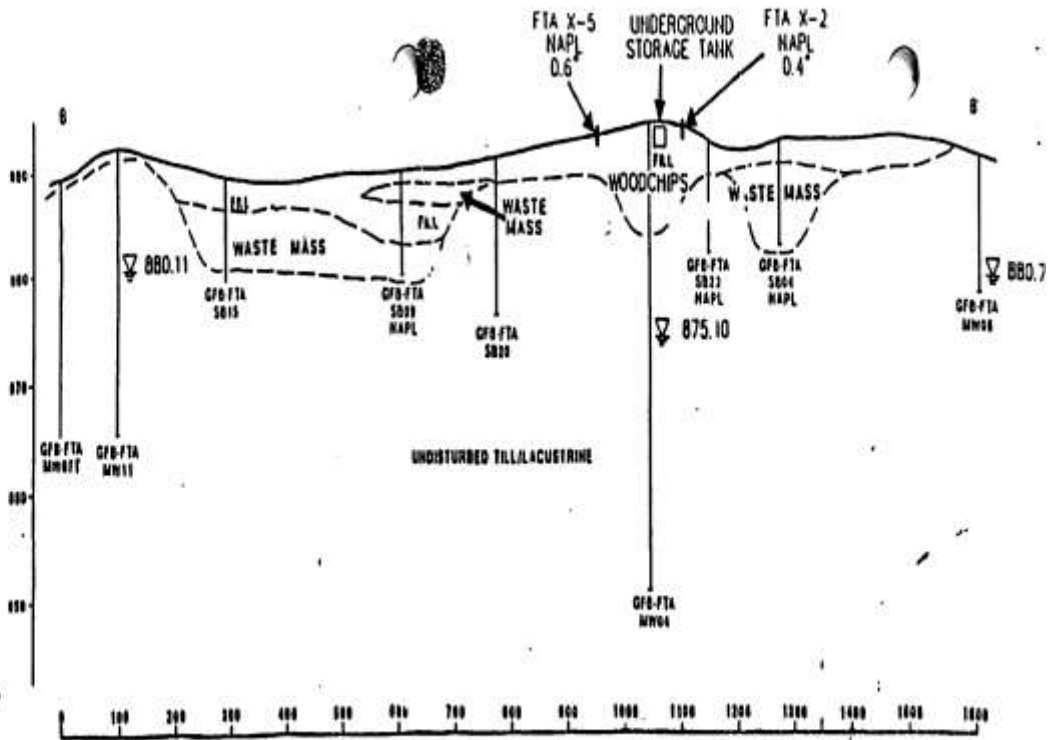


FIGURE 2A
 FIREFIGHTER TRAINING AREA
 CROSS SECTION A - A
 PHASE II, STAGE 2
 PREPARED FOR
 GRAND FORKS AIR FORCE BASE
 GRAND FORKS, NORTH DAKOTA



DRAWING NUMBER 301300-1
 CHECKED BY [Signature] 2-26-90
 APPROVED BY [Signature] 5-10-90
 LBS 4/5/90
 DRAWN BY [Signature]



NAPL: NON AQUEOUS PHASE LIQUID
 FTA X-5 PHASE II, STAGE 1, BORING
 WITH MEASURED NAPL THICKNESS
 ▽ 880.11 GROUND WATER ELEVATION

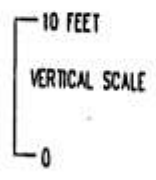
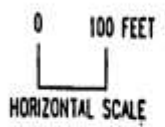
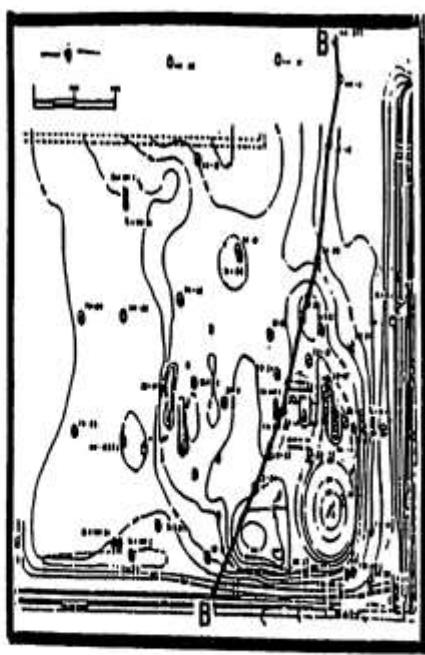
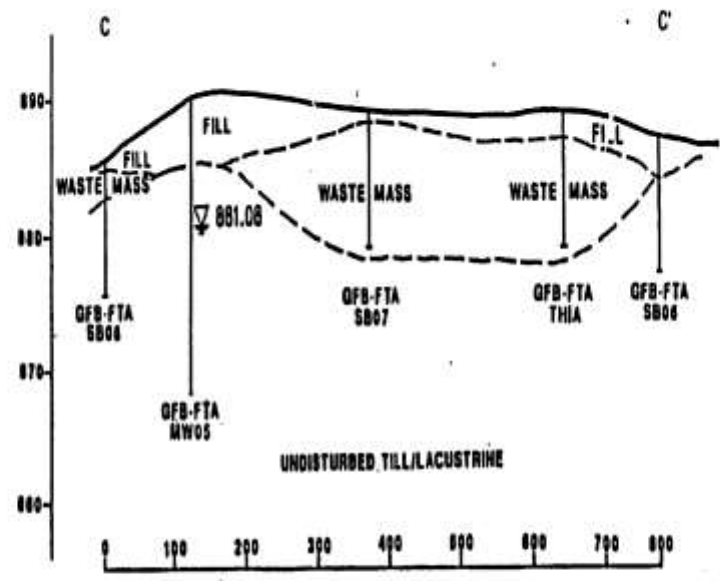


FIGURE 2B
 FIREFIGHTER TRAINING AREA
 CROSS SECTION B - B'
 PHASE II, STAGE 2
 PREPARED FOR
 GRAND FORKS AIR FORCE BA
 GRAND FORKS, NORTH DAKOTA



... Creating a Safer Tomorrow

DRAWN BY: LBS 4/25/90
 CHECKED BY: EAM 7-26-90
 APPROVED BY: JAS 5-15-90
 DRAWING NUMBER: 301305-A



▽ 881.08 GROUND WATER ELEVATION

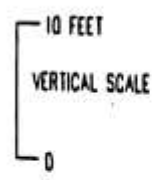
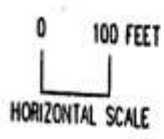
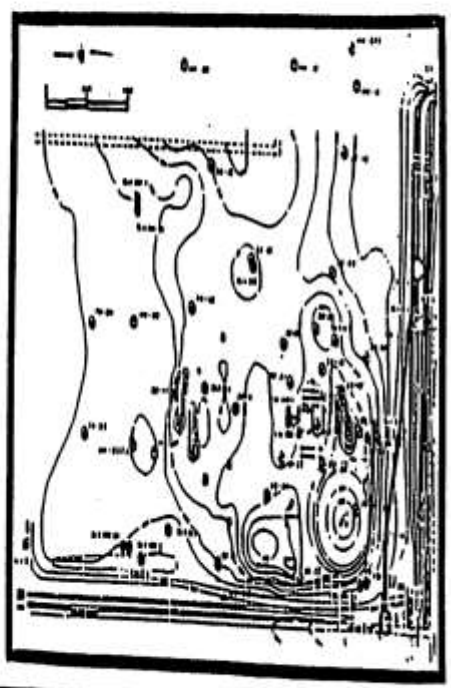


Figure 2C
 FIREFIGHTER TRAINING AREA
 CROSS SECTION C - C'
 PHASE II, STAGE 2
 PREPARED FOR
 GRAND FORKS AIR FORCE BASE
 GRAND FORKS, NORTH DAKOTA



... Creating a Safer Tomorrow

DRAWING NUMBER 301305
 CHECKED BY [signature]
 APPROVED BY [signature]
 LBS 4/5/90
 DRAWN BY [signature]

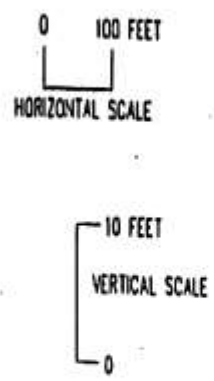
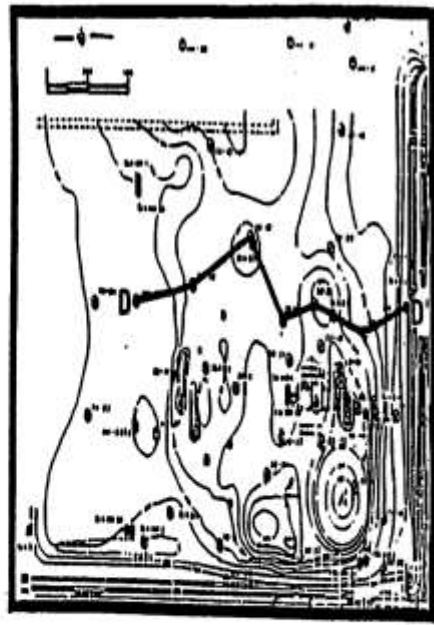
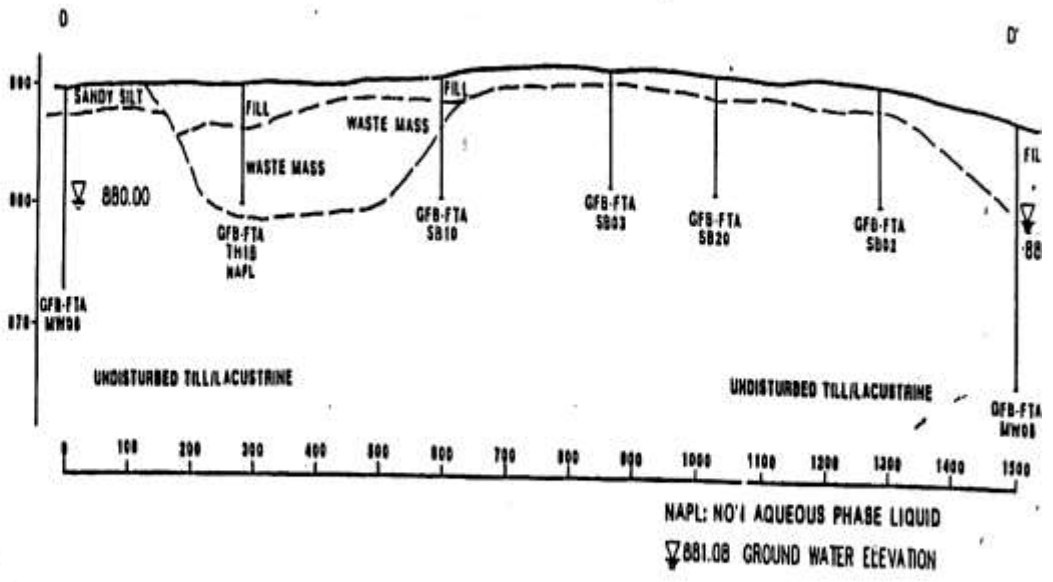
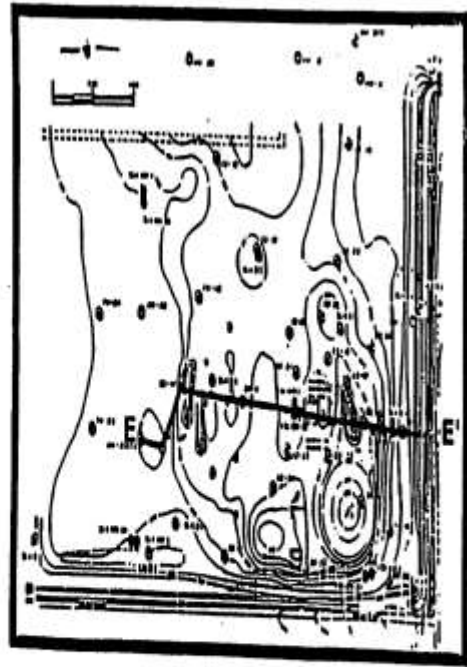
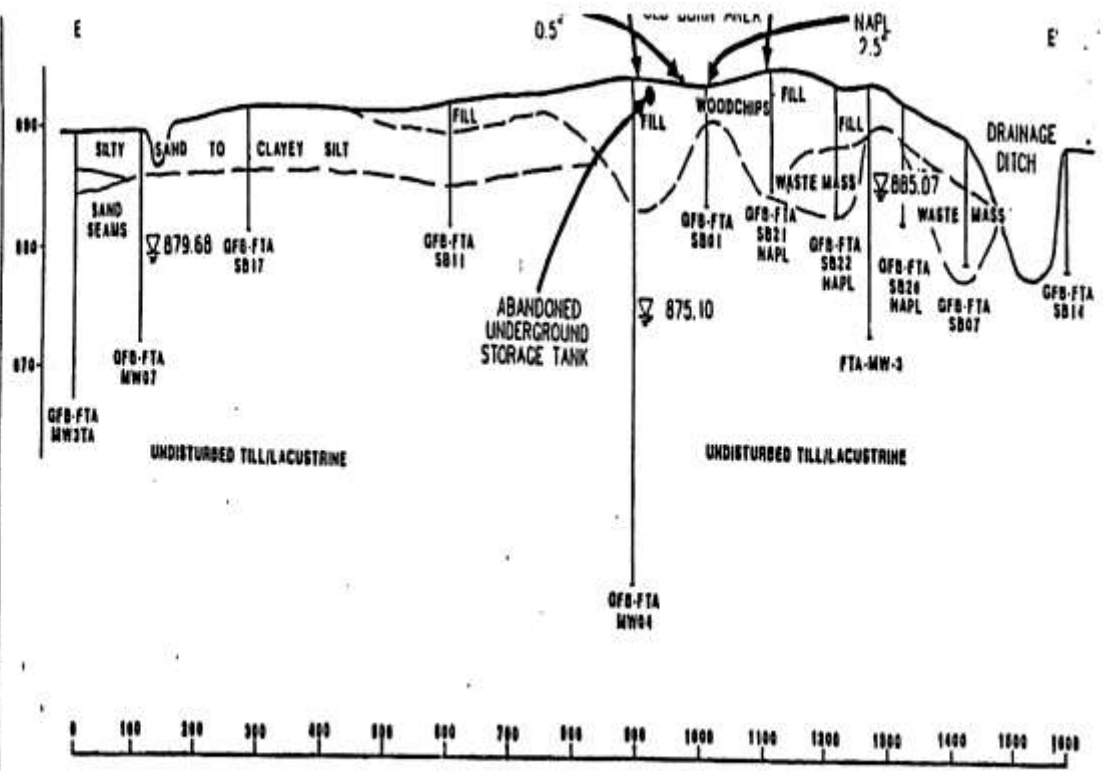


Figure 2D
 FIREFIGHTER TRAINING AREA
 CROSS SECTION D - D'
 PHASE II, STAGE 2
 PREPARED FOR
 GRAND FORKS AIR FORCE B
 GRAND FORKS, NORTH DAKC



DRAWING NUMBER 301305...
 CHECKED BY
 APPROVED BY
 LBS
 5/5/90
 DRAWN BY



NAPL: NON AQUEOUS PHASE LIQUID
 FTA X-5 PHASE II, STAGE I, BORING
 WITH MEASURED NAPL THICKNESS
 885.07 GROUND WATER ELEVATION

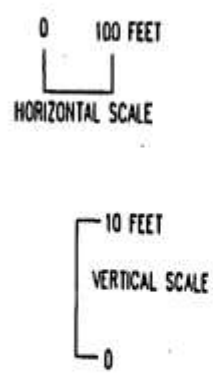
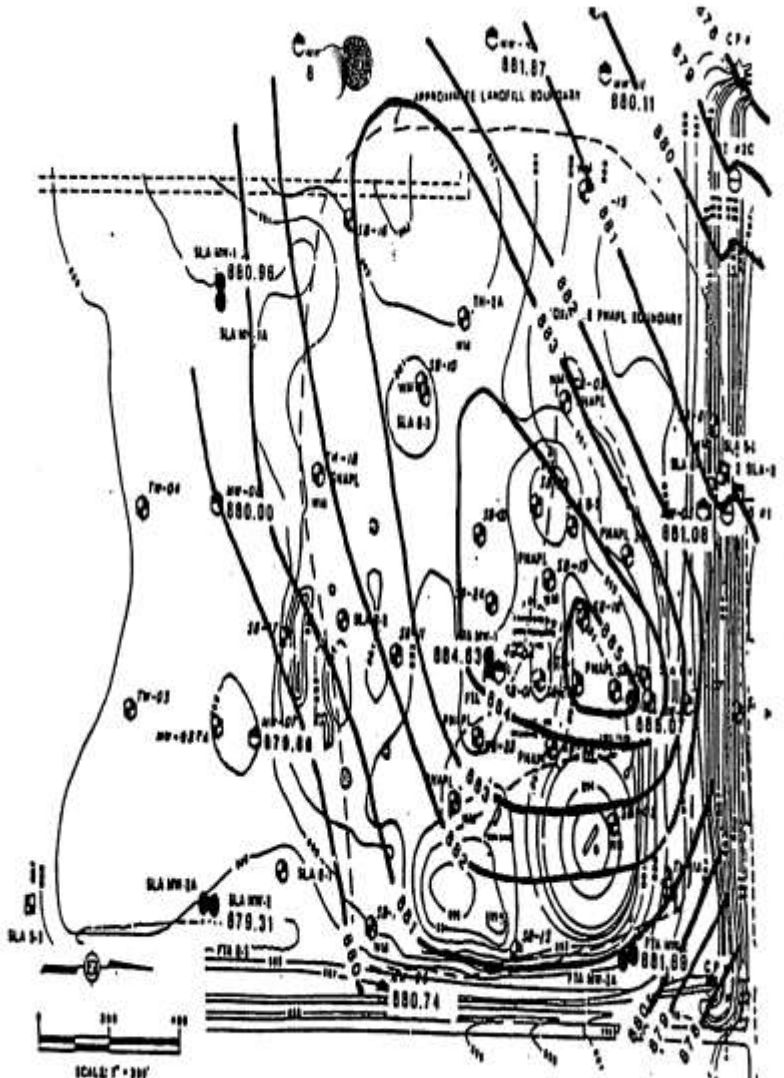


Figure 28
 FIREFIGHTER TRAINING AREA
 CROSS SECTION E - E'
 PHASE II, STAGE 2
 PREPARED FOR
 GRAND FORKS AIR FORCE BASE
 GRAND FORKS, NORTH DAKOTA
 ... Creating a Safer Tomorrow

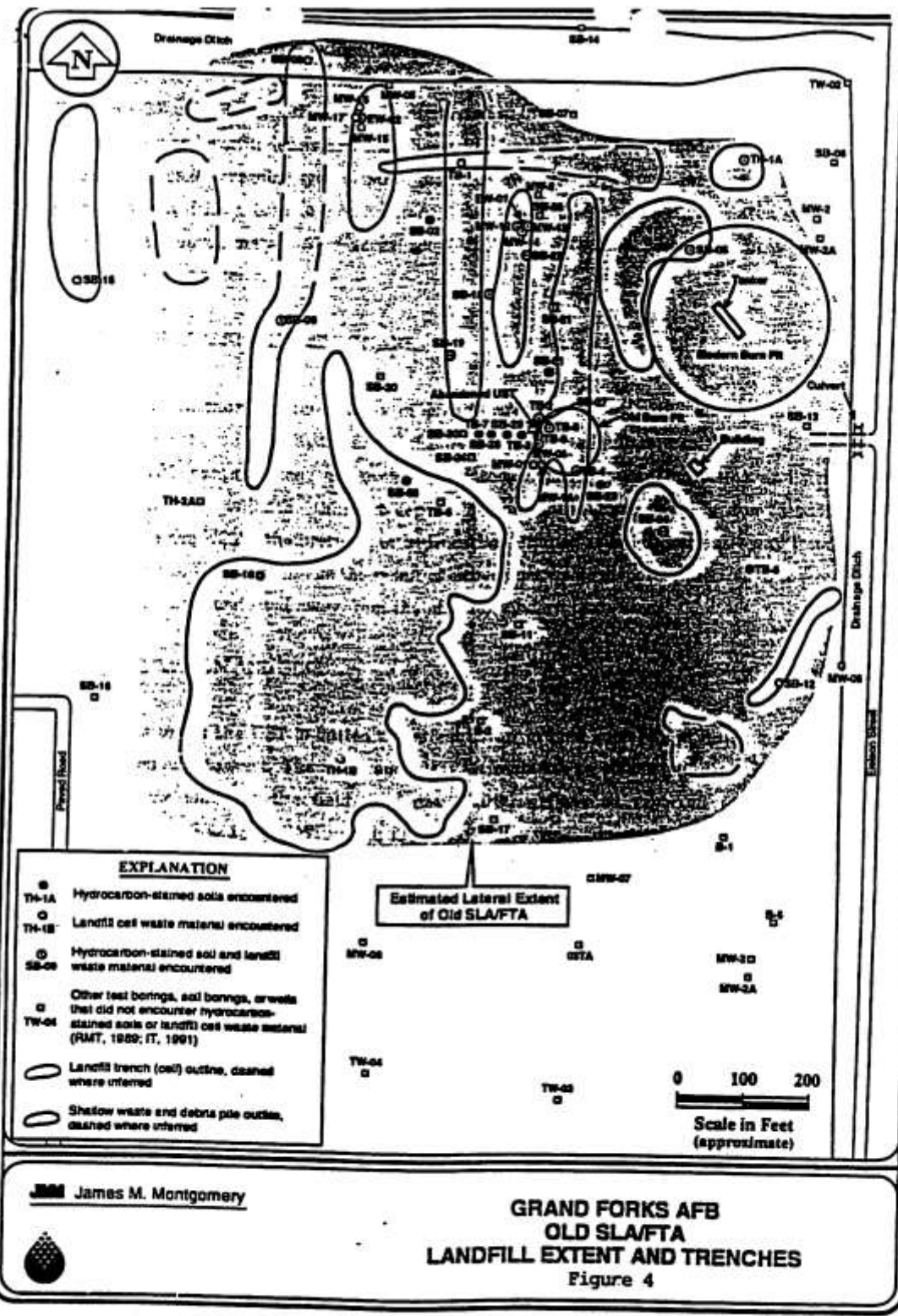
DRAWN BY: SEM
 CHECKED BY: SEM
 APPROVED BY: SEM
 DRAWING NUMBER: 3013



- LEGEND**
- △ EXISTING CONTROL POINT OR TBM
 - ⊙ EXISTING BORING
 - ⊠ SEDIMENT SAMPLE
 - ⊙ PHASE II, STAGE 2 MONITORING WELL
 - ⊙ PHASE II, STAGE 2 SOIL BORING
 - GROUND WATER LEVEL (FEET ABOVE MSL)

Figure 3
 GROUND WATER CONTOUR MAP
 OF SHALLOW WATER TABLE AT
 FIREFIGHTER TRAINING AREA
 PHASE II, STAGE 2
 PREPARED FOR
 GRAND FORKS AIR FORCE BASE
 GRAND FORKS, NORTH DAKOTA





PROJECT NO. 1858 0591

TABLE A-1

FEDERAL AND STATE CHEMICAL-SPECIFIC ARARs

Media-Of-Concern	Federal/ State	Chemical-Specific ARAR	Description	Applicable/ Relevant and Appropriate	Summary of ARAR Assessment
Groundwater	Federal	Safe Drinking Water Act, National Primary Drinking Standards, 40 CFR, Part 241	Establishes health-based standards for public water systems. Standards referred to as the Maximum Contaminant Levels (MCL).	Relevant and Appropriate	MCLs are relevant and appropriate in the groundwater of the Emerado Aquifer and glacial till water table aquifer. Although the aquifers are not currently used near the Old SLA/FTA as domestic water supplies, their potential use can not be ruled out (IT, 1990). MCLs are not relevant and appropriate in the Old SLA/FTA landfill cell water.
Groundwater	State	North Dakota Public Water Supply Systems Regulations: Maximum Contaminant Levels, North Dakota Rule: Article 33-17; Chapter 33-17-01; Section 33-17-01-06	Designates the federal MCLs as North Dakota drinking water standards.	Relevant and Appropriate	MCLs are relevant and appropriate in the groundwater of the Emerado Aquifer and glacial till water table aquifer. Although the aquifers are not currently used near the Old SLA/FTA as domestic water supplies, their potential use can not be ruled out (IT, 1990). MCLs are not relevant and appropriate in the Old SLA/FTA landfill cell water.
Groundwater/ Surface Water	State	North Dakota Water Quality Standards: Antidegradation Policy North Dakota Rule 33-16-02, Section 33-16-02-01	North Dakota Groundwater and Surface Water Antidegradation Policy	Applicable	Policy established for protection of North Dakota groundwater and surface water. Policy establishes substantive requirements under North Dakota Rule 33-16-02, Section 33-16-02-10.
Groundwater	State	North Dakota Water Quality Standards: Specific Standards of Quality for Designated Classes of Groundwaters of the State, North Dakota Rule: 33-16-02, Section 33-16-02-10	Establishes North Dakota groundwater classifications. Requires that discharges to groundwater not cause dissolved or suspended substances to exceed the maximum allowable chemical levels for drinking water, set forth in North Dakota Century Code Chapter 61-28.1 for a Class I groundwater.	Applicable	The glacial till water table aquifer and Emerado Aquifer are Class I groundwaters. Class I groundwaters have total dissolved concentrations of less than 10,000 mg/L.

TABLE A-1
FEDERAL AND STATE CHEMICAL-SPECIFIC ARARs
(CONTINUED)

Media-Of-Concern	Federal/ State	Chemical-Specific ARAR	Description	Applicable/ Relevant and Appropriate	Summary of ARAR Assessment
Groundwater	State	North Dakota Groundwater Resource Protection Act, Senate Bill No. 2231	Law that requires the North Dakota Department of Health and Consolidated Laboratories to establish groundwater protection standards.	----	Currently groundwater protection standards in North Dakota, other than those established under North Dakota Rule 33-16-02, Section 33-16-02-10, are established on a case-by-case basis. Senate Bill No. 2231 creates no substantive requirements.
Groundwater	Federal	Safe Drinking Water Act, National Secondary Drinking Water Standards, 40 CFR, Part 143	Establishes welfare-based standards for public water system. Standards referred to as Secondary Maximum Contaminant Levels (SMCLs).	No/No	North Dakota has adopted the Federal SMCLs as nonenforceable drinking water standards. As reported by the North Dakota Division of Water Quality, the SMCLs are infrequently, if ever, enforced in the State. The SMCLs are therefore not considered applicable or relevant and appropriate recognizing that the water qualities of the glacial till water table aquifer and Emerald Aquifer are naturally hard with elevated chloride, sulfate, and/or iron concentrations.
Groundwater	Federal	Safe Drinking Water Act, Maximum Contaminant Level Goals, 40 CFR 141.50	Establishes drinking water quality goals set at levels of no known or anticipated adverse health effects, with an adequate margin of safety. Goals referred to as Maximum Contaminant Level Goals (MCLGs).	To be considered	In North Dakota groundwater protection standards are established on a case-by-case basis and the federal MCLGs have not been adopted as drinking water standards. Since the glacial till water table aquifer and Emerald Aquifer are not currently being used near the Old SLA/FTA as domestic water supplies and the groundwaters are of poor water quality, only those MCLGs not equal to zero and established for site contaminants without existing MCLs are considered potentially ARAR. These MCLGs are to be considered. The MCLGs are not relevant and appropriate and are not to be considered for the Old SLA/FTA landfill cell water.

A-2

FEDERAL AND STATE CHEMICAL-SPECIFIC ARARs
(CONTINUED)

Media-Of-Concern	Federal/State	Chemical-Specific ARAR	Description	Applicable/Relevant and Appropriate	Summary of ARAR Assessment	
Groundwater	Federal	Clean Water Act, Quality Criteria for Water, 40 CFR, Part 131	Establishes criteria for ambient water quality based on toxicity to aquatic organisms and human health.	No/No	Water quality criteria adjusted to reflect exposure to drinking water are potentially relevant and appropriate if other drinking water standards are not available. This case does not apply to the OIA SLA/FTA.	
Groundwater	Federal	RCRA, Releases from Solid Waste Management Units, 40 CFR, Part 264, Subpart F	Establishes minimum national standards for the acceptable monitoring and response to releases from hazardous waste management units.	Relevant and Appropriate	Because the potential exists for the release of hazardous constituents to the glacial till water table aquifer and the Emerado Aquifer, the RCRA Maximum Concentration Levels are relevant and appropriate. (The standards are not applicable since wastes were disposed in the SLA/FTA prior to 1980).	
S-V	Surface Water	Federal	Clean Water Act, National Pollutant Discharge Elimination System, 40 CFR, Parts 122 and 125	Requires permits, with set discharge limits, for the discharge of pollutants from any point source into U.S. waters.	Applicable	Potential action-specific ARAR. If extracted landfill cell water is discharged to the GFAPB wastewater stabilization lagoons, the facility's NPDES permit will have to be modified and the permit discharge limits still achieved.
	Surface Water	State	North Dakota Pollutant Discharge Elimination System, North Dakota Rule 33-16-01	Establishes the regulations dictating the surface water effluent standards set in the GFAPB wastewater stabilization lagoon NPDES permit.	Applicable	Potential action-specific ARAR. If extracted landfill cell water is discharged to the GFAPB wastewater stabilization lagoons, the facility's NPDES permit will have to be modified and the permit discharge limits still achieved.
	Surface Water	Federal	Clean Water Act, National Pretreatment Standards, 40 CFR, Part 403	Sets standards to control pollutants which pass through or interfere with treatment processes in publicly owned treatment works or which may contaminant sewage sludge.	Relevant and Appropriate	Potential action-specific ARAR. If extracted landfill cell water is discharged to the GFAPB wastewater stabilization lagoons, the pretreatment standards are considered relevant and appropriate.

TABLE A-1
FEDERAL AND STATE CHEMICAL-SPECIFIC ARARs
(CONTINUED)

Media-Of-Concern	Federal/ State	Chemical-Specific ARAR	Description	Applicable/ Relevant and Appropriate	Summary of ARAR Assessment
Surface Water	Federal	Quality Criteria for Water, 40 CFR, Part 131	Establishes criteria for ambient water quality based on toxicity to aquatic organisms and human health.	Applicable	Groundwater and surface water from the Old SLA/PTA which are ultimately discharged to Turtle Creek shall not cause ambient water quality standards to be exceeded. To date, site characterization data indicate impact to Turtle Creek is negligible.
Surface Water	State	North Dakota Water Quality Standards: Surface Water Quality Standards for Designated Classes of Surface Water, North Dakota Rule 33-16-02; Section 33-36-02-01.	Establishes ambient surface water quality standards for Turtle River	Applicable	Groundwater and surface water from the Old SLA/PTA which are ultimately discharged to Turtle Creek shall not cause ambient water quality standards to be exceeded. To date, site characterization data indicate impact to Turtle Creek is negligible.
A-4	Air	Federal Clean Air Act, National Primary and Secondary Ambient Air Quality Standards (NAAQS), 40 CFR, Part 50	Establishes standards for ambient air quality to protect public health and welfare.	Relevant and Appropriate	Potential action-specific ARAR for air stripping and venting of landfill cap. Since these potential remedial actions do not qualify as major air pollutant sources, the standards are not considered applicable.
	Air	Federal Clean Air Act, National Emission Standards for Hazardous Pollutants (NESHAPs), 40 CFR, Part 61	Establishes national emission standards for hazardous air pollutants.	Relevant and Appropriate	Potential action-specific ARAR for remedial action. The NESHAPs are not applicable since potential remedial actions do not fall under a regulated source category. However, portions of the standards may be relevant and appropriate. For example, emission levels of vinyl chloride from an air stripper may be relevant and appropriate.
	Air	Federal Clean Air Act, New Source Performance Standards (NSPs), 40 CFR, Part 60	Establishes new source performance standards for air emission sources	Relevant and Appropriate	Potential action-specific ARAR. The NSPs are not applicable since potential remedial actions do not fall under the source-specific requirements. However, the standards may be relevant and appropriate to air stripping.

TABLE A-1

FEDERAL AND STATE CHEMICAL-SPECIFIC ARARs
(CONTINUED)

Media-Of-Concern	Federal/ State	Chemical-Specific ARAR	Description	Applicable/ Relevant and Appropriate	Summary of ARAR Assessment
Air	State	North Dakota Air Pollution Control Regulations, Article 33-15; Chapter 33-15-14	Establishes Federal NAAQs, NESHAPs, and NSPs as North Dakota air pollution control regulations. (Air permit requirements are established under these State regulations).	Relevant and Appropriate	Potential action-specific ARAR. See discussions for NAAQs, NESHAPs, and NSPs. (North Dakota permit application requirements are applicable).
Air	State	Air Toxic Policy	Establishes North Dakota Policy for the Control of Hazardous Air Pollutants.	----	North Dakota has an established policy to control toxic air pollutant emissions. Chemical-specific ARARs are not specified under policy.

A-5

TAB E A-3
FEDERAL AND STATE ACTION-SPECIFIC ARARs

Action(s) Triggering ARAR	Federal/ State	Action-Specific ARAR	Description	Applicable/ Relevant and Appropriate	Summary of ARAR Assessment
Landfill Cap Modification	Federal	RCRA, 40 CFR, Part 257: Criteria for Classification of Solid Waste Disposal Facilities and Practices	Establishes criteria for use in assessing whether or not a waste disposal facility poses a reasonable probability of adverse effects on health or the environment.	Relevant and Appropriate	The Old SLA/FTA should be maintained so that the facility does not pose future adverse effects on health or the environment.
Landfill Cap Modification	Federal	RCRA, 40 CFR, Part 241: Guidelines for the Land Disposal of Solid Wastes	Establishes requirements and procedures for land disposal of solid wastes.	Applicable	The landfill cap over the Old SLA/FTA shall meet the federal requirements applicable to solid waste landfill cap construction.
Landfill Cap Modification	State	North Dakota Article 33-20 and Chapter 33-03-06: North Dakota Solid Waste Management Regulations	Establishes requirements and procedures for land disposal of solid wastes.	Applicable	The landfill cap over the Old SLA/FTA shall meet the State requirements applicable to solid waste landfill cap construction.
Landfill Cap Modification	State	North Dakota Guidelines for Closure of Municipal and Inert Solid Waste Landfill Disposal Site	State solid waste landfill closure guidelines.	To be considered	Those landfill closure design criteria relevant and appropriate to the Old SLA/FTA are to be considered. Selection of design criteria will be based on cost and the degree to which individual design criteria will achieve the remedial objectives.
Landfill Cap Modification	Federal State*	40 CFR, Part 264, Subpart C: Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities; Closure and Post-Closure	Establishes minimum standards for the closure and post-closure care of a hazardous waste management unit.	Relevant and Appropriate, In Part	Since wastes were disposed in the Old SLA/FTA prior to 1980, the RCRA hazardous waste landfill closure requirements are not applicable. However, because hazardous wastes may have been disposed in the Old SLA/FTA, the RCRA hazardous waste closure requirements that address the stated remedial objectives -- mitigate the landfill seep and isolate the wastes -- are relevant and appropriate.

A-9

* North Dakota has adopted federal hazardous waste management rules as the North Dakota Hazardous Waste Management Rules, North Dakota Administrative Code Article 33-24.

TABLE A-3

FEDERAL AND STATE ACTION-SPECIFIC ARARs
(CONTINUED)

Action(s) Triggering ARAR	Federal/ State	Action-Specific ARAR	Description	Applicable/ Relevant and Appropriate	Summary of ARAR Assessment
Landfill Cap Modification	Federal/ State*	RCRA, 40 CFR, Part 264, Subpart N, Section 264.110: Standards for Owners and Operators of Hazardous Waste Treatment Storage and Disposal Facilities; Landfills	Establishes minimum standards for the acceptable closure of RCRA hazardous waste landfills.	Relevant and Appropriate, In Part	Since wastes were disposed in the Old SLA/FTA prior to 1980, the RCRA hazardous waste landfill closure requirements are not applicable. However, because hazardous wastes may have been disposed in the Old SLA/FTA, the RCRA hazardous waste closure requirements that address the stated remedial objectives -- mitigate the landfill seep and isolate the wastes -- are relevant and appropriate.
Landfill Cap Modification	Federal	EPA Guidance Document, EPA/654-89022, Requirements for Hazardous Waste Landfill Design, Construction, and Closure	Federal hazardous waste landfill closure guidelines.	To be considered	Those landfill closure design criteria relevant and appropriate to the Old SLA/FTA are to be considered. Selection of design criteria will be based on cost and the degree to which individual design criterion will achieve the remedial objectives.
Groundwater Monitoring	Federal/ State*	RCRA, 40 CFR, Part 264, Subpart F: Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities; Releases from Solid Waste Management Units	Establishes minimum standards for the acceptable monitoring and response to releases from hazardous waste management units.	Relevant and Appropriate	Because the potential exists for the release of hazardous constituents to the glacial till water table aquifer and Emerald Aquifer, the RCRA Maximum Concentration Limits are relevant and appropriate and should be incorporated into the Old SLA/FTA groundwater monitoring program as groundwater protection standards.
Groundwater Monitoring	Federal	Solid Waste Disposal Act 40 CFR, Part 241, Section 241.204: Guidelines for the Land Disposal of Solid Wastes, Water Quality	Requires that the construction of a land disposal site shall conform to the most stringent of applicable water quality standards or shall be constructed in such a manner as to provide adequate protection to ground and surface waters used as drinking water supplies.	Relevant and Appropriate	The Old SLA/FTA shall be maintained to provide adequate protection to the glacial till water table aquifer and Emerald Aquifer. Although the aquifers currently are not used near the Old SLA/FTA as domestic water supplies, their potential use cannot be ruled out (IT, 1990).

A-7

* North Dakota has adopted federal hazardous waste management rules as the North Dakota Hazardous Waste Management Rules, North Dakota Administrative Code Article 33-24.

TABLE A-2
FEDERAL AND STATE ACTION-SPECIFIC ARARs
 (CONTINUED)

Action(s) Triggering ARAR	Federal/ State	Action-Specific ARAR	Description	Applicable/ Relevant and Appropriate	Summary of ARAR Assessment		
B-V		Installation of Groundwater Extraction System and Monitoring Wells; Operation of Groundwater Treatment System	Federal/ State*	RCRA, 40 CFR, Part 262: Standards Applicable to Generators of Hazardous Waste	Establishes standards for generators of hazardous waste.	Potentially Applicable	Potentially applicable for remedial actions that involve the offsite disposal of soils or wastes. A potential site activity that could trigger this ARAR is the production of contaminated drill cuttings. The standards would be applicable if the soils or wastes are classified as RCRA hazardous wastes.
		Installation of Groundwater Extraction System and Monitoring Wells; Operation of Groundwater Treatment System	Federal/ State*	RCRA, 40 CFR, Part 263: Standards Applicable to Transporters of Hazardous Waste	Establishes standards for the transportation of a RCRA hazardous waste.	Potentially Applicable	Potentially applicable for remedial actions that involve the offsite transport of soils or wastes. The standards would be applicable if the soils or wastes are classified as RCRA hazardous wastes.
		Installation of Groundwater Extraction System and Monitoring Wells; Operation of Groundwater Treatment System	Federal/ State*	RCRA, 40 CFR, Part 264: Standards for Owners and Operators of Hazardous Waste Treatment, Storage and Disposal Facilities	Establishes minimum standards which define the acceptable management of hazardous waste for owners and operators of facilities which treat, store, or dispose of hazardous waste.	Potentially Applicable	Some requirements are potentially applicable for remedial actions that require the storage and/or offsite disposal or incineration of soils or wastes. The requirements would be applicable if the soils or wastes are classified as RCRA hazardous wastes.
		Installation of Groundwater Extraction System and Monitoring Wells	Federal/ State*	RCRA, 40 CFR, Part 268: Land Disposal Restrictions	Identifies hazardous wastes that are restricted from land disposal.	Potentially Applicable	If soils or wastes generated during remedial action are characterized as RCRA hazardous wastes, the land ban restrictions may apply for off-site disposal of the materials.

* North Dakota has adopted federal hazardous waste management rules as the North Dakota Hazardous Waste Management Rules, North Dakota Administrative Code Article 33-24.

TABLE A-2

FEDERAL AND STATE ACTION-SPECIFIC ARARs
(CONTINUED)

Action(s) Triggering ARAR	Federal/ State	Action-Specific ARAR	Description	Applicable/ Relevant and Appropriate	Summary of ARAR Assessment
Air Stripping, Venting of Landfill Cap	Federal	Clean Air Act, National Primary and Secondary Ambient Air Quality Standards (NAAQs), 40 CFR, Part 50	Establishes standards for ambient air quality to protect public health and welfare.	Relevant and Appropriate	Since the potential remedial actions do not qualify as major pollutant sources, the standards are not considered applicable.
Air Stripping, Venting of Landfill Cap	Federal	Clean Air Act, National Emission Standards for Hazardous Pollutants (NESHAPs), 40 CFR, Part 261	Establishes national emission standards for hazardous air pollutants.	Relevant and Appropriate	Potential action-specific ARAR for remedial action. The NESHAPs are not applicable since potential remedial actions do not fall under a regulated source category. However, portions of the standards may be relevant and appropriate. For example, emission levels of vinyl chloride from an air stripper.
A-9 Air Stripping, Venting of Landfill Cap	Federal	Clean Air Act, New Source Performance Standards (NSPs), 40 CFR, Part 60	Establishes new source performance standards for air emission sources.	Relevant and Appropriate	The NSPs are not applicable since the potential remedial actions do not fall under the source- specific requirements. However, the standards may be relevant and appropriate to air stripping.
Air Stripping, Venting of Landfill Cap	State	North Dakota Air Pollution Control Regulations, Article 33-15; Chapter 33-15-14	Establishes Federal NAAQs, NESHAPs, and NSPs as North Dakota air pollution control regulations. (Air permit requirements are established under these State regulations).	Relevant and Appropriate	See discussions for NAAQs, NESHAPs, and NSPs (North Dakota permit requirements are applicable).
Discharge of Landfill Cell Water to GFAPB Wastewater Stabilization Lagoons	Federal	Clean Water Act, National Pollutant Discharge Elimination System, 40 CFR, Parts 122 and 125	Requires permits, with set discharge limits, for the discharge of pollutants from any point source into U.S. waters.	Applicable	If extracted landfill cell water is discharged to the GFAPB wastewater stabilization lagoons, the facility's NPDES permit would have to be modified, and the permit discharge limits still achieved.

* North Dakota has adopted federal hazardous waste management rules as the North Dakota Hazardous Waste Management Rules, North Dakota Administrative Code Article 33-24.

TABLE A-3
FEDERAL AND STATE ACTION-SPECIFIC ARARs
(CONTINUED)

Action(s) Triggering ARAR	Federal/ State	Action-Specific ARAR	Description	Applicable/ Relevant and Appropriate	Summary of ARAR Assessment
Discharge of Landfill Cell Water to GFAPB Wastewater Stabilization Lagoons	State	North Dakota Pollutant Discharge Elimination System, North Dakota Rule 33-16-01	Establishes the regulations dictating the surface water effluent standards set in the GFAPB wastewater stabilization lagoon NPDES permit.	Applicable	If extracted landfill cell water is discharged to the GFAPB wastewater stabilization lagoons, the facility's NPDES permit would have to be modified, and the permit discharge limits still achieved.
Discharge of Landfill Cell Water to GFAPB Wastewater Stabilization Lagoons	Federal	Clean Water Act National Pretreatment Standards, 40 CFR, Part 403	Sets standards to control pollutants which pass through or interfere with treatment processes in publicly owned treatment works or which may contaminate sewage sludge.	Relevant and Appropriate	If extracted landfill cell water is discharged to the GFAPB wastewater stabilization lagoons, the pretreatment standards are considered relevant and appropriate.
Remedial Actions, General	Federal	OSHA 29 CFR 1910	Regulates worker health and safety.	Applicable	Health and safety requirements are applicable to all remedial actions.

A-10

* North Dakota has adopted federal hazardous waste management rules as the North Dakota Hazardous Waste Management Rules, North Dakota Administrative Code Article 33-24.

SWMU-3

Building 306 (oil contamination)

ERP Site ST-04

Closure Documentation

GRAND FORKS AIR FORCE BASE
Grand Forks AFB, North Dakota
March 14, 2007

Facility/Unit Type:	United States Air Force Base Former Building 306, (Site ST-04 / SWMU 3)
Contaminants:	Benzene, total petroleum hydrocarbons
Media:	Soil and groundwater
Remedy:	Soil vapor extraction (SVE) and monitored natural attenuation (MNA) through annual groundwater monitoring at wells throughout the site

INTRODUCTION

The Grand Forks Air Force Base (AFB) Corrective Action Program is conducted under the authority of Sections 3004(u), 3004(v), 3005(c)(3), 3008(h), 3013, 6001, and 7003 of the Resource Conservation and Recovery Act (RCRA)(42 U.S.C. 6901 et seq.) as amended by the Hazardous and Solid Waste Amendments of 1984 (HSWA) (Pub. L. No. 98-616, 98 Stat. 3221) and the Federal Facility Compliance Act of 1992 (Pub. L. 102-386, 106 Stat. 1505). North Dakota has been delegated authority under the RCRA Corrective Action Program by the U.S. Environmental Protection Agency (USEPA) and has program responsibility for this action by virtue of that delegation.

The objective of a RCRA corrective action program is to evaluate the nature and extent of the release of contaminants; to evaluate site characteristics, including identification of solid waste management units, geophysical information, areas and populations threatened by the release, and actual and potential threats to human health and the environment; and to identify, develop, and implement an appropriate corrective measure or measures to protect human health and the environment.

This Statement of Basis is part of the corrective action process and is a requirement of the RCRA Corrective Action Permit, issued to Grand Forks AFB by the North Dakota Department of Health (NDDH). The purpose of the Statement of Basis is multi-fold: 1) identify remedies evaluated; 2) identify the proposed remedy and rationale for its selection; 3) provide information on how the public can become involved in the selection process; and 4) solicit public review and comment on the proposed remedy. This Statement of Basis summarizes information obtained during

investigations and remedial actions conducted at the former Building 306 (Environmental Restoration Program (ERP) Site ST-04/SWMU 3) as well as the demolition of the site removing all contamination clean closing the site.

FACILITY DESCRIPTION

Building 306 was a Semi-Automated Ground Environment (SAGE) facility, which housed an early supercomputer for radar detection in support of the U.S. Air Force (USAF) missile defense mission. This facility later was converted to house the headquarters missile wing staff. ERP Site ST-04 is comprised of Solid Waste Management Unit (SWMU) 3, which was investigated beginning in 1989 under the Environmental Restoration Account (ERA) remedial investigation/feasibility study (RI/FS) program for the USAF. Subsequently, the site was addressed under the RCRA Facility Investigation (RFI)-Corrective Measures Study (CMS) under the NDDH, which is the lead regulatory agency for cleanup of contaminated areas in North Dakota.

Building 306

Building 306 originally housed several large emergency backup generators, several boilers, and electrical equipment to support the SAGE supercomputer. Later, all but one generator were removed when the mission requiring the supercomputer changed. Building 306 was constructed with a concrete subfloor five feet below the primary concrete floor with a sand fill unit between these floors. The upper, primary floor provided maintenance access to the generators. The lower subfloor supported the weight of the generators housed in this portion of Building 306. The concrete subfloor was required to be more than four feet thick because

the generator equipment was very heavy and large, approximately 25 feet long, by 10 feet wide, and 12 feet high.

In 1988, a petroleum release was identified when fuel was detected in a trench outside Building 306. The release was traced to a leaking fuel line that connected an aboveground storage tank inside the building to four underground storage tanks (USTs) located outside of the building footprint. The connecting pipeline was located in a trench in the subfloor of the building. The release caused a portion of the sandy fill between the concrete floor and the subfloor to become saturated with diesel fuel. The fuel also impacted soil outside the building.

After a remedial investigation in 1989-1990, it was recommended that all non-aqueous phase liquids (NAPLs) be removed from outside Building 306 and from its subfloor. The four USTs located outside of the building, including a 15,000-gallon UST and three 30,000-gallon USTs used to store diesel and fuel oil, were removed in 1992 by the U.S. Army Corps of Engineers Rapid Response Team. This removal effort also included excavation and proper disposal of all contaminated soils located outside of the building, amounting to over 800 cubic yards of contaminated soil. The original Decision Document for this site recommended installation of a Soil Vapor Extraction (SVE) Unit and the removal of four UST's. This action was determined to be the most effective alternative in protecting human health and the environment, complying with media cleanup standards, and providing adequate protection against future releases. This revised Decision Document accounts for the demolition of the facility and removing all contaminated soil to the base permitted land-farm. All contamination at the site was removed allowing for unrestricted use of the land.

In September 1993, a soil vapor extraction (SVE) system was then installed in the northeast corner of Building 306. The SVE remedy was selected in the original Decision Document. The system was installed to remove subsurface volatile organic compounds (VOCs) including benzene, toluene, ethylbenzene, and total xylenes (BTEX) compounds and diesel range organics (DRO), as well as free-phase product from the subfloor.

The SVE system consisted of a 50 cubic feet per minute (cfm) vacuum blower, one vapor

extraction well, and five ambient air equalization wells to allow air movement and to improve volatilization of VOCs. Two of the five ambient air equalization wells were later converted to vapor extraction wells to improve the efficiency of the system.

RCRA Facility Investigation/Corrective Measures Study

The RCRA Corrective Action program oversees the cleanup of existing contamination and any future contamination at active facilities. In its ongoing effort to improve the corrective action program, EPA, with the assistance of interested stakeholders, identified several improvements to increase the efficiency and cost-effectiveness of facility cleanups.

One of the improvements is "results-based" cleanup guidance, as outlined under the RCRA Cleanup Reforms announcement (EPA530-F-99-018, July 1999 available at: http://www.epa.gov/correctiveaction/reforms/refo_rms1.pdf). Results-based corrective action encourages technical and administrative innovation to achieve environmentally protective cleanups on a facility-specific basis.

Results-based approaches emphasize outcomes, or results, in cleaning up actual releases, rather than the process used to achieve those results. The benefits of a results-based corrective action are:

- Improved focus on the end goals of corrective action and intermediate milestones, such as environmental indicators, rather than on unnecessary adherence to a predetermined administrative process
- Generally, more rapid achievement of results
- Resource savings to both owner/operator and implementing agency

Additional information about results-based corrective action approach is included in Attachment A.

An initial soil sample was collected from the subfloor in September 1993 from a depth of approximately 3.5 feet below the primary floor. The sample was analyzed for total petroleum hydrocarbons (TPH) as DRO. The concentration was greater than 6,120 milligrams per kilogram (mg/kg). The original SVE system (an air

vacuum connected to one vapor extraction well) operated for a period of one year, and in September 1994, a second soil sample was collected from approximately 3 feet below the primary floor within one foot of the previous soil sample. The TPH as DRO concentration was reported as 43.9 mg/kg, indicating an approximate 100-fold reduction in contamination.

Soil sampling events in June and September 1995 were conducted as part of the long-term monitoring program (LTMP) activities at Building 306. In June 1995, a LTMP was established for Site ST-04 to determine contaminant concentrations in the backfill beneath Building 306. Groundwater monitoring wells GFB306-MW01, -MW02, -MW03, and -MW04 were removed in order to facilitate the collection of soil samples from the sidewalls of the boreholes at these locations. Soil samples were collected from each well borehole at an approximate depth of 3 to 5 feet below the primary floor. DRO concentrations detected in soil samples collected during the June and September 1995 sampling events exceeded the NDDH cleanup action level for TPH in soil (100 parts per million [ppm]). DRO concentrations detected in soil samples collected during the June 1995 sampling event ranged up to 2,100 ppm. DRO concentrations reported for the September 1995 sampling event ranged up to 4,000 ppm.

Soil vapor sampling ports (SVPs) were installed to replace these four borehole locations (former monitoring wells GFB306-MW01, -MW02, -MW03, and -MW04). LTMP activities performed during September 1996 and June 1997 included the collection of soil vapor samples to determine the effectiveness of the SVE system.

In April 1998, two SVP wells were converted to soil vapor extraction wells and connected to the vacuum pump. The vacuum pump was also modified to increase the vacuum to the wells to increase the effectiveness of the SVE system.

The SVE system was monitored quarterly as part of the Grand Forks AFB LTMP. The last quarterly monitoring was conducted in October 2002 prior to the initiation of Bldg. 306 demolition activities that began in December 2002 and concluded in October of 2003. Results of the final quarterly monitoring indicate that the SVE system had removed the lighter hydrocarbon fraction from the soil contamination beneath the

building. Vapor monitoring failed to detect organic compounds in any of the SVPs from January 2002 through the final sampling in October 2002.

Remaining soil contaminated with petroleum hydrocarbons was removed from between the primary floor and the subfloor of the mechanical room in the northeast corner of the building during the demolition of the sub-grade of Building 306. This contaminated soil was transported to the Base Land Treatment Facility (LTF), a permitted treatment facility, for treatment. The subfloor slab beneath the mechanical room was found to be more than 4 feet thick and very difficult to break and remove. Therefore trenches were dug around the perimeter of the subfloor to look for contaminated soil. Evidence of contaminated soil was not found in the trenches, and the integrity of the concrete subfloor slab was found to be excellent. Therefore, contaminated soil under the subfloor slab is not anticipated.

The area was backfilled with clean soil after completion of the trenching and determination that all contaminated soil was removed from beneath the mechanical room at Building 306. Three groundwater monitoring wells were removed in accordance with NDDH rules and regulations and then landscaping operations began to restore the site.

The findings of investigations, remedial actions, and building demolition indicate that all petroleum hydrocarbon contamination was remediated or removed from beneath the northeast corner mechanical room of Building 306 (ERP Site ST-04). Remedial action in 1992 removed the released diesel fuel from the outside of the building footprint. The SVE system was subsequently installed and successfully removed the volatile components of the diesel fuel-contaminated sandy backfill between the primary floor and subfloor beneath the mechanical room. The diesel fuel contamination was found to be completely confined to the sandy backfill between these two concrete slabs and removed and transported to the permitted Base LTF for further treatment. ERP Site ST-04, Building 306, SWMU 3 therefore meets the NDDH requirements for clean closure.

EXPOSURE PATHWAYS

ERP Site ST-04 is proposed for clean-closure because no contamination of soil or groundwater remains at the site after the remedial activities. Consequently, no completed exposure pathways to either human or ecological receptors exist and no risk of exposure is present.

The site is therefore proposed for unrestricted release.

PROPOSED REMEDY

ERP Site ST-04 is proposed as requiring no further action (NFA) because all contaminated soil, which was confined to the subfloor area by the 4-foot thick foundation, has been removed. No evidence of contaminant migration to adjacent or underlying soils is present and no groundwater contamination is detected. The site meets the

KEY WORDS:

soil, groundwater; soil vapor extraction; SVE; land treatment facility; excavation; VOCs, benzene; BTEX; TPH; monitoring.

NDDH criteria for unconditional release and unrestricted use.

INNOVATIVE TECHNOLOGIES CONSIDERED

None.

PUBLIC PARTICIPATION

The public comment period for this Statement of Basis is 60 calendar days.

NEXT STEPS

The NDDH will initiate the permit modification process for the Grand Forks AFB's Corrective Action Permit after selection of a remedy.

CONTACT:

Curtis Erickson
North Dakota Department of Health
Division of Waste Management
918 East Divide Avenue – 3rd Floor
Bismarck, ND 58501-1947
(701) 328-5166

ATTACHMENT A RESULTS-BASED CORRECTIVE ACTION APPROACH

Throughout the years of implementing the Corrective Action program and other cleanup programs (for example, the Superfund program), a results-based approach has been developed that project managers and owner/operators may use to more efficiently identify releases and risks and to accelerate facility cleanup. A successful RCRA program allows flexible program implementation that incorporates many different technical solutions and administrative approaches to site management. Approaches that focus owner/operators on program goals and appropriately reduce the process towards attaining those goals are termed "results-based" and are the primary focus of the effort to improve the corrective action program.

One of the improvements is "results-based" cleanup guidance, as outlined under the RCRA Cleanup Reforms announcement (EPA530-F-99-018, July 1999 available at:

<http://www.epa.gov/correctiveaction/reforms/reforms1.pdf>). Greater use of results-based corrective action approaches has been the U.S. Environmental Protection Agency's (EPA's) stated policy since the 1996 Advanced Notice of Proposed Rulemaking (ANPR), Corrective Action for Solid Waste Management Units at Hazardous Waste Management Facilities (61CFR19432). Results-based corrective action encourages technical and administrative innovation to achieve environmentally protective cleanups on a facility-specific basis.

Results-based approaches emphasize outcomes, or results, in cleaning up actual releases, rather than the process used to achieve those results. Results-based approaches involve setting goals and, where appropriate, allowing owner/operators to move towards those goals without the implementing agency unnecessarily dictating how owners or operators will attain the goals. EPA continues to encourage program implementers and facility owner/operators to focus on the desired result of cleanup rather than a mechanistic cleanup process. The benefits of a results-based corrective action are:

- Improved focus on the end goals of corrective action and intermediate milestones, such as environmental indicators, rather than on unnecessary adherence to a predetermined administrative process
- Generally, more rapid achievement of results
- Resource savings to both owner/operator and implementing agency

Additionally, the Superfund program began developing presumptive remedy guidance in 1991 using past experience to streamline cleanups. Presumptive remedies are preferred technologies for common categories of sites, based on historical patterns of remedy selection and EPA's scientific and engineering evaluation of performance data on technology implementation. EPA expects project managers to use presumptive remedies at appropriate RCRA facilities to help ensure consistency in remedy selection and implementation and to reduce the cost and time required to investigate and remediate similar types of sites. In general, even though EPA's presumptive remedy guidance documents were developed for CERCLA sites, project managers should use them at appropriate RCRA corrective action facilities to focus investigations and simplify the evaluation of remedial alternatives and remedy selection processes.

The following is a list of some oversight activities that have been adapted to facilities to decrease the level of oversight as deemed appropriate. These include, but are not limited to:

- Eliminating duplicative state/federal reviews of documents
- Eliminating interim deliverables while maintaining accountability of the owner/operator to produce a measurable end product
- Time-limited review where agency approval is not required for the owner/operator to proceed
- Increasing the use of meetings, briefings, and other communication methods to identify and resolve issues early on rather than using formal documentation methods
- Limiting the number of facility visits for routine field activities when the owner/operator demonstrates competence in achieving remedial results, including public involvement
- Establish performance standards that define clear and attainable results
- Using briefings, conversations, and progress reports from the owner/operator to replace some of the formal interim deliverables while still making this information publicly available where appropriate
- Encouraging communication among the project manager, owner/operator and the community; for example, make up-to-date facility information available at publicly accessible locations. Public participation remains a key component of the corrective action process

North Dakota is a leading state in developing and implementing these recommendations of EPA. In fact, North Dakota has been using this concept prior to EPA's guidance issuance. Our progress in achieving the environmental indicators at contaminated sites under control is a testament to the working relationship North Dakota shares with its facilities under corrective action and a results-based approach.



DEPARTMENT OF THE AIR FORCE
HEADQUARTERS 319TH AIR REFUELING WING (AMC)
GRAND FORKS AIR FORCE BASE, NORTH DAKOTA

18 JUN 1998

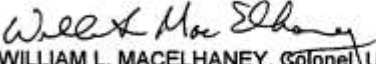
MEMORANDUM FOR NORTH DAKOTA DEPARTMENT OF HEALTH

ATTENTION: Mr Neil Knatterud
1200 Missouri Avenue
P.O. Box 5520
Bismarck ND 58502-5520

FROM: 319 ARW/CV
460 Steen Blvd
Grand Forks AFB ND 58205-6231

SUBJECT: New Decision Document (DD) for Installation Restoration Program (IRP) Site ST-04, Building 306

1. Attached is a new decision document for Site ST-04 which incorporates corrected terminology, Soil Vapor Extraction, for the selected remedial action. To ensure an accurate public record, we withdrew the 14 Sep 94 DD for IRP Site ST-04, Building 306 and are submitting a new DD as my IRP Manager has discussed with your staff.
2. The original DD stated that the selected remedy for remediation at Building 306 was bioventing when in actuality, soil vapor extraction was implemented. Bioventing and soil vapor extraction were used interchangeably in contractor reports for remediation at Building 306. Bioventing and soil vapor extraction are similar technologies which may have led to the confusion by contractors in writing the reports.
3. A Public Hearing was held on 26 May 1998 and there were no comments or suggestions to the decision document.
4. My IRP Manager, Mr. Arthur Burbank, can be contacted at (701) 747-4183 if he can help you further.


WILLIAM L. MACELHANEY, Colonel, USAF
Chairman, Environmental Protection Committee

Attachment:
New Site ST-04 Decision Document

DECISION DOCUMENT

1.0 INSTALLATION/SITE NAME AND LOCATION

- 1.1 Grand Forks AFB, Grand Forks, North Dakota
- 1.2 Site ST-04, Building 306

2.0 STATEMENT OF BASIS

2.1 The decision described herein concerning the remedial alternative (RA) at Building 306 is based on an evaluation of the results received from the investigation performed under the U.S. Air Force Installation Restoration Program (IRP). Documented studies include Preliminary Assessment/Site Inspection (PA/SI), contained within the IRP Remedial Investigation Phase II Stage 2 Report (International Technology Corporation, Mar 91), and Bioremediation Treatability Study (OHM Corporation, Jan 93).

3.0 DESCRIPTION OF THE SELECTED REMEDY

3.1 The removal of four underground storage tanks (USTs) located northeast of Building 306 and the implementation of a soil vapor extraction (SVE) system for the diesel fuel contaminated soils in the subfloor of Building 306's mechanical room is selected as the preferred remedial alternative for this IRP site. This decision is supported by an evaluation of the results of the PA/SI and the treatability study.

4.0 DECLARATION OF CONSISTENCY WITH CERCLA AND THE NCP

4.1 This document presents the selected remedy for this site developed in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended by the Superfund Amendments and Reauthorization Act (SARA) of 1986, National Contingency Plan (NCP), and the Resource Conservation and Recovery Act (RCRA) of 1976, as amended. It has been determined that a removal action and soil vapor extraction (SVE) is the most effective way of remediating the site.

5.0 SITE IDENTIFICATION

5.1 Grand Forks, ND, is located on the North Dakota-Minnesota border at the junction of the Red Lake River and the Red River of the North, 75 miles north of Fargo, ND, and 145 miles south of Winnipeg, Manitoba, Canada. Grand Forks AFB is located on US. Highway 2, approximately 15 miles west of Grand Forks and 10 miles west of the Mark Andrews International Airport.

5.2 Grand Forks AFB is situated in a subhumid climate characterized by a wide temperature range, variable precipitation, and rigorous winters. Records from 1900 to 1940 indicate the coldest recorded temperature was -43 degrees Fahrenheit (°F) and the warmest was 109°F.

5.3 The average annual daily maximum temperature is about 50°F with highest temperatures occurring during July and August. The average annual daily minimum temperature

is about 28°F with the lowest temperatures occurring during January. The annual average daily temperature is 39°F.

5.4 The average monthly rainfall precipitation ranges from greater than 3.0 inches during June to less than 0.5 inches during February. The average annual rainfall precipitation is about 18.5 inches, three-fourths of which occurs from May to September. Snowfall averages slightly less than three feet each year. The prevailing wind direction is from the northwest.

5.5 Building 306 is located on the southeast corner of the intersection of G Street and Steen Avenue at the Grand Forks AFB (Figure 1). The building houses the headquarters of the 321st Missile Group and a number of shops involved in industrial operations of the 321st Field Missile Maintenance Squadron.

5.6 Building 306 was erected on undeveloped land between 1956 and 1958 with no previous structures present. The building was designed as a self-sufficient unit with independent heating, cooling and power supply systems. The mechanical room is located in the northeast corner of the building and houses the compressor, generator and boilers which serve the building. A subfloor lies 5 feet beneath the existing concrete floor in the mechanical room. Sand and gravel fill the area between the building floor and subfloor. A utility pit is located in the northeast corner of the mechanical room.

5.7 Four USTs are located approximately 75 feet northeast of the northeast corner of Building 306. These tanks have no secondary containment, cathodic protection or vapor recovery system. Tank inspections have not been performed on the tanks. The tanks were taken out of service in the late 1970s, but were left in the ground. The remaining fuel in them was used to feed the generators and boilers in the mechanical room.

5.8 The site is in an area of low topographic relief. The area immediately surrounding Building 306 is developed with training and service facilities with all parking lots and roadways paved.

5.9 Surface drainage for the site is to the northeast where it is channeled via curb and gutter to the storm drainage system. The storm drain flows to the east where it discharges to a ditch which drains into Kellys Slough, approximately 2 miles east of the base.

5.10 Building 306 became an IRP site in 1988 when a leak was detected in an above ground fuel line located in the building's mechanical room. The fuel line delivered heating oil from underground tanks located outside of the building to an above ground day tank situated in the mechanical room. Fuel from the pipeline leaked into the sand and gravel fill beneath the existing floor through the utility trench. In addition, fuel oil entered the base storm sewer system via a sump in the utility pit. The fuel oil discharged into a drainage ditch where the leak was first detected. Fuel lines to the day tank have since been removed.

6.0 PHYSIOGRAPHY AND LAND USE

6.1 Grand Forks AFB lies within the Agassiz Lake Plain District of the Western Ground Drift section of the Central Lowland Physiographic Province. The Western Ground Drift section is a lowland prairie upon a gently rolling glacial ground moraine. It is occasionally interrupted by ridges of end moraine and flat outwash plains. Strandline deposits associated with Glacial Lake Agassiz form low, narrow linear ridges with a northwesterly trend. The average elevation above sea level is about 890 feet with a maximum local relief of about 25 feet.

6.2 Grand Forks AFB is also located in the Red River Valley topographic area which corresponds to the Agassiz Lake Plain physiographic division. Geologic processes include the movement of groundwater through underlying rock strata, differential erosion, modification by glaciers, and recent wind and stream forming events. Prior to glaciation, the river became incised until it reached Precambrian rock, then shifted its course westward as it eroded away Cretaceous shale and sand, thereby forming the Pembina Escarpment. When glaciers deposited a layer of till over the area, the river erosion temporarily ceased. Lake Agassiz sediment now covers the Red River Valley. The modern Red River of the North flows on this lake plain. The Pembina Escarpment was probably altered by glacial processes but exists today as the western extent of Glacial Lake Agassiz sediments, about 10 miles west of Grand Forks AFB. The present location of the Red River of the North is 25 miles east of Grand Forks AFB, representing the North Dakota-Minnesota state line.

6.3 Land use in Grand Forks County consists primarily of cultivated crops with remaining land used for pasture and hay, urban development, recreation and wildlife habitat. Principal crops are spring wheat, barley, sunflowers, potatoes and sugar beets. Turtle River State Park, located about five miles west of the Base, is the only major recreational area in Grand Forks County. Several watershed protection dams are being developed for recreational activities. Wildlife habitat is very limited in the County. Kellys Slough National Wildlife Refuge and the adjacent National Waterfowl Production Area are managed for wetland wildlife and migratory waterfowl, but they also include a significant acreage of openland wildlife habitat in the county.

7.0 GEOLOGY

7.1 Geologic data was collected at Site ST-04 during the PA/SI. In the vicinity of the site, soil borings were logged to distinguish between in situ soils (till and lacustrine sediments), disturbed soil (reworked till/lacustrine), and emerald sand (Emerald Aquifer). Figures 2A-B show east-west and north-south cross sections across the site delineating the units described above.

7.2 Geological cross sections of the site show that the Building 306 area is immediately underlain by fill composed of brown coarse sand, gravel and silty clay. The thickness of the fill is estimated from Phase II Stage 2 soil borings to be 2.5 to 6 feet. Mottling was observed beginning at depths of 2.5 to 5 feet indicating a seasonal perched or shallow water table condition. The fill is underlain by 15 to 40 feet of brown and gray mottled silty clay with decayed vegetation. Euhedral, transparent, tabular crystals of selenite and black, magnesium oxide occur in voids and along fracture surfaces of the clay encountered in the Phase II Stage 2 borings. This unit may be correlated with the reworked till/lacustrine #1 unit. The next descending unit encountered is a gray clay layer with gravel and occasional cobbles. This unit varies in thickness in the boring logs from 25 to 58 feet and is probably correlative with the till #1 unit. Beneath this unit is a gray silty clay layer that measures 16 to 32 feet thick on the boring logs. This unit can be correlated with the lacustrine #2 unit. The lacustrine #2 unit is underlain by a gray sand unit. The sand unit may be correlated with the Emerald Sand unit. An unknown thickness of gray silty to sandy clay with some gravel is the last unit encountered in the borings. This can be correlated with the undifferentiated pleistocene sediments.

8.0 HYDROGEOLOGY

8.1 Groundwater levels were measured in the three outside wells on 5 Dec 89 and 21 Mar 90 during the PA/SI. A contour map of the shallow water table was constructed utilizing the 21 Mar 90 water level measurements (Figure 3). The contour map indicates that groundwater at the site flows northeast in the vicinity of the tanks.

8.2 The gradient was calculated to be 0.025 and the hydraulic conductivity of the soils at Building 306 was assumed to be equal to the conductivity of the soils at the Fire Training Area/Old Sanitary Landfill Area (FTA/OSLA) (2.3×10^{-5} cm/s). This is a reasonable assumption since the geologic information obtained in the well borings identified the presence of essentially the same units as the FTA/OSLA and Building 306. The effective porosity for the soils at the site was assumed to be 10 to 30%. Utilizing the hydraulic gradient, hydraulic conductivity and effective porosities as discussed above, the hydraulic velocity of groundwater at the site was calculated to be 2 feet per year.

8.3 Groundwater at Building 306 is expected to migrate northeast to Kellys Slough. Groundwater may be intercepted by the various sewer systems located between Building 306 and Kellys Slough.

9.0 SURFACE HYDROLOGY

9.1 Natural surface water features on Grand Forks AFB are limited to a small stretch of the Turtle River that flows across the northwestern portion of the Base approximately 2½ miles northwest of Building 306. In general, surface water runoff west of the taxiway and drainage from the maintenance apron (just east of the runway) are routed through drainage ditches that flow north into the Turtle River. The remaining surface water on the Base, including the runoff from Building 306 is directed to the north and south drainage ditches which flow into Kellys Slough.

10.0 BACKGROUND

10.1 A release of unknown quantity was detected in the spring of 1983 resulting from a leak in a fuel line leading to an above ground day tank inside Building 306's mechanical room. The leak was discovered due to a release of fuel in a drainage ditch east of the Base. The discharge was traced to the mechanical room of Building 306. At that time, the fuel lines to the day tank were buried within a utility trench located beneath the floor of the mechanical room. After the leak was discovered, the lines were removed from the utility trench and overhead lines installed. The utility trench drains to the north into a utility pit which, in turn, drains into a sump and finally into the base storm sewer system. The storm sewer drains to the east and empties into the drainage ditch where the fuel oil release was first detected.

10.2 An investigation did not reveal contamination at the northeast corner of Building 306, but did reveal fuel oil saturated fill material beneath the mechanical room concrete floor. A six inch PVC well was installed and an unknown quantity of fuel was recovered. That well has since been capped with concrete. The remaining fuel in the USTs was removed.

10.3 Subsequent to the discovery of the leak, personnel in room 171 reported smelling diesel vapors. At that time the source could not be determined.

10.4 Groundwater samples were taken from each of four existing wells around the USTs and within Building 306. Kerosene (0.31 mg/L) was detected in the monitoring well east of the building and diesel fuel (1050 mg/L) was detected in the monitoring well located within the mechanical room.

10.5 Soil and sediment samples were also taken at Building 306. Samples taken within the mechanical room determined soil to be contaminated with total petroleum hydrocarbon (TPH) at

concentrations as high as 170,000 µg/g. Soil samples taken northeast of the building, near the USTs, showed concentrations of TPH as high as 2000 µg/g.

10.6 To remediate the diesel fuel contaminated soils in the subfloor of the mechanical room in Building 306, a SVE unit will be installed. In addition to the installation of the SVE system, a 1-inch blanket of water, containing a solution of ammonium phosphate, will be added to the subfloor to neutralize the pH of the environment and add nutrients and moisture to enhance the bioremediation capabilities of the indigenous microorganisms.

11.0 PUBLIC COMMUNITY AND REGULATORY AGENCIES

11.1 An Administrative Record (AR) is the legal record of the physical situation at an installation, by which response actions are reviewed and defended. An AR must be established at each installation which has conducted or is conducting IRP activities and must be available to the public at or near the installation. The AR at GFAFB is being prepared by contract and is scheduled for completion 1 Oct 94. This record is maintained at the following location and is updated as needed by the base Remedial Project Manager.

11.1.a 319 CES/CEV
525 6th Ave
Grand Forks AFB ND 58205-6434

11.2 An Information Repository (IR) is a project file on IRP activities at AF installations. The repository is to be established for all remedial action sites and for all sites where removal actions last longer than 120 days. It is located either on or off base at a place convenient to the community and contains site information, investigatory reports, information about the sources and nature of the contaminants, and a schedule for cleanup operations. The IR is intended to address community relations requirements and is a source of reading material for the public. Much, if not all of the documents may be the same in the IR and the AR. In Jan 93, GFAFB established an IR which is maintained at the Grand Forks City Library, in the reference section, to insure public access. Following is the location of the IR:

11.2.a Grand Forks Public Library
2100 Library Circle
Grand Forks, ND 58201

12.0 TECHNICAL REVIEW COMMITTEES/RESTORATION ADVISORY BOARDS

12.1 A Technical Review Committee (TRC) was established at GFAFB Dec 91 to review and comment on Department of Defense actions and proposed actions with respect to releases or threatened releases of hazardous substances into the environment at GFAFB. The TRC was also established to ensure open communication and exchange of ideas with the general public about the GFAFB IRP and CERCLA (1980), SARA (1986), and RCRA (1976).

12.2 All TRC members understand and agree that the primary purpose and function of the TRC is informational, specifically to foster community and interagency awareness and understanding of Grand Forks AFB IRP remedial actions related to the releases or threatened releases of hazardous substances at Grand Forks AFB.

12.3 As part of the Grand Forks AFB community relations plan, news releases, newsletters, and fact sheets are periodically distributed to the local media and TRC members to inform the public about past, present, and future IRP events.

12.4 To further insure public awareness, GFAFB has implemented a Restoration Advisory Board.

13.0 ALTERNATIVES EVALUATED

13.1 The following six alternatives were identified for remediation of the contaminated soil in the subfloor of Site ST-04. Remediation alternatives for the four USTs outside of Building 306 will be discussed separately.

1. No further action
2. Excavation
3. Soil washing with treatment system and discharge
4. Soil washing in a closed-loop treatment scheme
5. Soil vapor extraction

13.2 The comparative analysis of the five alternatives was conducted to evaluate the alternatives with respect to their relative performance according to nine evaluation criteria which were developed by the EPA to compare the relative performance of the alternatives and identify the advantages and disadvantages of each alternative. This approach to analyzing alternatives is intended to provide sufficient information to adequately compare the alternatives, and eventually select the most appropriate site remedy. The nine criteria are:

1. Overall protection of human health and the environment
2. Compliance with Applicable or Relevant and Appropriate Requirements
3. Long term effectiveness and permanence
4. Reduction of toxicity, mobility, or volume
5. Short term effectiveness
6. Implementability
7. Cost
8. State acceptance
9. Community acceptance

13.2.1 Overall Protection of Human Health and the Environment

Protectiveness is the primary requirement that remedial actions must meet. A remedy is protective if it adequately eliminates, reduces, or controls all current and potential risks posed through each pathway by the site. The assessment against this criterion describes how the alternative achieves and maintains protection of human health and the environment.

Alternative 1: A no action alternative is not feasible due to diesel fuel vapors in the mechanical room, resulting in an inhalation pathway. A no action decision would result in personnel continuing to work in an unhealthy environment and is unacceptable.

Alternative 2: Excavation of the soil will not cause any long-term adverse human health effects; however, it will create temporary exposure pathways (i.e. dermal, inhalation, and ingestion) during the remediation. Excavation and disposal of contaminated soil does not remediate the contamination and the contaminated soil remains a health hazard and a threat to the environment.

Alternative 3: Soil washing, along with a treatment system and effluent discharge, presents dermal and inhalation exposure pathways as well as an environmental threat via the contaminated residual discharge.

Alternative 4: Soil washing in a closed-loop treatment scheme also results in a contaminated effluent; although, not as voluminous as that of Alternative 3. However, the exposure pathways and environmental threat remains.

Alternative 5: SVE results in air emissions and contaminated effluent, although, not as voluminous as those of Alternatives 3 and 4. However, both create exposure pathways and limited environmental threats.

13.2.2 Compliance with Applicable or Relevant and Appropriate Requirements (ARARs)

Applicable requirements are cleanup standards, standards of control, and other substantive environmental protection requirements, criteria, or limitations promulgated under Federal or State law that specifically address a hazardous substance, pollutant, contaminant, remedial action, location or other circumstance at a site. Relevant and appropriate requirements address problems or situations sufficiently similar to those encountered at the site and that their use is well suited to the environmental and technical factors at a particular site.

All alternatives, with the exception of Alternative 1, comply with ARARs.

Alternative 1: A no action alternative does not serve to remediate a known contaminated site and does not comply with ARARs. This alternative is therefore not acceptable.

Alternative 2: Excavation and disposal requires the control of fugitive dust and emissions, as outlined in the Clean Air Act (40 CFR Part 50) and in the North Dakota Administrative Code (NDAC) 33-15-17-03, which describes reasonable precautions for abating and preventing fugitive particulate emissions. The disposal of diesel fuel contaminated soil invokes Article 33-20 of the NDAC, which describes, in part, regulations associated with land treatment of solid waste.

Alternatives 3 and 4: Soil washing technologies must comply with Article 33-20 of the NDAC if contaminated liquid effluent is to be land treated (i.e. landfarmed) or the National Pollutant Discharge Elimination System under the Clean Water Act if the effluent is to be discharged to a treatment system.

Alternative 5: SVE invokes the Clean Air Act (40 CFR Part 50) as well as Article 33-15 of the NDAC. The ND Department of Health considers emissions to be of minor significance and a Permit to Construct and/or Permit to Operate is not required. (Correspondence 09/22/93) Personnel reported smelling diesel vapors and the venting of emissions is considered a less serious health risk. Diesel fuel contaminated residuals must be disposed of in accordance with Article 33-20 of the NDAC or the Clean Water Act. The effluent can be managed by discharge to oil water separator connected to sanitary sewer.

13.2.3 Long Term Effectiveness and Permanence

Alternative 1: A no action alternative is not a remediation alternative. There is no long term effectiveness or permanence. Contamination is left in place, unmitigated. This alternative is therefore unacceptable.

Alternative 2: Excavation and disposal of contaminated soil is both effective and permanent for remediating the contaminated site; however, the contaminated soil must be disposed of in another location. The contamination is still present to create an exposure pathway as well as a threat to the environment; therefore, this alternative is unacceptable.

Alternatives 3, 4, and 5: Both soil washing alternatives and the soil venting alternatives are equally as effective and permanent

13.2.4 Reduction of Toxicity, Mobility, or Volume

Alternative 1: A no action alternative would not reduce the toxicity, mobility, or volume of the contaminant in a reasonable timeframe, and is therefore not acceptable.

Alternative 2: Excavation and disposal of the contaminated soil reduces the toxicity, mobility, and volume of the contaminated soil at the site; however, the contaminated soil is itself not remediated and continues to present a hazard to both human health and the environment.

Alternatives 3 and 4: Both soil washing methods reduce the toxicity, mobility, and volume of contamination on-site; however, these methods transfer the contamination from one media (soil) to another (water).

Alternative 5: SVE also reduces the toxicity, mobility, and volume of the contamination in the soil; however, it cannot address the nonvolatile organic constituents that are present in diesel fuels. SVE also transfers the contamination from the soil to air. Although a permit was applied for, ND Department of Health considered the emissions to be of minor significance and a Permit to Construct and/or Permit to Operate was not required.

13.2.5 Short Term Effectiveness

Alternative 1: The no action alternative is not effective, in either a short-term or long-term timeframe, and is therefore not acceptable.

Alternative 2: Excavation and disposal of the contaminated soil is the most effective short-term remediation method of the six alternatives.

Alternatives 3 and 4: Both soil washing methods are more effective than SVE, but less effective than the excavation and disposal as short term remediation methods.

Alternative 5: SVE is less effective as short term remediation techniques, requiring approximately two to three years for complete cleanup.

13.2.6 Implementability

Alternative 1: No action is a "do nothing" alternative and is therefore the easiest to implement. However, considering all the other factors, this alternative is unacceptable.

Alternative 2: Any options involving excavation were not considered feasible since the building is still in use and would require demolition within the building. Since utilities are known to lie between the subfloor and floor, the risks involved with partial demolition and the disruptions to current building operations were considered too great

to warrant further consideration. Therefore, the excavation of contaminated subfloor soils is an unacceptable alternative.

Alternatives 3 and 4: Both soil washing alternatives are easily implemented; however, they usually require the installation of more wells and more operator attention than either soil venting or soil-vapor extraction. The soil washing alternatives also require treatment of residuals.

Alternative 5: SVE target contaminant groups include the contaminant, diesel fuel. (Remediation Technologies Screening Matrix July 1993) SVE greatly reduces the possibility of contaminant release elsewhere.

Based on analytical results for the treatability study, a SVE system was determined to be an effective method of in-situ remediation of diesel fuel contaminated soils in the subfloor of Building 306's mechanical room.

13.2.7 Cost

Alternative 1: A no action alternative would be the least costly; however, considering all other factors, this alternative is unacceptable.

Alternative 2: Excavation would be extremely expensive since the building is still in use and would require demolition within the building. Since utilities are known to lie between the subfloor and floor, the expense involved with partial demolition and the disruptions to current building operations were considered too great to warrant further consideration. Therefore, the excavation of contaminated subfloor soils is an unacceptable alternative.

Alternatives 3 and 4: Both soil washing alternatives were eliminated from preliminary consideration primarily due to the higher cost of setting up and operating. Without consideration of treatment feasibility, the anticipated system required to treat the wash waters added a cost not associated with the other alternatives. This immediately placed soil washing options in the highest cost category. With a typical "closed-loop system", an eventual discharge of liquids would be required since reinjection of treated water to the subfloor was considered unlikely to be approved. Treatment and discharge to a sewer system might be possible, however, a permit would be required, and would necessitate additional time/cost for design, review, and approval. Therefore, soil washing is an unacceptable alternative.

Alternative 5: SVE is a relatively inexpensive remediation technology, with costs estimated at \$50/ton. However, this technology often requires treatment for off gases and collected groundwater, adding cost to the overall remediation. In our case, there is no additional cost because vapors are vented to the air and liquids pass through a water oil separator and are then transferred to a sanitary landfill.

13.2.8 State Acceptance

All alternatives, with the exception of Alternative 1, would be accepted by the state as a means of remediating the diesel fuel contaminated soil. However, the state would be more likely to accept SVE as the remedial technology since the contamination is rendered nonhazardous and there are no residuals produced that would require further treatment. In addition, SVE can minimize the risks of volatilization of contaminants into the atmosphere.

Alternative 1: A no action alternative would not be accepted by the state since soils are contaminated by diesel fuels and vapors are creating an unhealthy working environment.

13.2.9 Community Acceptance

All alternatives, with the exception of Alternative 1, have been discussed and accepted by the base RAB as a means of remediating the diesel fuel contaminated soil. However, the RAB generally prefers destruction technologies that do not require excavation.

Alternative 1: A no action alternative would not be accepted by the RAB since soils are contaminated by diesel fuels and vapors are creating an unhealthy working environment.

13.3 The following two alternatives were identified for remediation of the contaminated soil and groundwater surrounding the four USTs located northeast of Building 306.

1. No further action
2. Removal and disposal of USTs

13.3.1 A no action alternative is not feasible since the PA/SI performed at the site determined soil and groundwater surrounding the USTs was contaminated with petroleum products. Therefore, a no action decision is unacceptable.

13.3.2 Removing and disposing of the four USTs and all contaminated soil and water was determined to be the most effective remediation technique for the USTs northeast of Building 306. By removing the source and the existing contamination, additional soil and groundwater contamination due to migration is eliminated. The removal and disposal of the USTs are regulated under Article 33-24 of the NDAC.

13.4 The alternatives described will provide overall protection of human health and the environment by preventing exposure through removal of contaminants outside Building 306 and by isolating and remediating the contaminants inside the building. The alternatives selected will also reduce the toxicity, mobility, and volume of the contaminants by removing and bioremediating the contamination. This will provide a long term solution to the problem with good implementability and reasonable cost. The state and community are likely to accept these alternatives based on the facts described in this decision document.

14.0 CONCLUSION

14.1 In summary, the installation of a SVE system and the removal of four USTs was determined to be the most effective remedial alternative in protecting human health and the environment, complying with media cleanup standards, and providing adequate protection against future contaminant releases.


WILLIAM A. MACELHANEY, Colonel, USAF
Chairman, Environmental Protection Committee

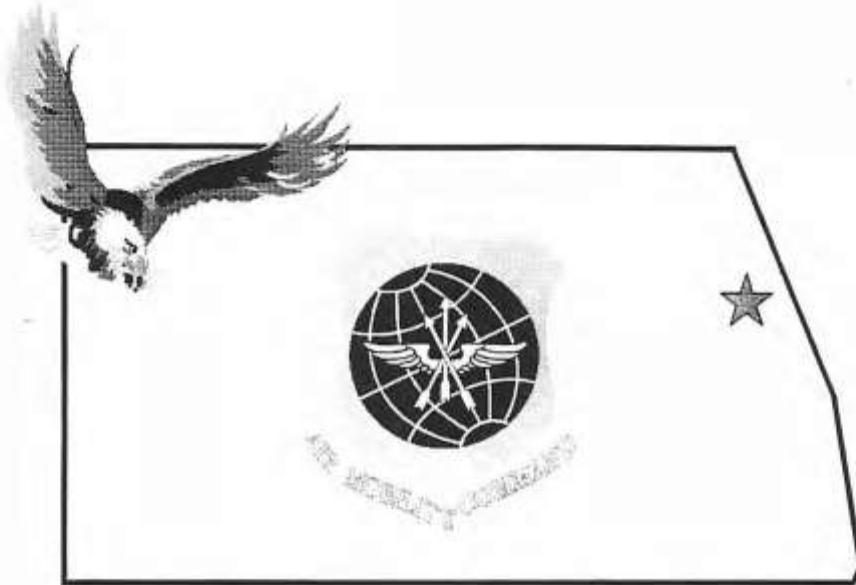
SWMU-4

New Sanitary Landfill Area

ERP Site LF-03

Closure Documentation

DECISION DOCUMENT
NEW SANITARY LANDFILL AREA
IRP SITE LF-03



GRAND FORKS AIR FORCE BASE, NORTH DAKOTA

Oct 95

EXECUTIVE SUMMARY

The following Decision Document was written to fulfill the requirements of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). The purpose of a Decision Document is to highlight key aspects of Remedial Investigation/Feasibility Study (RI/FS) reports, provide a brief analysis of remedial alternatives under consideration, and identify the selected alternative.

The Decision Document described herein summarizes the remedial alternatives suggested for the New Sanitary Landfill Area (NSLA), site LF-03, at Grand Forks AFB. The NSLA, which occupies 80 acres, is the northern most landfill unit within a two-unit sanitary landfill area located in the north central section of Grand Forks AFB (Figure ES-1). The NSLA is north of the FTA/OSLA (FT-02), from which it is separated by a dirt road and a drainage ditch. Both landfills received solid waste between 1956 and 1980. The material disposed of at the NSLA included general refuse, leachate, cleaning residues, and solvents from Base industrial operations. Disposal of unsegregated municipal and potentially hazardous waste at the NSLA ceased in 1980. The NSLA is currently permitted as a special use landfill for the disposal of construction rubble and is used for stockpiling construction supplies and demolition debris.

Four alternatives were identified as remedial alternatives for LF-03: 1) No Further Action and Institutional Controls; 2) Landfill Cap; 3) Landfill Cap/Cell Water Extraction/Treatment by Oil/Water Separation; and 4) Landfill Cap/Cell Water Extraction/Treatment by Oil/Water Separation and Air Stripping. These alternatives are described in Section 13.0 of the Decision Document.

A comparative analysis of the four alternatives was conducted to evaluate the alternatives with respect to their relative performance concerning nine criteria. These evaluation criteria are described in Section 13.2 of the Decision Document. The selected alternative for LF-03 is alternative 2, landfill cap. This alternative includes construction of a landfill cap and long term cap maintenance, groundwater monitoring, and a five-year review prescribed by the National Contingency Plan (NCP) when contaminants remain on site above levels that allow unlimited use (40 CFR 300.430 (f)(4)(ii)). Analysis of the selected action indicates the landfill cap alone will sufficiently protect human health and the environment by reducing and potentially eliminating recharge by precipitation into the landfill cells. Additionally, a landfill cap will effectively drain water off the site, eliminating percolation of surface water into the soils, and decreasing the mobility of groundwater at the site. This will effectively isolate the waste.

Technical Review Committee (TRC) meetings, held since Dec 91, have been one avenue in which the base has informed the community of IRP activities. The TRC, as a whole, has agreed that a landfill cap must be constructed over the site. In Dec 94, the TRC was replaced by a Restoration Advisory Board (RAB) to increase community involvement. The RAB members were also informed of the proposed landfill cap and have since concurred on the action. There has been very little public interest in this activity, based on the lack of questions and/or comments posed by the community members of the former TRC and current RAB. A Proposed Plan, RAB meetings, and the IR have all provided an opportunity for public comment/involvement in this and other base IRP activities. The Proposed Plan was placed in the IR at the Grand Forks Public Library for a 30-day period during which the community was invited to review and comment the Plan. An article advertising the Plan's availability at the Library was placed in the Grand Forks Herald, a local newspaper. A Public Hearing to discuss the Proposed Plan was held on 6 Sep 95 at Grand Forks AFB. No comments were received from the public.

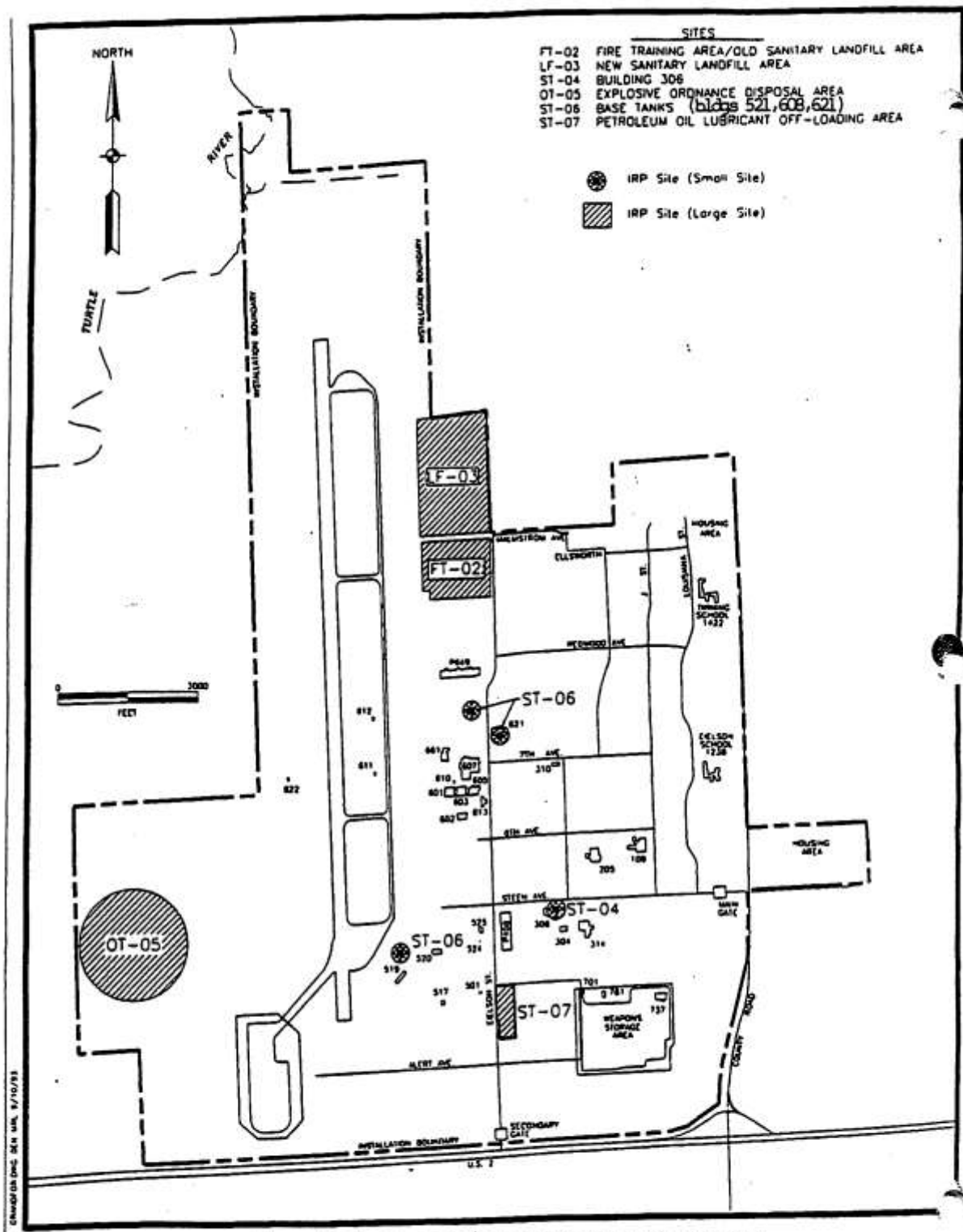


Figure ES-1. Grand Forks AFB IRP Site Location Map

**DECISION DOCUMENT
NEW SANITARY LANDFILL AREA
INSTALLATION RESTORATION PROGRAM SITE LF-03
GRAND FORKS AIR FORCE BASE, NORTH DAKOTA**

1.0 INSTALLATION NAME AND LOCATION

- 1.1 Grand Forks AFB
Grand Forks, North Dakota

2.0 STATEMENT OF BASIS

2.1 The decision described herein concerning the remedial alternative at the New Sanitary Landfill Area (NSLA) is based on an evaluation of the results received from investigations performed under the U.S. Air Force Installation Restoration Program (IRP).

2.2 Documented studies include:

- IRP Phase I: Records Search (Apr 85)
- IRP Phase II Stage 1 Remedial Investigation Report for Potentially Hazardous Waste Sites (Feb 89)
- IRP Remedial Investigation Phase II Stage 2 (Mar 91)
- Draft Final Feasibility Study Report (Jun 93)
- New Sanitary Landfill Area Cap 90% Design Submittal (Aug 93)
- Draft Final Remedial Investigation Supplemental Data Report (Jun 94)

3.0 DESCRIPTION OF THE PROPOSED REMEDY

3.1 The selected remedial alternative for this site is a landfill cap constructed over the existing landfill cells. The southern portion of the NSLA will be capped with the Fire Training Area/Old Sanitary Landfill Area (FTA/OSLA), another IRP site, beginning in FY96. The northern area of the NSLA is scheduled to be capped in FY97. Once the landfill cap is operational, the site will be monitored by groundwater wells to determine the effectiveness of the system. The remedial alternative is supported by an evaluation of the results of all IRP investigations. This includes evaluation of human health risks, risks to the ecological community, and the potential for future contamination of groundwater.

4.0 DECLARATION OF CONSISTENCY WITH CERCLA AND THE NCP

4.1 This document presents the selected remedy for the NSLA developed in accordance with the Resource Conservation and Recovery Act (RCRA) of 1976, Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), Section 117(a), as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA), the National Contingency Plan (NCP), and the North Dakota Solid Waste Management Regulations. Utilizing a landfill cap in conjunction with a groundwater monitoring program has been found to be the most effective way of remediating the site.

5.0 SITE IDENTIFICATION

5.1 Grand Forks, ND is located on the North Dakota-Minnesota border at the junction of the Red Lake River and the Red River of the North, 75 miles north of Fargo, ND and 145 miles south of Winnipeg, Manitoba, Canada. Grand Forks Air Force Base (AFB) is located on U.S. Highway 2,

approximately 15 miles west of Grand Forks and 10 miles west of the Mark Andrews International Airport.

5.2 Grand Forks AFB is situated in a subhumid climate characterized by a wide temperature range, variable precipitation, and rigorous winters. Base records indicate the coldest recorded temperature was -36 degrees Fahrenheit (°F) and the warmest was 106°F. The average annual daily maximum temperature is about 50°F with the highest temperatures occurring during July and August. The average annual daily minimum temperature is about 30°F with the lowest temperature occurring during January. The annual average daily temperature is 40°F.

5.3 The average monthly precipitation ranges from greater than 3.0 inches during June to less than 0.5 inches during February (rainfall). The average annual rainfall precipitation is about 18.5 inches, three-fourths of which occurs from May to September. Snowfall averages slightly less than three feet annually. The prevailing wind direction is from the northwest.

5.4 The NSLA, which occupies 80 acres, is the northern most landfill unit within a two-unit sanitary landfill area (SLA) located in the north central section of Grand Forks AFB (Figure 1, Sites FT-02 and LF-03). The NSLA is north of the FTA/OSLA (FT-02), from which it is separated by a dirt road and a drainage ditch. Both landfills received solid waste between 1956 and 1980. Material disposed of at the NSLA included general refuse, leachate, cleaning residues, and solvents from Base industrial operations. Disposal of unsegregated municipal and potentially hazardous waste at the NSLA ceased in 1980. The NSLA is currently permitted as a special use landfill for the disposal of construction rubble and is used for stockpiling construction supplies and demolition debris.

5.5 The NSLA is a relatively flat, grass-covered site with an average elevation of 887 feet above mean sea level, with surface drainage to the northeast. The south and west sides of the NSLA are bounded by a ditch which drains to the north, toward Turtle River approximately one mile away. Groundwater is mounded in the landfill waste and decreases in elevation radially outward toward the boundaries of the landfill. Vegetation consists primarily of grass and a few young trees.

5.6 Adjacent land uses include the FTA/OSLA located directly south of the NSLA, flight line to the west, and the small arms firing range to the southwest. The Base perimeter borders the NSLA on the north and east sides. Land used immediately outside the fence on the north and east sides of the NSLA is farmland.

5.7 Physical features adjacent to and paralleling the NSLA boundaries include an unpaved access road to the south (Malmstrom Avenue), and a dirt road to the east and north.

6.0 PHYSIOGRAPHY AND LAND USE

6.1 Grand Forks AFB lies within the Agassiz Lake Plain District of the Western Ground Drift section of the Central Lowland Physiographic Province. The Western Ground Drift section is a lowland prairie upon a gently rolling glacial ground moraine. It is occasionally interrupted by ridges of end moraine and flat outwash plains. Strandline deposits associated with Glacial Lake Agassiz form low, narrow linear ridges with a northwesterly trend. The average elevation above sea level is about 890 feet with a maximum local relief of about 25 feet.

6.2 Grand Forks AFB is also located in the Red River Valley topographic area which corresponds to the Agassiz Lake Plain physiographic division. Geologic processes include the movement of groundwater through underlying rock strata, differential erosion, modification by glaciers, and recent wind and stream-forming events. Prior to glaciation, the river became incised until it reached Precambrian rock, then shifted its course westward as it eroded away Cretaceous shale and sand, thereby forming the Pembina Escarpment. When glaciers deposited a layer of till over the area, the river erosion temporarily ceased. Lake Agassiz sediment now covers the Red River Valley. The modern Red River of the North flows on this lake plain. The Pembina Escarpment was probably altered by glacial

processes but exists today as the western extent of Glacial Lake Agassiz sediments, about 10 miles west of Grand Forks AFB. The present location of the Red River of the North is 18 miles east of Grand Forks AFB, representing the North Dakota-Minnesota state line.

6.3 Land use in Grand Forks County consists primarily of cultivated crops with remaining land used for pasture and hay, urban development, recreation and wildlife habitat. Principal crops are spring wheat, barley, sunflowers, potatoes and sugar beets. Turtle River State Park, located about five miles west of the Base, is one of the major recreational areas in Grand Forks County. Several watershed protection dams are being developed for recreational activities. Kellys Slough National Wildlife Refuge, located approximately 5 miles east of the base, and the adjacent National Waterfowl Production Area are managed for wetland wildlife and migratory waterfowl, but they also include a significant acreage of openland wildlife habitat in the county.

7.0 GEOLOGY

7.1 Geological data obtained from soil boring logs at the NSLA during the Stage 1 Remedial Investigation (RI) indicated that the unconsolidated materials above bedrock consist predominantly of pebbly silty clays, silts, and fine to coarse-grained sand.

7.2 During the RI, four till units were encountered below Grand Forks AFB. Except for minor variations, the tills are very similar, being texturally fine-grained (silty clay, sandy clay), with a small percentage of angular pebbles and gravel. Each till unit is massive, with no evidence to suggest jointing. Soil peds are present in the upper surface of the uppermost till unit. Occasional zones were encountered in some of the borings which show more or less coarse fractions within an individual till. This is due to textural differences within the glacial ice at deposition. The uppermost till unit at the NSLA is mantled by a thin (up to 18 feet) veneer of silt and sandy silt which was presumably deposited by Glacial Lake Agassiz. Selenite crystals were observed in the near surface materials at several locations. The uppermost till unit and the second till unit (immediately beneath the Emerald Sand) is continuous across the site, as each was encountered in all of the intermediate borings that exceeded 100 feet in depth.

7.3 The till units are separated by a series of lacustrine silts, clays, or sands. The first two till units below the Grand Forks AFB are separated by a silt unit over a sand unit. The sands are those which make up the Emerald Aquifer. Coarse-grained sands and gravels predominate the lower portion of the Emerald Aquifer. The sands and gravels become finer grained and show better sorting progressively higher in the section. The grain-size typically decreases to silt-sized material before the sediment of the uppermost till is encountered. The other deeper till units are separated by coarse-grained sediments only.

7.4 Two NX core-barrel samples were taken in the bedrock. The sample collected from 248 to 252 feet proved to be a highly weathered gray to dark gray shale that appeared to be unconsolidated. The core sample retrieved from 284 to 289.5 feet is described as a shale, competent enough to be slightly fissile. The organic horizon was encountered at 223 feet, and consisted of either a highly-weathered coal or highly-weathered organic rich shale.

8.0 HYDROGEOLOGY

8.1 Hydrogeologic information obtained from the Stage 1 and Stage 2 RI determined that the shallow groundwater at the NSLA is mounded and flows radially outward from the center of the landfill toward the site perimeters. Water levels are highest in the southern portion of the NSLA and lowest in the northern part, as groundwater elevations decrease away from the mound at the FTA/OSLA located directly south of the NSLA (see Figure 2).

8.2 Horizontal gradients for the shallow groundwater are fairly constant across the site at 0.002-0.006. The geometric mean conductivity value of 2.3×10^{-5} cm/sec was determined during the Stage 1

RI for the shallow monitoring wells. Also, an effective porosity of 30% was determined to be the maximum expected effective porosity for the clayey materials at the NSLA. Utilizing the hydraulic gradient, hydraulic conductivity and effective porosities as discussed above, the hydraulic velocity of groundwater at the site was calculated to be between 1 and 13 inches per year.

8.3 The Emerado Aquifer is confined beneath till and lacustrine sediments at the site. Water levels measured in the aquifer wells during the Stage 1 and Stage 2 RI were above the top of the aquifer, indicating the presence of artesian conditions. The potentiometric surface of the Emerado Aquifer is above the shallow groundwater table in all the wells at the NSLA indicating the presence of an upward hydraulic gradient between the shallow groundwater and the aquifer.

8.4 The mean vertical gradient at the NSLA was determined to be 0.048 in the upward direction. Utilizing a range of hydraulic conductivities from the Stage 1 RI of 1.2×10^{-6} and 5.7×10^{-7} cm/s, groundwater will flow upward from the Emerado Aquifer at rates ranging between 0.5 and 4 inches per year.

9.0 SURFACE HYDROLOGY

9.1 Natural surface water features on Grand Forks AFB are limited to small wetlands, including prairie potholes, and a small stretch of the Turtle River that flows across the northwestern portion of the Base approximately one mile northwest of the NSLA. In general, surface water runoff west of the taxiway and drainage from the maintenance apron (just east of the runway) and the NSLA are routed through drainage ditches that flow north into the Turtle River. The low flow in this drainage channel (0-0.1 million gallons per day) suggests that the ditch exerts a negligible effect on Turtle River water quality. The remaining surface water on Base is directed to the north and south drainage ditches which flow into Kellys Slough National Wildlife Refuge.

9.2 The Turtle River channel is very sinuous and generally flows in a northeasterly direction. It eventually empties into the Red River of the North which flows north to Lake Winnipeg in Canada. The Red River drainage basin is part of the Hudson River drainage system. At Manvel, North Dakota, approximately 10 miles northeast of Grand Forks AFB, the mean discharge of the Turtle River is 50.3 cubic feet per second. Peak flows result from spring runoff in April, and minimum flows (or no flow in some years) occur in January and February.

10.0 BACKGROUND

10.1 A records search was performed at Grand Forks AFB to identify the potential for environmental contamination resulting from past waste disposal practices and to assess the potential for contaminant migration. The records search concluded there was a potential for environmental contamination at the NSLA and recommended further investigation to adequately characterize the site. The NSLA entered into the IRP upon completion of this investigation.

10.2 The NSLA RI was conducted under two stages. Stage 1 was completed in Feb 89 and Stage 2 field work was completed in Mar 91.

a. The Stage 1 investigation involved acquisition of geophysical data, completion of soil borings, installation of 12 groundwater monitoring wells and collection of chemical data on a sediment sample and groundwater samples. The sediment sample, collected immediately downgradient of the NSLA, was reported to contain low levels of volatile organic compounds (VOCs), pesticides, and metals. Contaminants detected in groundwater samples included low levels of VOCs, base-neutral acid extractables (BNAEs), and metals. This study characterized geology, hydrogeology and contaminant extent and suggested that further investigation was necessary to delineate and quantify contamination at the site.

b. In response, Stage 2 field work was conducted at the NSLA. The scope of this investigation included drilling additional borings to obtain soil and sediment samples and installing two monitoring wells to obtain groundwater samples. The soil sediment samples were analyzed for VOCs, total metals, total recoverable petroleum hydrocarbons (TRPH), BNAEs, pesticides, and polychlorinated biphenyls (PCBs). The groundwater samples were analyzed for VOCs, BNAEs, total metals, TRPH, pesticides, and PCBs. Figures 3 and 4 show the results of the soil/sediment and groundwater sampling effort.

10.3 After two stages of RI at the NSLA a subsequent investigation was performed in Sep 92, at EPA's request, to supplement previous RI work. Data gaps in the previous investigations identified the need for additional characterization to determine the extent of contamination. Additional soil, surface water, and sediment samples were collected at the NSLA.

a. Soil:

1. To confirm the lateral and vertical extent of the NSLA, twenty soil borings were drilled (Figure 5). No soil samples were collected; however, a sample of landfill cell leachate was collected for VOC analysis (Figures 6 and 7).

b. Surface Water/Sediments:

1. Surface water and sediment samples collected from the NSLA drainage ditches were analyzed for VOCs, BNAEs, metals, herbicides, pesticides, and PCBs (Figures 6 and 7). Two rounds of sediment and surface runoff samples were collected from the NSLA to a discharge point at the Turtle River. The first round was collected in mid-April 93, during the spring seasonal high flow runoff period, and the second round was collected in early July 93, and was intended to represent dry season conditions, although wet conditions persisted throughout the summer. Analyses of the samples found very low levels of VOCs and BNAEs and were thought to be more representative of laboratory contamination than environmental contamination.

2. Additional samples were collected to characterize contamination associated with leachate within the NSLA. Contaminants in the leachate collected from a soil boring drilled into a landfill cell trench are shown in Figures 6 and 7. The concentrations are below the State of North Dakota surface water quality criteria. A related seep was identified at the drainage ditch bordering the north side of the NSLA. Surface water samples from this seep contained low levels of volatile organic compounds including toluene, xylenes, 1,1,2,2-tetrachloroethane, and vinyl chloride. Vinyl chloride and 1,1,2,2-tetrachloroethane were detected at concentrations of 13 µg/L and 47 µg/L, respectively, which exceed the surface water criteria concentrations of 2.0 µg/L and 0.17 µg/L, respectively.

c. Wetlands:

1. To determine the presence or absence of contamination in wetland areas within the NSLA, four surface water and four sediment samples were collected from three areas (Figures 8). Surface water and sediment samples were collected when standing water was present and were analyzed for VOCs, BNAEs, metals, herbicides, pesticides, and PCBs. The study found that surface water samples contained only low levels of metals which may have been indicative of background conditions that have been affected by agricultural practices. The other parameters were not detected in either the surface water or the sediments in the wetland area. It was concluded that wetland areas within the NSLA did not appear to be impacted by organic or inorganic contamination from the landfill.

2. Construction of a landfill cap will require filling in six acres of wetland areas, which formed as a result of landfill activities. A permit requesting approval to fill in the wetlands was submitted to the Army Corps of Engineers (COE). The COE determined that the project does not require

an individual Department of the Army permit and does qualify under the Nationwide permit (33 CFR 330.6). The Nationwide permit regulates the discharge of dredged or fill material into waters of the United States, including wetlands. Grand Forks AFB will also obtain clearance from the State Historical Society of North Dakota prior to landfill cap construction.

10.4 As part of the additional RI, a conceptual model was developed to qualitatively predict the fate and transport of the contaminants at the NSLA from the source to surface water and sediments, and ultimately into the Turtle River. The model suggested that the predominant fate of contaminants migrating from the NSLA leachate seep was a result of adsorption of contaminants in solution onto sediments and the secondary fate was a result of contaminant transport by surface water and sediment. The model also suggested that degradation and volatilization may limit the ability of contaminants to migrate and, therefore, play important parts in contaminant fate and transport. Based on the sampling locations and contaminant concentrations, the supplemental investigation concluded that contaminants from the leachate seeps are not migrating very far from the release points via surface drainage and that the wetlands are not negatively impacted as a result of activities at the NSLA.

10.5 The following information summarizes risk pathways for human and ecological health.

a. Groundwater Pathway:

1. The groundwater in the surficial till is not used as a water source at Grand Forks AFB. The water to Grand Forks AFB is supplied by two sources. The City of Grand Forks extracts its water from both the Red River and the Red Lake River and delivers approximately eighty percent of the water used by the base. The second supplier of water to the base is Grand Forks-Trail Water Users, Inc., located in Thompson, ND. The water from this supplier is drawn from twelve wells, approximately 300 feet deep, between Arvilla and Northwood, ND. The Emerado aquifer beneath the till has not been impacted from previous NSLA activities and will not be impacted without drastic changes in site conditions.

2. No significant detections of contaminants were obtained in the monitoring well network surrounding the NSLA. The hydrogeologic characteristics of the site suggests there is the potential for contaminants to migrate via a groundwater pathway from the FTA/OSLA to the NSLA. However, the permeability of the glacial till is very low and transport would require many years. Additionally, a landfill cap will reduce percolation of surface water into the soils thereby decreasing the mobility of groundwater at the site. Therefore, the groundwater pathway is not considered a viable pathway.

b. Soils Pathway:

1. Direct contact with contaminated soils at the NSLA may result in dermal absorption and incidental soil ingestion. However, surface soils at the NSLA have a low permeability and are between one and seven feet thick. Also, the entire site is well vegetated with grass and small trees. Therefore, the potential for direct contact with waste materials is not likely. Future potential for direct contact exposure to waste contents of the landfill is not a concern since Grand Forks AFB will establish a long term monitoring and maintenance program for the NSLA. Therefore, direct contact exposure is not a viable pathway.

2. The NSLA's soils will be stabilized by a landfill cap and vegetative cover. Therefore the potential for air releases via wind erosion of waste beneath the cap is not considered a viable pathway since disturbance of the landfill is not plausible under future land uses.

c. Air Pathway:

1. The air pathway is not considered to be a viable inhalation pathway since air monitoring at the site revealed background conditions throughout the field investigation. Additionally, volatilization of VOCs from the subsurface of the site is unlikely because of tight soils and good vegetative cover across most of the site.

d. Surface Water/Sediments Pathway:

1. The soils and surface water/sediments pathway is considered to be a viable pathway due to contamination of drainage ditch surface water/sediments in the leachate seep area. There may be a potential for exposure to contaminated surface water/sediments by direct contact, which includes incidental ingestion as well as dermal contact and absorption.

2. There are two potential pathways for surface water impact due to contamination at the NSLA. Seepage of contaminated landfill cell water to the drainage ditch via the leachate seep may impact the surface water. Also, leaching of the contaminated sediments at the leachate seep, may impact the surface water. Impacts to Turtle River via groundwater pathways are not considered plausible since groundwater in the glacial till has a low hydraulic velocity, ranging from 2 to 37 inches per year.

3. A health risk estimate for surface water exposure was performed during the Stage 2 RI at FT-02. Since existing conditions and contaminants at LF-03 are similar to those at FT-02, conclusions from the Stage 2 RI for FT-02 can be extended to LF-03. The health risk estimate indicated a potential for receptors to be exposed to surface water through recreational activities. It should, however, be emphasized that the assumed level of recreational use is unlikely due to the characteristics of the runoff water and the location of the ditch. Contaminated surface water/sediments at the leachate seep are approximately 1.5 miles south of the Turtle River. In addition, the outfall at Turtle River runs through base property and is less frequented by the public than the part of the river that flows through Turtle River Park.

11.0 PUBLIC RELATIONS - Administrative Record and Information Repository

11.1 An Administrative Record (AR) is a legal record of the physical situation at an installation, by which response actions are reviewed and defended. An AR must be established at each installation which has conducted or is conducting IRP activities and must be available to the public at or near the installation. The AR at GFAFB is maintained at the following location and is updated as needed by the base Remedial Project Manager.

319 CES/CEVR
525 6th Ave
Grand Forks AFB ND 58205-6434

11.2 An Information Repository (IR) is a project file on IRP activities at AF installations. The repository is to be established for all remedial action sites and for all sites where removal actions last longer than 120 days. It is located either on or off base at a place convenient to the community and contains site information, investigatory reports, information about the sources and nature of the contaminants, and a schedule for cleanup operations. The IR is intended to address community relations requirements and is a source of reading material for the public. Many, if not all of the documents may be the same in the IR and the AR. In Jan 93, GFAFB established an IR which is maintained at the Grand Forks City Library, in the reference section, to insure public access. Following is the location of the IR:

Grand Forks Public Library
2100 Library Circle
Grand Forks, ND 58201

12.0 TECHNICAL REVIEW COMMITTEE/RESTORATION ADVISORY BOARD

12.1 A Technical Review Committee (TRC) was established at Grand Forks AFB in Dec 91 to review and comment on Department of Defense actions and proposed actions with respect to releases or threatened releases of hazardous substances into the environment at Grand Forks AFB. The TRC was also established to ensure open communication and exchange of ideas with the general public about the Grand Forks AFB IRP and CERCLA (1980), SARA (1986), and RCRA (1976).

12.2 The TRC was a body comprised of members from Grand Forks AFB, U.S. Environmental Protection Agency, North Dakota State Department of Health, Grand Forks Health Department, and community representatives. All TRC members understood and agreed that the primary purpose and function of the TRC was informational, specifically to foster community and interagency awareness and understanding of Grand Forks AFB IRP remedial actions related to the releases or threatened releases of hazardous substances at Grand Forks AFB.

12.3 In Dec 94, the TRC was replaced by a Restoration Advisory Board (RAB) to enhance community involvement. The RAB provides an environment for an open exchange of ideas, opinions, and information and includes a more thorough representation of the community. The purpose of the RAB is to promote community awareness and obtain constructive community review and comment on environmental restoration actions to accelerate the overall cleanup of Grand Forks AFB. It is used to disseminate information about the IRP and to ensure opinions about environmental restoration reflect diverse interests within the community. The RAB serves in an advisory capacity to Grand Forks AFB, US Environmental Protection Agency Region VIII, and the North Dakota Department of Health.

12.4 As part of the Grand Forks AFB community relations plan, news releases and newsletters are periodically distributed to the local media and RAB members to inform the public about past, present, and future IRP events.

13.0 ALTERNATIVES EVALUATED

13.1 The following four alternatives were identified for Site LF-03:

1. No Further Action and Institutional Controls

a. The no action response is allowable only if the remedial action objectives can be achieved in an acceptable period of time without remedial action. Institutional controls include prohibiting shallow groundwater use until ARARs are met. Monitoring can be used to track the direction and rate of movement of the contaminant plume. As an institutional control, fencing of the leachate seep may be used to prevent contact with contaminated surface water and sediments until remedial action objectives are met. The no action and institutional controls scenario may achieve ARARs as a response action through the natural attenuation of contaminants, but the restoration time frame would be extensive. Under this alternative, groundwater and landfill seep water quality monitoring would be the only activity conducted.

2. Landfill Cap

a. A cap is intended to physically contain the waste in a landfill by reducing surface water infiltration and limiting landfill cell water flow thus minimizing continued migration of contaminants into the landfill cell water. Under this alternative, water quality monitoring and landfill cap modifications by regrading and new cap construction would be conducted.

b. Landfill cap modification represents the placement of a volume of cover materials towards achieving the remedial objectives. The specified landfill area would be regraded with a common fill to within a 3% grade, then capped in accordance with the North Dakota municipal landfill closure

requirements. These requirements would include a vent layer followed by a geomembrane covering, on top of which would be placed an 18-inch thick layer of clay rich soil followed by a 0.5-foot thick layer of plant growth material for a total thickness of greater than 2.0 feet. The top layer would be hydroseeded with a shallow-root grass seed and mulched. The cap modification alternative would also include a long-term (30-year) cap inspection program.

3. Landfill Cap/Cell Water Extraction/Treatment by Oil/Water Separation

a. In this response action, shallow groundwater and landfill cell water would be extracted from the shallow aquifer and landfill cells using collection trenches. Discharge from the leachate seep would be collected by a recovery trench that is either localized adjacent to the seep or that extends across the entire northern boundary of the landfill cells. Extracted water would be treated by oil/water separation to remove free-floating product and discharged to the lagoon on base if the water is determined to be nonhazardous. In addition, groundwater monitoring would be implemented as an institutional control. If the water is determined to be hazardous, it will be disposed of according to state and federal regulations.

4. Landfill Cap/Cell Water Extraction/Treatment by Oil/Water Separation and Air Stripping

a. This response action is similar to Alternative 3 with the exception that an additional treatment technology, air stripping, would be added to the treatment train. Air stripping is a mass transfer process used to move volatile contaminants from water to air. Offgases may require treatment to recapture contaminants.

13.2 Screening of Control Measures

a. The comparative analysis of the four alternatives was conducted to evaluate the alternatives with respect to their relative performance with respect to nine criteria. These evaluation criteria are divided into three categories and have been developed by the EPA to address the technical and policy considerations that have proven important for selecting remedial alternatives. The nine criteria are [40 CFR 300.430 (f)(1)(i)]:

b. THRESHOLD CRITERIA

1. Overall protection of human health and the environment
2. Compliance with Applicable or Relevant and Appropriate Requirements (ARARs)

PRIMARY BALANCING CRITERIA

3. Long term effectiveness and permanence
4. Reduction of toxicity, mobility, or volume (TMV)
5. Short term effectiveness
6. Implementability
7. Cost

MODIFYING CRITERIA

8. State acceptance
9. Community acceptance

c. The objectives of the comparison are to assess the relative advantages and disadvantages among the alternatives and to identify the key tradeoffs which must be balanced in selecting a preferred alternative.

13.3 Criterion 1: Overall Protection of Human Health and the Environment

a. Protectiveness is the primary requirement that remedial actions must meet under CERCLA. A remedy is protective if it adequately eliminates, reduces, or controls all current and potential risks posed through each pathway at the site. To ensure the overall protection of human health and the environment in this remedial response, three objectives need to be addressed: mitigation of the leachate

seep, waste isolation and future maintenance of the landfill cap, and non-degradation of the Emerado Aquifer and the glacial till water table aquifer groundwater qualities. All of the alternatives, with the exception of Alternative 1 (No Further Action), provides for overall protection of human health and the environment.

b. Alternative 1 - This alternative does not provide for overall protection of human health and the environment because it would not reduce the potential of contaminant migration. By implementing this alternative, risk may actually increase over time, even if biodegradation is considered, as a result of unmitigated releases of contaminants from the leachate seep.

c. Alternative 2 - The landfill cap should effectively mitigate the seep by reducing and possibly eliminating recharge to the landfill cells by percolation of precipitation. As a result, water levels within the cells should become lower, possibly to the point of being completely dewatered, significantly reducing the leaching of contaminants from soils and waste material. The cap will also reduce, if not completely eliminate, direct contact to the waste and contaminated soil and groundwater. However, in itself, this alternative will not reduce the amount of contamination within the landfill.

d. Alternatives 3 and 4 - These alternatives do not satisfy all of the objectives necessary to ensure the overall protection of human health and the environment. The option of using extraction trenches within landfill cells allows for a pathway from the waste stream to receptors and, therefore, this option has been eliminated for human and environmental health concerns. These alternatives would, in theory, reduce the concentrations of contaminants; however, geological and physical barriers at this site (i.e. low conductivity of soils) will hinder the collection and treatment of landfill water, as was demonstrated by a pilot-scale treatment test conducted at FT-02 (James M. Montgomery, 1992). Although the landfill cap modifications, as stated in the discussion for Alternative 2, will reduce direct contact to the waste and contaminated soil and landfill cell water, the extraction trenches will not.

13.4 Criterion 2: Compliance with ARARs

a. Compliance with ARARs is one of the statutory requirements of remedy selection. The primary ARARs at the landfill are MCLs, landfill closure requirements, and storm water and sewage drainage requirements. Attachment 1 provides a detailed list of chemical-specific ARARs for the media of concern (groundwater, surface water, and air) and for action-specific ARARs.

b. Alternative 1 - This alternative does not comply with Federal or State ARARs.

c. Alternative 2 - The primary ARARs at the landfill are the MCLs, landfill closure requirements (RCRA and North Dakota Guidelines) and stormwater discharge and drainage requirements (Clean Water Act [CWA] and National Pollutant Discharge Elimination System [NPDES]). This alternative meets the ARARs identified as applicable to the landfill. Because wastes were disposed of in the landfill prior to 1980, the RCRA hazardous waste landfill closure requirements are not applicable. However, because hazardous waste may have been disposed of in the landfill, the RCRA hazardous waste closure requirements that address the primary remedial objectives (seep mitigation, waste isolation, and aquifer non-degradation) are relevant and appropriate. This alternative should achieve these objectives by preventing groundwater recharge and subsequent mounding of water within and over the landfill cells. This should result in reduced flow from the leachate seep and isolation and reduction of the quantity of water within the landfill cells. The cap will also satisfy the ARARs identified as applicable to the landfill under CWA requirements by grading the site to a positive grade thus minimizing surface water ponding. These options will also ensure stormwater runoff is diverted away from the landfill via existing drainage routes.

d. Alternative 3 - The primary ARARs at the landfill are MCLs, landfill closure requirements (RCRA and North Dakota Guidelines) and stormwater and sewage discharge requirements (CWA and NPDES). The cap modification meets applicable ARARs, as described for Alternative 2. In order to comply with the base's NPDES permit for pretreatment standards, a permit modification may be

necessary for discharge of generated wastewaters from both of the landfill cell water interception, extraction, and treatment alternative options to the base wastewater treatment lagoons. This may prompt the State to impose pretreatment and influent quality standards for the alternatives. Consequently, the alternatives may not comply with future CWA and NPDES requirements.

e. Alternative 4 - In addition to the ARARs for Alternative 3, this alternative would also have to comply with State Air Pollution Control Regulations, Federal Clean Air Act, and Air Toxic Policy due to the use of an air stripper.

13.5 Criterion 3: Long Term Effectiveness and Permanence

a. This criterion reflects CERCLA's emphasis on implementing remedies that will ensure protection of human health and the environment in the long term. The assessment of alternatives against this criterion evaluates the residual risks at a site after completion of a remedial action or enactment of a no action alternative.

b. Alternative 1 - This alternative will not achieve long term effectiveness and permanence because it does not provide for isolation of waste and maintenance nor will it limit exposure to the leachate seep.

c. Alternative 2 - This alternative will achieve long-term effectiveness and permanence with respect to seep mitigation and limiting exposure to landfill waste within a foreseeable time frame. In conjunction with groundwater monitoring, this alternative will ensure that long term effects of groundwater degradation do not occur.

d. Alternatives 3 and 4 - These alternatives will achieve long-term effectiveness and permanence with respect to seep mitigation and limiting exposure to landfill waste within a foreseeable time frame. In theory, landfill cell water interception and extraction via the drainage trench will help to dewater and decrease contaminant concentrations over time within the landfill cell water. However, geological and physical barriers at this site (i.e. low conductivity of soils) will hinder the collection and treatment of landfill water, as was demonstrated by a pilot scale treatment test conducted at the FTA/OSLA, a site with similar hydrogeologic characteristics (James M. Montgomery, 1992). Also, implementation of Alternatives 3 and 4 would result in a wastewater discharge to the base lagoon, which may require a modification to the current base National Pollutant Discharge Elimination System (NPDES) permit. In conjunction with groundwater monitoring, these alternatives will ensure that long term effects of groundwater degradation will not occur.

13.6 Criterion 4: Reduction of Toxicity, Mobility, and Volume (TMV)

a. This criterion addresses the statutory preference for remedies that employ treatment as a principal element. The assessment against this criterion evaluates the anticipated performance of the specific treatment technologies an alternative may employ.

b. Alternative 1 - This alternative does not reduce the TMV of contaminants present in the NSLA. By implementing this alternative, immediate TMV may actually increase as a result of unmitigated contaminant releases from the leachate seep. The toxicity will eventually decrease as a result of natural attenuation. However, it is uncertain as to whether the contaminants will degrade to nontoxic concentrations before reaching the Turtle River, which is approximately one mile away from the site.

c. Alternative 2 - This alternative will have a partial effect on the reduction of TMV of contaminants present in the landfill. The cap should effectively reduce cell water recharge by percolation. This will consequently reduce the mounded landfill cell water and effectively decrease the flow of contaminants to the leachate seep and reduce downward and lateral flow to the groundwater. Leaching of contaminated soils above the landfill cell water will also be reduced, minimizing the amount of contaminants that could migrate into the landfill cell water.

d. Alternatives 3 and 4 - These alternatives will, in theory, help reduce the amount and the TMV of contaminants present in the landfill. However, geological and physical barriers at this site (i.e. low conductivity of soils) will hinder the collection and treatment of landfill water, as was demonstrated by a pilot scale treatment test conducted at the FTA/OSLA, a site having similar hydrogeologic properties (James M. Montgomery, 1992). Installation of the cap should effectively reduce groundwater recharge from percolation, reduce contaminant mobility, and reduce water levels. The drainage trench should remove available contaminated landfill cell water and further reduce water levels in the landfill cells. Leaching of contaminated soils above the landfill cell water will also be reduced, minimizing the amount of contaminants migrating to the landfill cell water.

13.7 Criterion 5: Short Term Effectiveness

a. This criterion addresses short-term impacts of the alternative. The assessment against this criterion examines the effectiveness of alternatives in protecting human health and the environment during the construction and implementation of a remedy.

b. Alternative 1 - The current land use at this site defines the short-term effectiveness of this alternative. Short-term risks associated with this alternative include potential contaminant exposure at the landfill seep and during the installation and sampling of monitoring wells.

c. Alternative 2 - Short term risks associated with this alternative include potential contaminant exposure at the landfill seep, during the installation and sampling of monitoring wells, and during cap modifications.

d. Alternatives 3 and 4 - Short-term risks associated with these alternatives include potential for contaminant exposure during sampling of monitoring wells and at both the landfill seep and along the northern boundary during the installation of the drainage trench. In addition, exposure to contaminants may occur during cap modifications.

13.8 Criterion 6: Implementability

a. The assessment against this criterion evaluates the technical and administrative feasibility of the alternatives and the availability of the goods and services needed to implement them.

b. Alternative 1 - This alternative would be easily implemented but most likely would not be permitted administratively because risks exist due to the leachate seep discharge.

c. Alternative 2 - Landfill caps have been successfully used at many waste sites and are easily implemented, where clay soils are available, as in Grand Forks.

d. Alternatives 3 and 4 - Alternatives 3 and 4 are viable alternatives and have been successfully used at many waste sites. However, the existing clay soils may hinder extraction of the landfill cell water, thus limiting implementability. These alternatives may also require minor quantitative changes to the NPDES discharge permit for flowrates and influent wastewater quality. However, no requirements presently exist that would hinder implementation.

13.9 Criterion 7: Cost

a. Cost encompasses all engineering, construction, and operation and maintenance costs incurred over the life of the project. The assessment against this criterion is based on the present worth of these costs for each alternative. In ranking costs from least to most expensive, Alternative 1 would be the least expensive choice, followed by Alternatives 2, 3, and 4, respectively.

b. Alternative 1 - Costs associated with this alternative are incurred under the 30-year post-closure monitoring period. The total present worth cost of this alternative, over 30 years, is estimated at \$400K.

c. Alternative 2 - The cost of this alternative is based on the area of landfill to be capped and that only State municipal waste landfill regulations for landfill closures are applicable. The cost of the cap is estimated at \$7M in addition to the \$400K for the 30-year post-closure monitoring period.

d. Alternative 3 - The cost for this alternative is based on the assumptions that discharge under a modified NPDES permit will be allowed, that the trenching lengths will be 200 or 1200 feet, depending on the location of the trench, and that oil/water separation will be sized for discharges ranging between 5 and 15 gallons per minute (gpm). The total present worth cost of each scenario to be maintained for a 30-year period is approximately \$450K and \$910K, respectively. These costs are in addition to the \$7M for the cap and the \$400K for the 30-year post-closure monitoring period.

e. Alternative 4 - In addition to the cost factors mentioned in Alternative 3, this alternative may require additional money for the extra unit operations in the treatment train. Startup costs for this alternative are estimated at \$2M to \$3M depending on the treatment capacity, the length of the interception trench, and the type of air stripper system. Operating costs for these systems generally range from \$10K to \$150K per gallon of contaminant removed. In addition, the cost for this alternative is based on the assumptions that discharge under a modified NPDES permit will be allowed and do not include treatability studies which would be required prior to installation at the site.

13.10 Criterion 8: State Acceptance

a. This criterion, which is an ongoing concern throughout the remedial process, reflects the statutory requirement to provide for substantial and meaningful State involvement.

b. Alternative 1 - The North Dakota Department of Health (NDDH) would accept no less than a RCRA landfill cap as the remedial action at the site. Therefore Alternative 1 is not acceptable.

c. Alternative 2 - NDDH has determined that a landfill cap is an acceptable remedial action. A Proposed Plan was submitted to the NDDH and the US Environmental Protection Agency (EPA). Comments made by the NDDH are incorporated into this Decision Document. Grand Forks AFB received no comments from the EPA.

d. Alternatives 3 and 4 - NDDH may possibly accept these alternatives as acceptable remedial actions. However, concerns may arise over the effect of pumping on the subsurface and the disposal of the effluent from the treatment systems. The state may be reluctant to grant additional permit modifications for NPDES (Alternatives 3 and 4) or air emissions (Alternative 4).

13.11 Criterion 9: Community Acceptance

a. This criterion reflects the community's apparent preferences or concerns about alternatives.

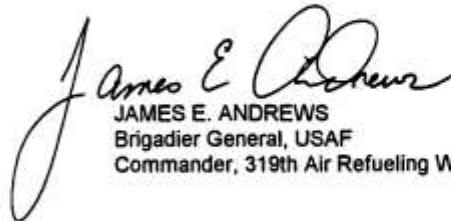
b. The TRC, RAB, and IR have been the avenues in which the base has informed the community of IRP activities. TRC meetings were held from Dec 91 to Dec 94. In Dec 94, the TRC was converted to a RAB, which meetings are held quarterly. Both the former TRC and current RAB members agreed that a landfill cap must be constructed over the site. Community members would most likely accept Alternatives 3 and 4 as well; however, they would most likely not accept Alternative 1. Overall, there has been very little public interest in this activity, based on the lack of questions and/or comments posed by the community members of the TRC and RAB.

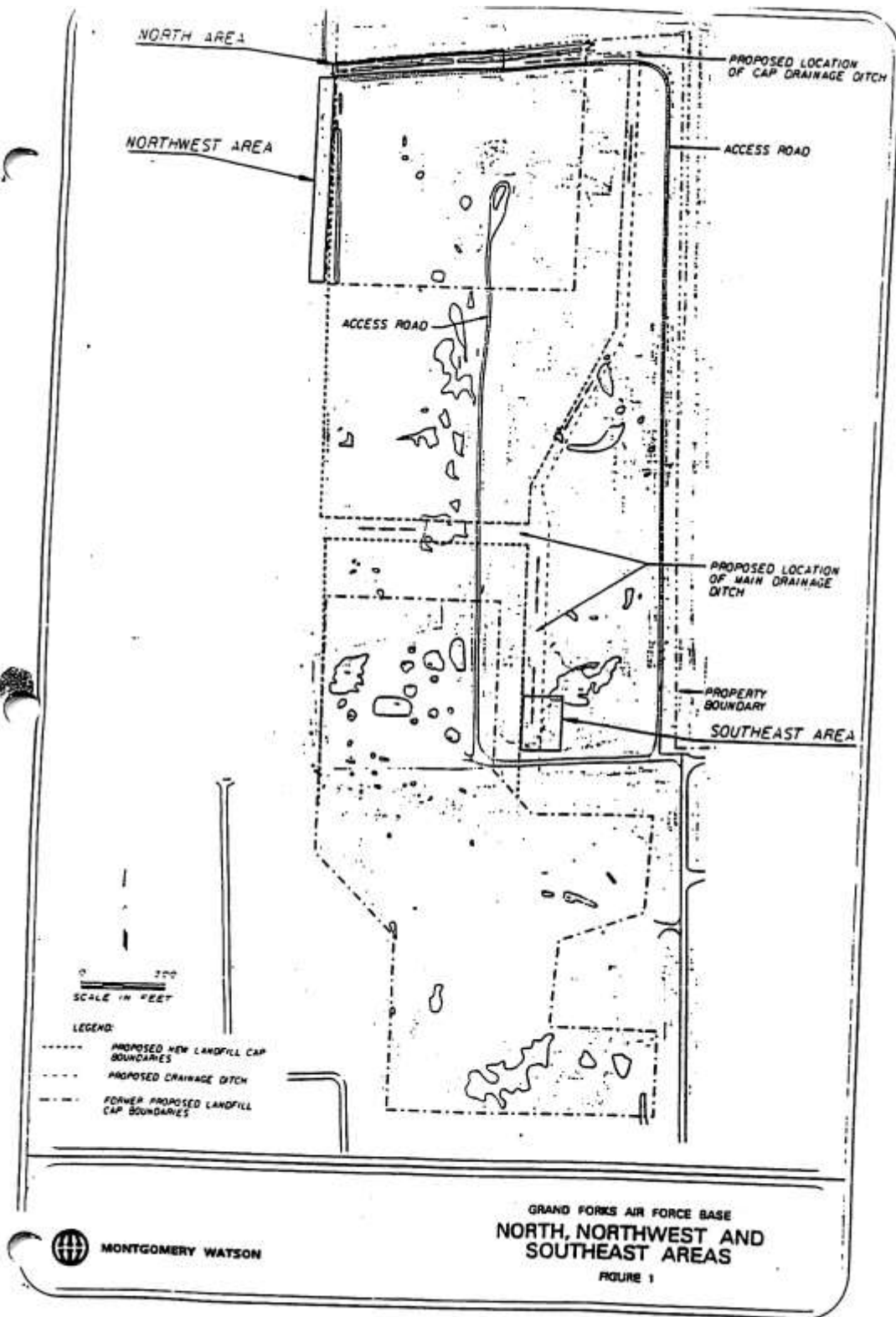
c. A Proposed Plan, RAB, and the IR have all provided an opportunity for public comment/involvement in this and other base IRP activities. The Proposed Plan was placed in the IR at the Grand Forks Public Library for a 30-day period during which the community was invited to review and comment on the Plan. An article advertising the Plan's availability at the Library was placed in the Grand Forks Herald, a local newspaper. A Public Hearing to discuss the Proposed Plan was held on 6 Sep 95 at Grand Forks AFB. No comments were received from the public.

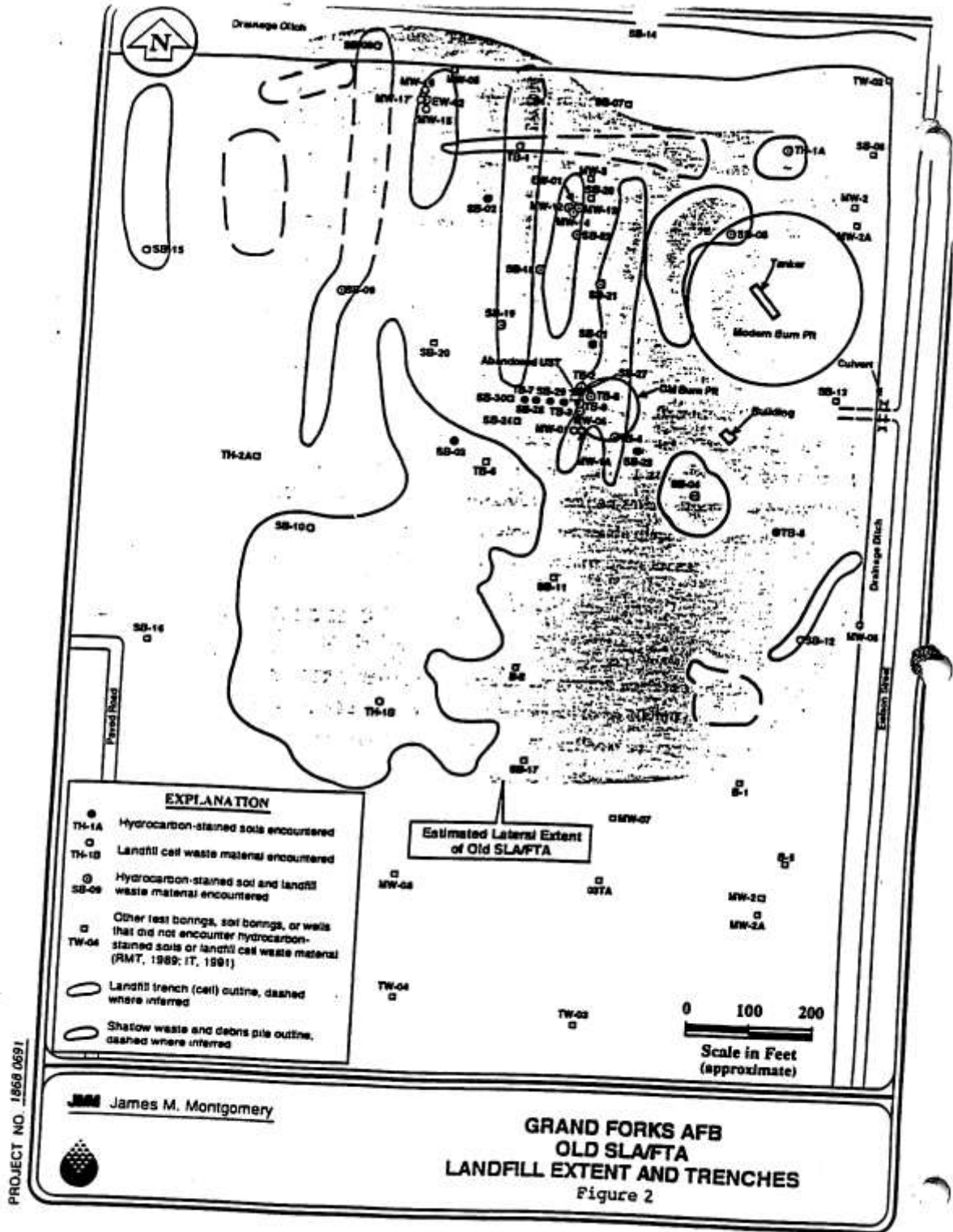
14.0 CONCLUSION

14.1 The selected alternative for the NSLA is alternative 2, landfill cap modification. This alternative includes construction of a landfill cap, long term cap maintenance, groundwater monitoring, and a five-year review prescribed by the NCP when contaminants remain on site above levels that allow unlimited use (40 CFR 300.430 (f)(4)(ii)). Analysis of the proposed action indicates the landfill cap alone will sufficiently protect human health and the environment by reducing and potentially eliminating recharge by precipitation into the landfill cells. Additionally, a landfill cap will reduce percolation of surface water into the soils thereby decreasing the mobility of groundwater at the site and will effectively isolate the waste, eliminating the seep. Primary ARARs for the NSLA as they pertain to Alternative 2 include MCLs, landfill closure requirements, and storm water drainage requirements, all of which will be met. The alternative also includes sufficient provisions for long term effectiveness and reduction in TMV.

14.2 Alternative 2 is a viable and pragmatic approach to remediating the site and is based on materials that are readily available and technologies that have been used successfully at other hazardous waste sites.


JAMES E. ANDREWS
Brigadier General, USAF
Commander, 319th Air Refueling Wing





- EXPLANATION**
- TH-1A Hydrocarbon-stained soils encountered
 - TH-1B Landfill cell waste material encountered
 - ⊙ SB-09 Hydrocarbon-stained soil and landfill waste material encountered
 - Other test borings, soil borings, or wells that did not encounter hydrocarbon-stained soils or landfill cell waste material (RMT, 1989; IT, 1991)
 - Landfill trench (cell) outline, dashed where inferred
 - Shallow waste and debris pile outline, dashed where inferred

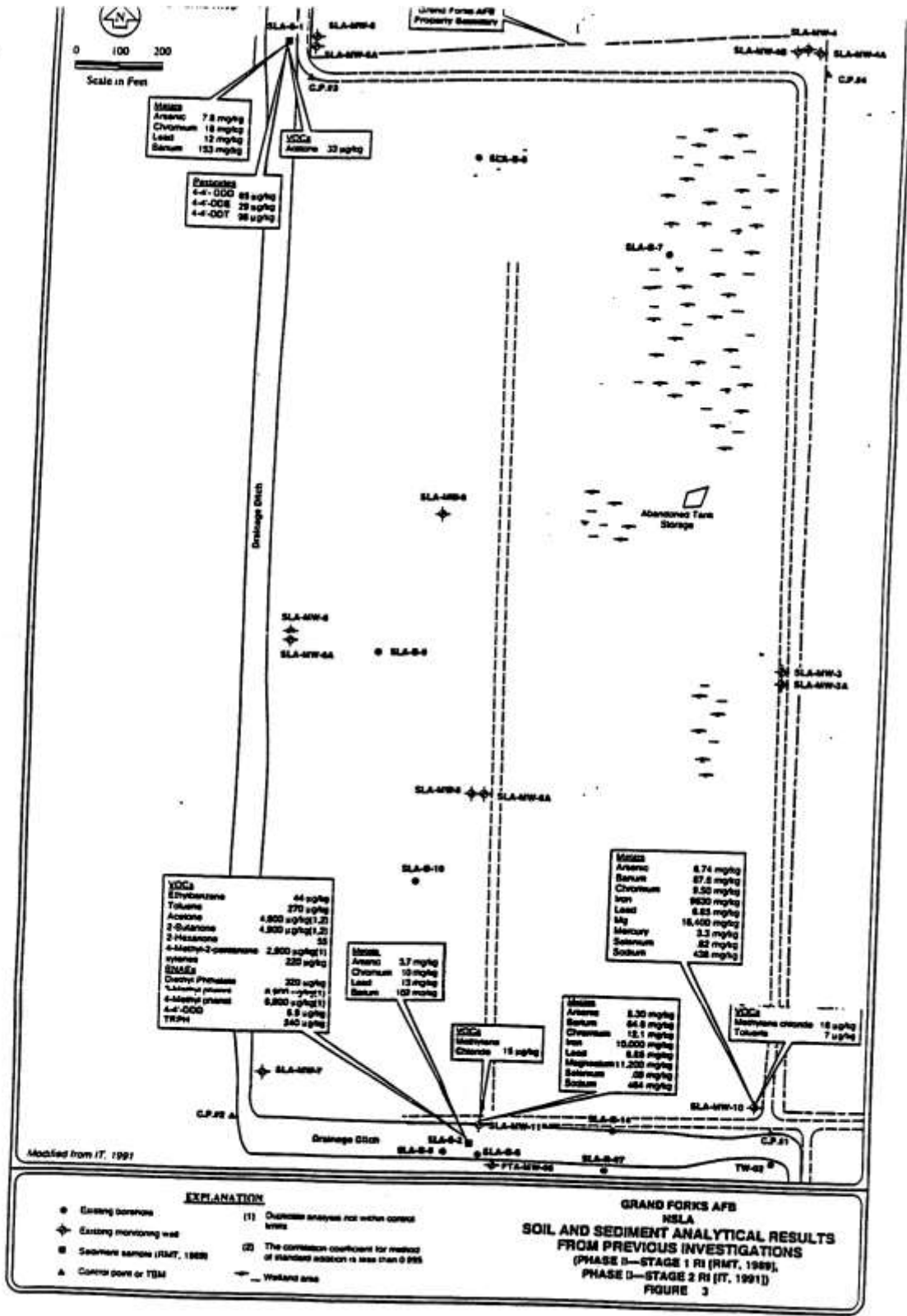
Estimated Lateral Extent of Old SLA/FTA

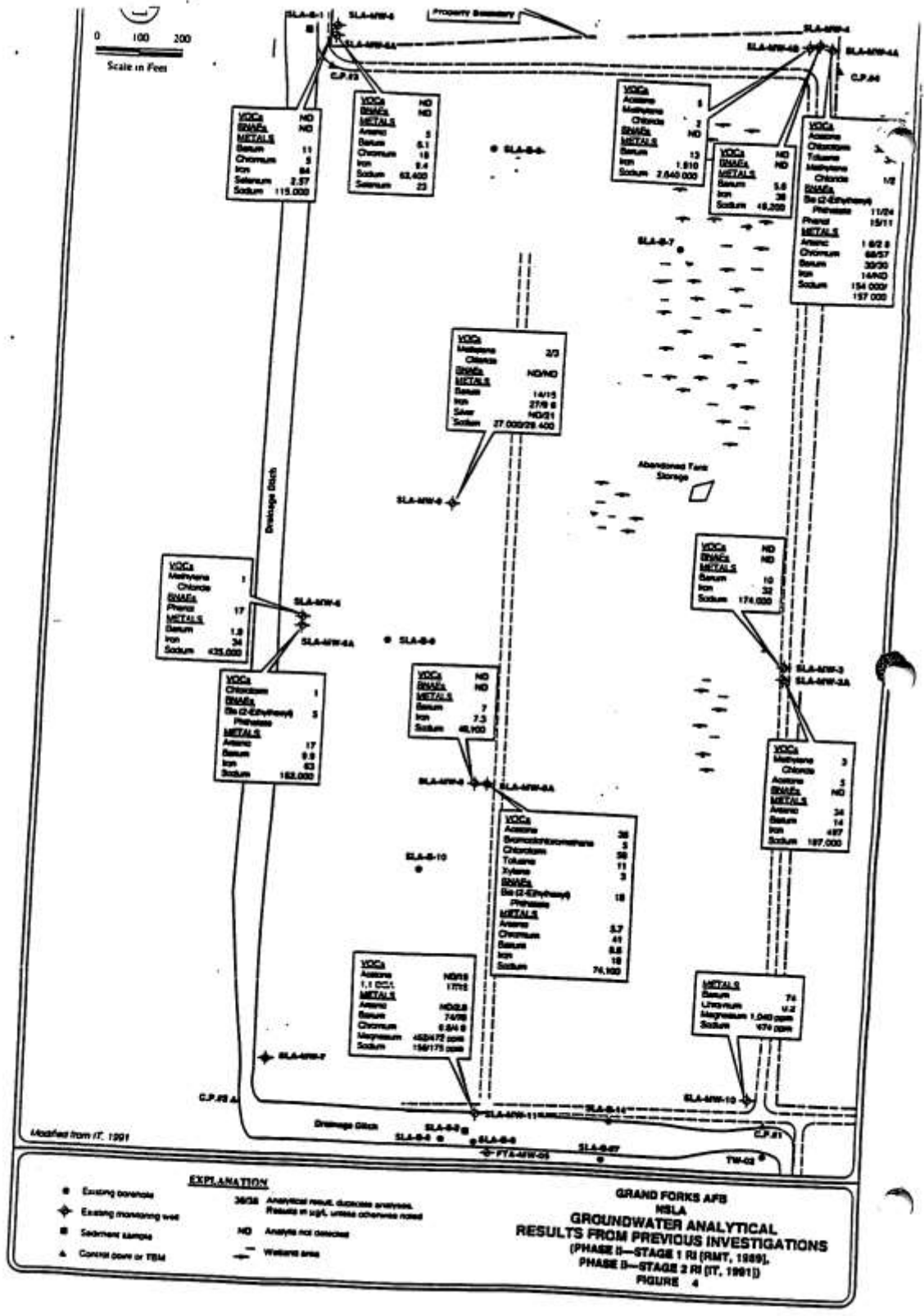
0 100 200
Scale in Feet (approximate)

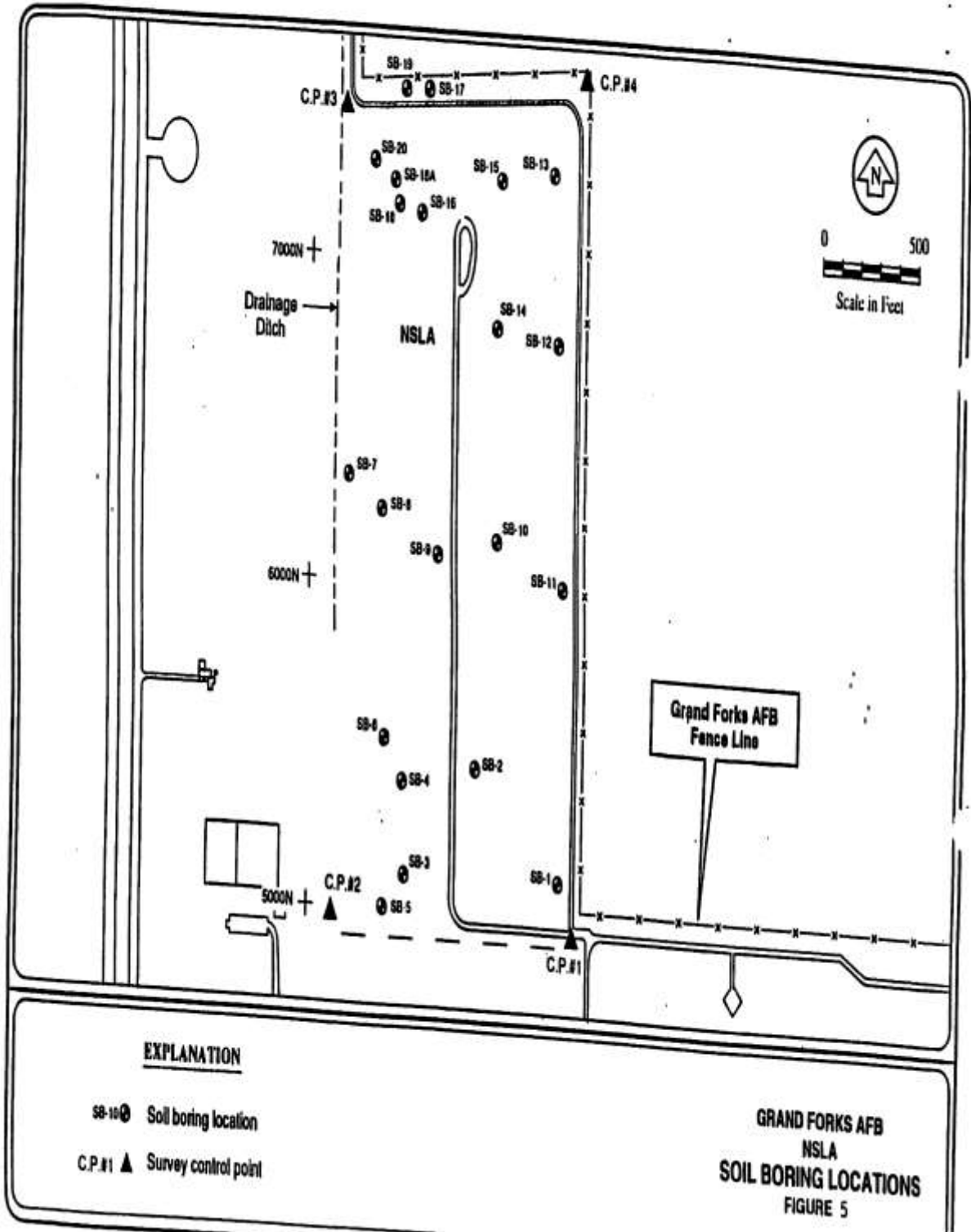
PROJECT NO. 1968 0691

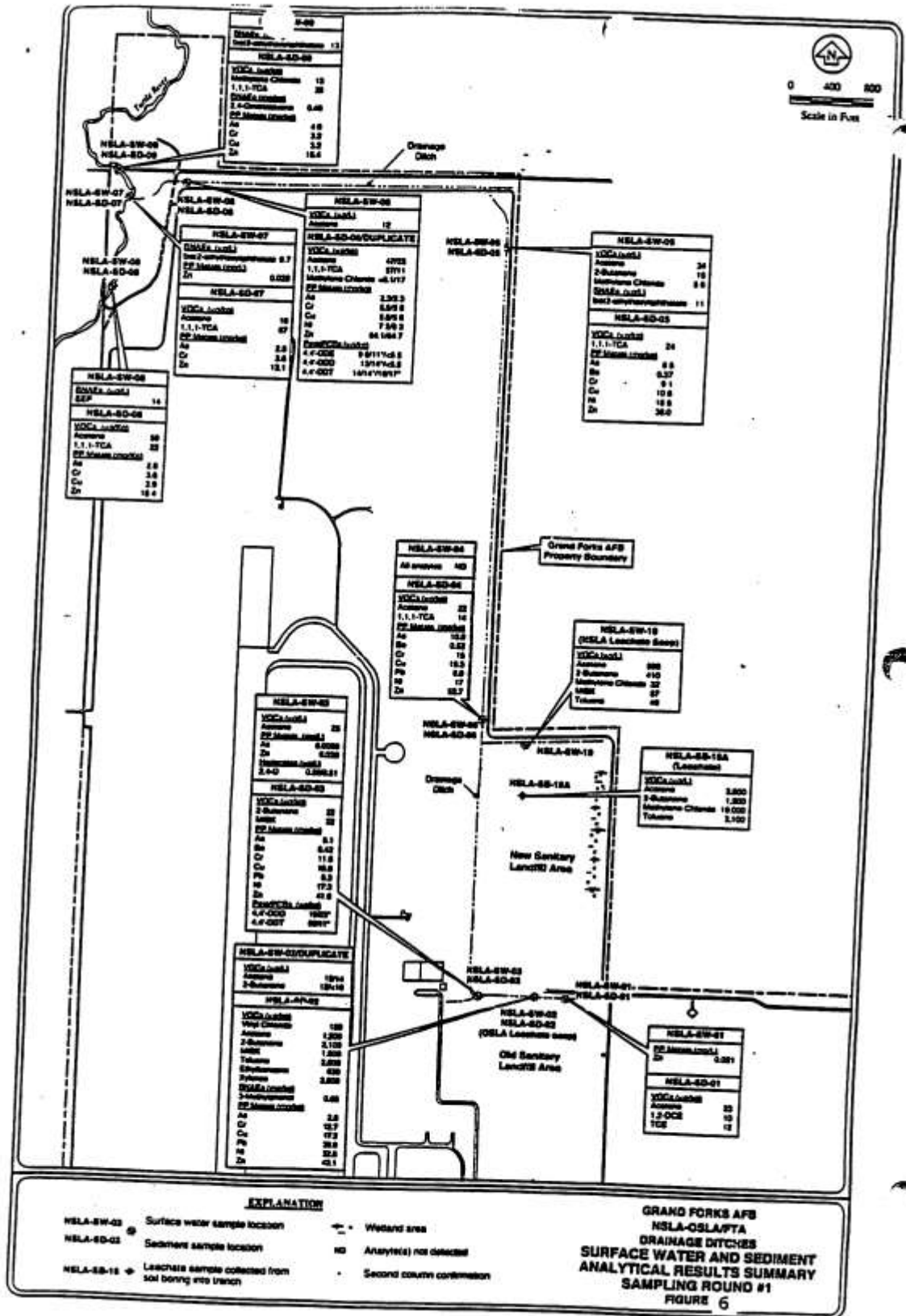
JMM James M. Montgomery

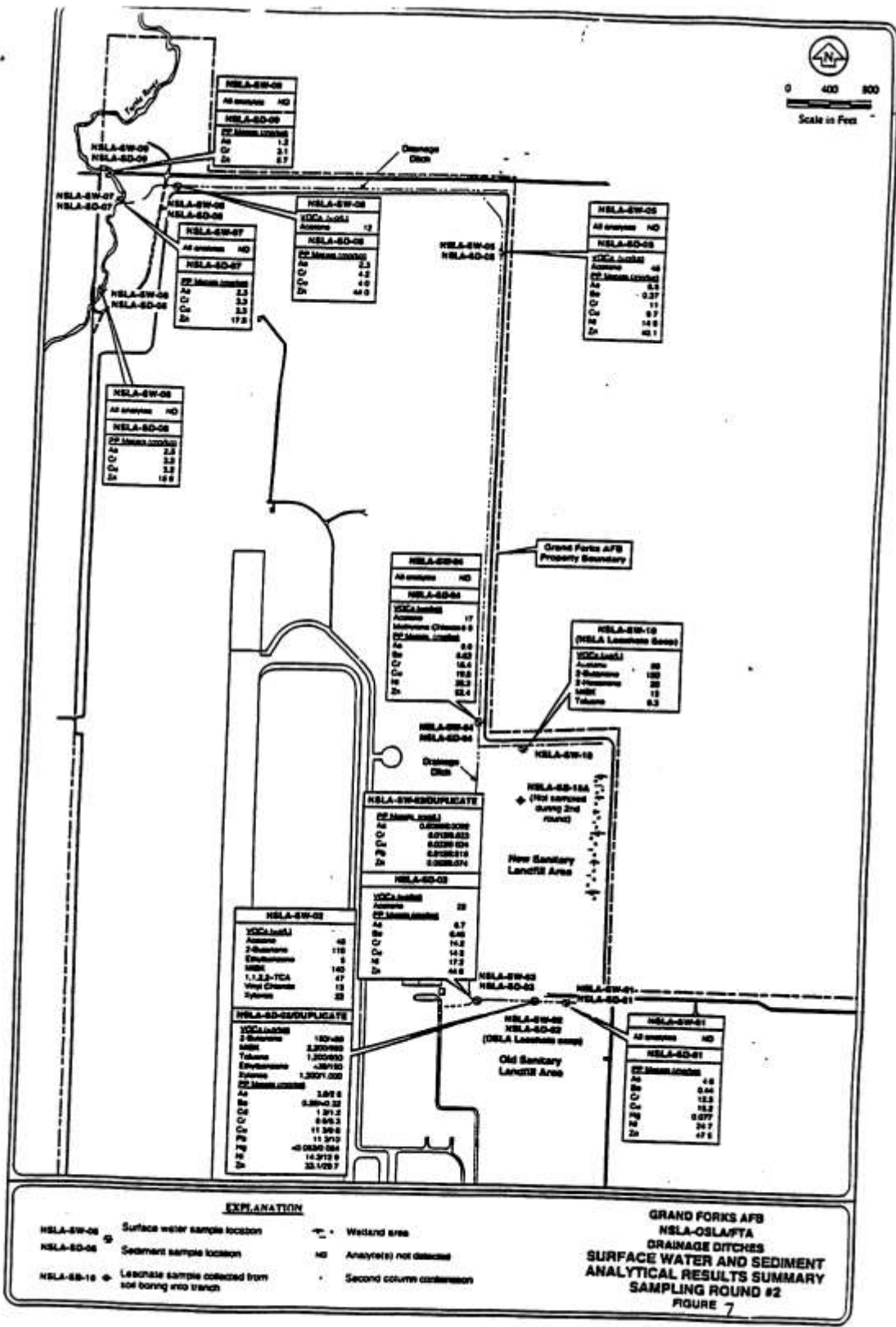
**GRAND FORKS AFB
OLD SLA/FTA
LANDFILL EXTENT AND TRENCHES**
Figure 2











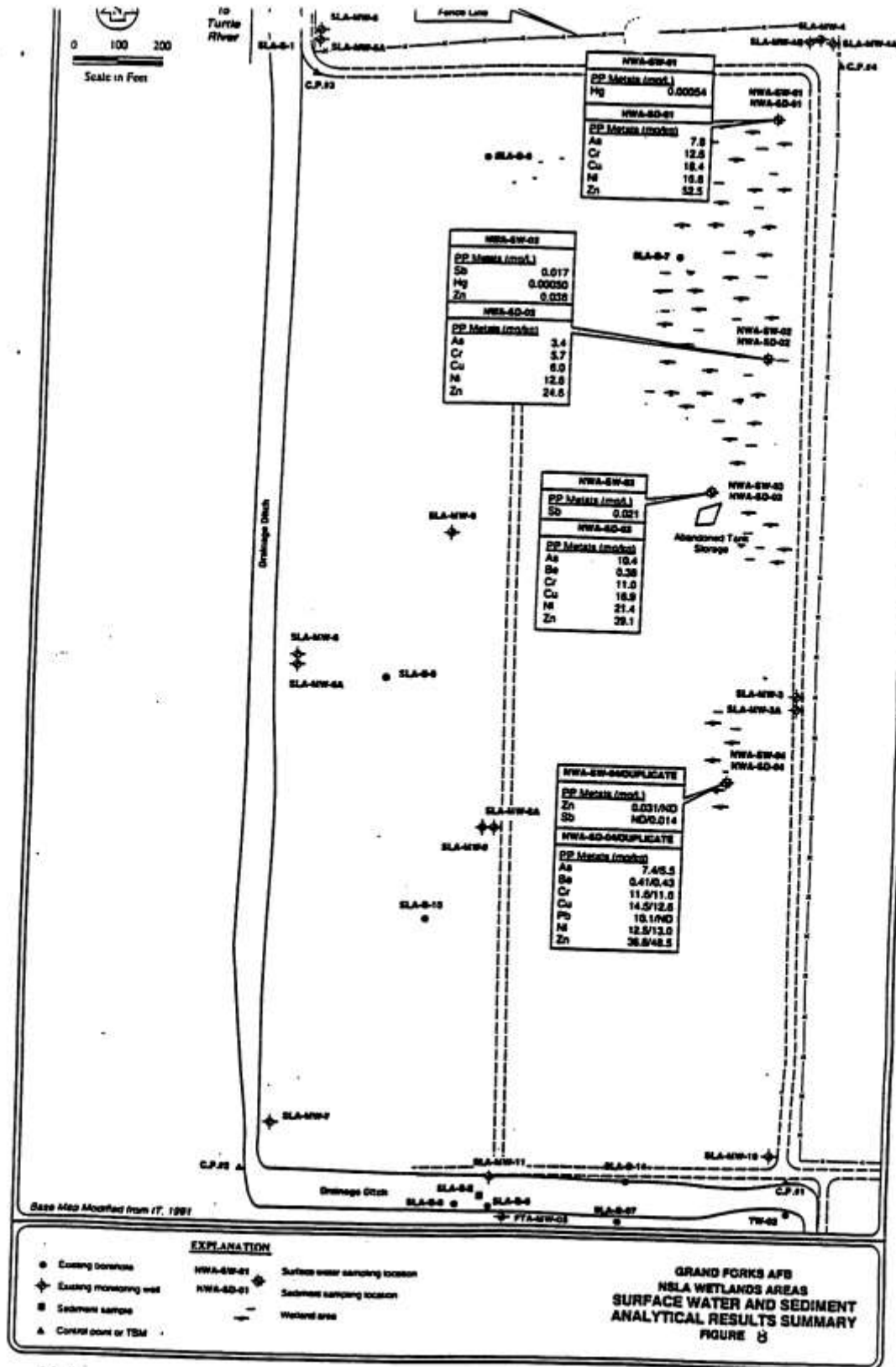


TABLE A-1

FEDERAL AND STATE CHEMICAL-SPECIFIC ARARs

Media-Of-Concern	Federal/ State	Chemical-Specific ARAR	Description	Applicable/ Relevant and Appropriate	Summary of ARAR Assessment
Groundwater	Federal	Safe Drinking Water Act, National Primary Drinking Standards, 40 CFR, Part 241	Establishes health-based standards for public water systems. Standards referred to as the Maximum Contaminant Levels (MCL).	Relevant and Appropriate	MCLs are relevant and appropriate in the groundwater of the Emerado Aquifer and glacial till water table aquifer. Although the aquifers are not currently used near the Old SLAFTA as domestic water supplies, their potential use can not be ruled out (IT, 1990). MCLs are not relevant and appropriate in the Old SLAFTA landfill cell water.
Groundwater	State	North Dakota Public Water Supply Systems Regulations: Maximum Contaminant Levels, North Dakota Rule: Article 33-17; Chapter 33-17-01; Section 33-17-01-06	Designates the federal MCLs as North Dakota drinking water standards.	Relevant and Appropriate	MCLs are relevant and appropriate in the groundwater of the Emerado Aquifer and glacial till water table aquifer. Although the aquifers are not currently used near the Old SLAFTA as domestic water supplies, their potential use can not be ruled out (IT, 1990). MCLs are not relevant and appropriate in the Old SLAFTA landfill cell water.
Groundwater/ Surface Water	State	North Dakota Water Quality Standards: Antidegradation Policy North Dakota Rule 33-16-02, Section 33-16-02-01	North Dakota Groundwater and Surface Water Antidegradation Policy	Applicable	Policy established for protection of North Dakota groundwater and surface water. Policy establishes substantive requirements under North Dakota Rule 33-16-02, Section 33-16-02-10.
Groundwater	State	North Dakota Water Quality Standards: Specific Standards of Quality for Designated Classes of Groundwaters of the State, North Dakota Rule: 33-16-02, Section 33-16-02-10	Establishes North Dakota groundwater classifications. Requires that discharges to groundwater not cause dissolved or suspended substances to exceed the maximum allowable chemical levels for drinking water, set forth in North Dakota Century Code Chapter 61-28.1 for a Class I groundwater.	Applicable	The glacial till water table aquifer and Emerado Aquifer are Class I groundwaters. Class I groundwaters have total dissolved concentrations of less than 10,000 mg/L.

1-V

TABLE A-1
 FEDERAL AND STATE CHEMICAL-SPECIFIC ARARs
 (CONTINUED)

Media-Of-Concern	Federal/ State	Chemical-Specific ARAR	Description	Applicable/ Relevant and Appropriate	Summary of ARAR Assessment
Groundwater	State	North Dakota Groundwater Resource Protection Act, Senate Bill No. 2231	Law that requires the North Dakota Department of Health and Consolidated Laboratories to establish groundwater protection standards.	Currently groundwater protection standards in North Dakota, other than those established under North Dakota Rule 33-16-02, Section 33-16-02-10, are established on a case-by-case basis. Senate Bill No. 2231 creates no substantive requirements.
Groundwater	Federal	Safe Drinking Water Act, National Secondary Drinking Water Standards, 40 CFR, Part 143	Establishes welfare-based standards for public water system. Standards referred to as Secondary Maximum Contaminant Levels (SMCLs).	No/No	North Dakota has adopted the Federal SMCLs as nonenforceable drinking water standards. As reported by the North Dakota Division of Water Quality, the SMCLs are infrequently, if ever, enforced in the State. The SMCLs are therefore not considered applicable or relevant and appropriate recognizing that the water qualities of the glacial till water table aquifer and Emerado Aquifer are naturally hard with elevated chloride, sulfate, and/or iron concentrations.
Groundwater	Federal	Safe Drinking Water Act, Maximum Contaminant Level Goals, 40 CFR 141.50	Establishes drinking water quality goals set at levels of no known or anticipated adverse health effects, with an adequate margin of safety. Goals referred to as Maximum Contaminant Level Goals (MCLGs).	To be considered	In North Dakota groundwater protection standards are established on a case-by-case basis and the federal MCLGs have not been adopted as drinking water standards. Since the glacial till water table aquifer and Emerado Aquifer are not currently being used near the Old SLAFTA as domestic water supplies and the groundwaters are of poor water quality, only those MCLGs not equal to zero and established for site contaminants without existing MCLs are considered potentially ARAR. These MCLGs are to be considered. The MCLGs are not relevant and appropriate and are not to be considered for the Old SLAFTA landfill cell water.

A-2

FEDERAL AND STATE CHEMICAL-SPECIFIC ARARs
(CONTINUED)

Media-Of-Concern	Federal/ State	Chemical-Specific ARAR	Description	Applicable/ Relevant and Appropriate	Summary of ARAR Assessment
Groundwater	Federal	Clean Water Act, Quality Criteria for Water, 40 CFR, Part 131	Establishes criteria for ambient water quality based on toxicity to aquatic organisms and human health.	No/No	Water quality criteria adjusted to reflect exposure to drinking water are potentially relevant and appropriate if other drinking water standards are not available. This case does not apply to the Old SLA/FTA.
Groundwater	Federal	RCRA, Releases from Solid Waste Management Units, 40 CFR, Part 264, Subpart F	Establishes minimum national standards for the acceptable monitoring and response to releases from hazardous waste management units.	Relevant and Appropriate	Because the potential exists for the release of hazardous constituents to the glacial till water table aquifer and the Emerald Aquifer, the RCRA Maximum Concentration Levels are relevant and appropriate. (The standards are not applicable since wastes were disposed in the SLA/FTA prior to 1980).
A-3 Surface Water	Federal	Clean Water Act, National Pollutant Discharge Elimination System, 40 CFR, Parts 122 and 125	Requires permits, with set discharge limits, for the discharge of pollutants from any point source into U.S. waters.	Applicable	Potential action-specific ARAR. If extracted landfill cell water is discharged to the GFAPB wastewater stabilization lagoons, the facility's NPDES permit will have to be modified and the permit discharge limits still achieved.
Surface Water	State	North Dakota Pollutant Discharge Elimination System, North Dakota Rule 33-16-01	Establishes the regulations dictating the surface water effluent standards set in the GFAPB wastewater stabilization lagoon NPDES permit.	Applicable	Potential action-specific ARAR. If extracted landfill cell water is discharged to the GFAPB wastewater stabilization lagoons, the facility's NPDES permit will have to be modified and the permit discharge limits still achieved.
Surface Water	Federal	Clean Water Act, National Pretreatment Standards, 40 CFR, Part 403	Sets standards to control pollutants which pass through or interfere with treatment processes in publicly owned treatment works or which may contaminate sewage sludge.	Relevant and Appropriate	Potential action-specific ARAR. If extracted landfill cell water is discharged to the GFAPB wastewater stabilization lagoons, the pretreatment standards are considered relevant and appropriate.

**TABLE A-1
FEDERAL AND STATE CHEMICAL-SPECIFIC ARARs
(CONTINUED)**

Media-Of-Concern	Federal/State	Chemical-Specific ARAR	Description	Applicable/Relevant and Appropriate	Summary of ARAR Assessment
Surface Water	Federal	Quality Criteria for Water, 40 CFR, Part 131	Establishes criteria for ambient water quality based on toxicity to aquatic organisms and human health.	Applicable	Groundwater and surface water from the Old SLA/FTA which are ultimately discharged to Turtle Creek shall not cause ambient water quality standards to be exceeded. To date, site characterization data indicate impact to Turtle Creek is negligible.
Surface Water	State	North Dakota Water Quality Standards: Surface Water Quality Standards for Designated Classes of Surface Water, North Dakota Rule 33-16-02; Section 33-38-02-01.	Establishes ambient surface water quality standards for Turtle River	Applicable	Groundwater and surface water from the Old SLA/FTA which are ultimately discharged to Turtle Creek shall not cause ambient water quality standards to be exceeded. To date, site characterization data indicate impact to Turtle Creek is negligible.
Air	Federal	Clean Air Act, National Primary and Secondary Ambient Air Quality Standards (NAAQS), 40 CFR, Part 50	Establishes standards for ambient air quality to protect public health and welfare.	Relevant and Appropriate	Potential action-specific ARAR for air stripping and venting of landfill cap. Since these potential remedial actions do not qualify as major air pollutant sources, the standards are not considered applicable.
Air	Federal	Clean Air Act, National Emission Standards for Hazardous Pollutants (NESHAPs), 40 CFR, Part 61	Establishes national emission standards for hazardous air pollutants.	Relevant and Appropriate	Potential action-specific ARAR for remedial action. The NESHAPs are not applicable since potential remedial actions do not fall under a regulated source category. However, portions of the standards may be relevant and appropriate. For example, emission levels of vinyl chloride from an air stripper may be relevant and appropriate.
Air	Federal	Clean Air Act, New Source Performance Standards (NSPs), 40 CFR, Part 60	Establishes new source performance standards for air emission sources	Relevant and Appropriate	Potential action-specific ARAR. The NSPs are not applicable since potential remedial actions do not fall under the source-specific requirements. However, the standards may be relevant and appropriate to air stripping.

TABLE A-1

FEDERAL AND STATE CHEMICAL-SPECIFIC ARARs
(CONTINUED)

Media-Of-Concern	Federal/ State	Chemical-Specific ARAR	Description	Applicable/ Relevant and Appropriate	Summary of ARAR Assessment
Air	State	North Dakota Air Pollution Control Regulations, Article 33-15; Chapter 33-15-14	Establishes Federal NAAQs, NESHAPs, and NSPs as North Dakota air pollution control regulations. (Air permit requirements are established under these State regulations).	Relevant and Appropriate	Potential action-specific ARAR. See discussions for NAAQs, NESHAPs, and NSPs. (North Dakota permit application requirements are applicable).
Air	State	Air Toxic Policy	Establishes North Dakota Policy for the Control of Hazardous Air Pollutants.	----	North Dakota has an established policy to control toxic air pollutant emissions. Chemical-specific ARARs are not specified under policy.

A-5

**TABLE A-3
FEDERAL AND STATE ACTION-SPECIFIC ARARs**

Action(s) Triggering ARAR	Federal/State	Action-Specific ARAR	Description	Applicable/Relevant and Appropriate	Summary of ARAR Assessment
Landfill Cap Modification	Federal	RCRA, 40 CFR, Part 257: Criteria for Classification of Solid Waste Disposal Facilities and Practices	Establishes criteria for use in assessing whether or not a waste disposal facility poses a reasonable probability of adverse effects on health or the environment.	Relevant and Appropriate	The Old SLA/FTA should be maintained so that the facility does not pose future adverse effects on health or the environment.
Landfill Cap Modification	Federal	RCRA, 40 CFR, Part 241: Guidelines for the Land Disposal of Solid Wastes	Establishes requirements and procedures for land disposal of solid wastes.	Applicable	The landfill cap over the Old SLA/FTA shall meet the federal requirements applicable to solid waste landfill cap construction.
Landfill Cap Modification	State	North Dakota Article 33-20 and Chapter 33-03-05: North Dakota Solid Waste Management Regulations	Establishes requirements and procedures for land disposal of solid wastes.	Applicable	The landfill cap over the Old SLA/FTA shall meet the State requirements applicable to solid waste landfill cap construction.
Landfill Cap Modification	State	North Dakota Guidelines for Closure of Municipal and Inert Solid Waste Landfill Disposal Site	State solid waste landfill closure guidelines.	To be considered	Those landfill closure design criteria relevant and appropriate to the Old SLA/FTA are to be considered. Selection of design criteria will be based on cost and the degree to which individual design criteria will achieve the remedial objectives.
Landfill Cap Modification	Federal State*	40 CFR, Part 264, Subpart G: Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities; Closure and Post-Closure	Establishes minimum standards for the closure and post-closure care of a hazardous waste management unit.	Relevant and Appropriate, In Part	Since wastes were disposed in the Old SLA/FTA prior to 1980, the RCRA hazardous waste landfill closure requirements are not applicable. However, because hazardous wastes may have been disposed in the Old SLA/FTA, the RCRA hazardous waste closure requirements that address the stated remedial objectives -- mitigate the landfill seep and isolate the wastes -- are relevant and appropriate.

* North Dakota has adopted federal hazardous waste management rules as the North Dakota Hazardous Waste Management Rules, North Dakota Administrative Code Article 33-24.

TABLE A-3

FEDERAL AND STATE ACTION-SPECIFIC ARARs
(CONTINUED)

Action(s) Triggering ARAR	Federal/ State	Action-Specific ARAR	Description	Applicable/ Relevant and Appropriate	Summary of ARAR Assessment
Landfill Cap Modification	Federal/ State*	RCRA, 40 CFR, Part 264, Subpart N, Section 264.310: Standards for Owners and Operators of Hazardous Waste Treatment Storage and Disposal Facilities; Landfills	Establishes minimum standards for the acceptable closure of RCRA hazardous waste landfills.	Relevant and Appropriate, in Part	Since wastes were disposed in the Old SLA/FTA prior to 1980, the RCRA hazardous waste landfill closure requirements are not applicable. However, because hazardous wastes may have been disposed in the Old SLA/FTA, the RCRA hazardous waste closure requirements that address the stated remedial objectives -- mitigate the landfill seep and isolate the wastes -- are relevant and appropriate.
Landfill Cap Modification	Federal	EPA Guidance Document, EPA/654-R/92/22, Requirements for Hazardous Waste Landfill Design, Construction, and Closure	Federal hazardous waste landfill closure guidelines.	To be considered	These landfill closure design criteria relevant and appropriate to the Old SLA/FTA are to be considered. Selection of design criteria will be based on cost and the degree to which individual design criterion will achieve the remedial objectives.
Groundwater Monitoring	Federal/ State*	RCRA, 40 CFR, Part 264, Subpart F: Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities; Releases from Solid Waste Management Units	Establishes minimum standards for the acceptable monitoring and response to releases from hazardous waste management units.	Relevant and Appropriate	Because the potential exists for the release of hazardous constituents to the glacial till water table aquifer and Emerald Aquifer, the RCRA Maximum Concentration Limits are relevant and appropriate and should be incorporated into the Old SLA/FTA groundwater monitoring program as groundwater protection standards.
Groundwater Monitoring	Federal	Solid Waste Disposal Act 40 CFR, Part 241, Section 241.204: Guidelines for the Land Disposal of Solid Wastes, Water Quality	Requires that the construction of a land disposal site shall conform to the most stringent of applicable water quality standards or shall be constructed in such a manner as to provide adequate protection to ground and surface waters used as drinking water supplies.	Relevant and Appropriate	The Old SLA/FTA shall be maintained to provide adequate protection to the glacial till water table aquifer and Emerald Aquifer. Although the aquifers currently are not used near the Old SLA/FTA as domestic water supplies, their potential use cannot be ruled out (IT, 1990).

A-7

* North Dakota has adopted federal hazardous waste management rules as the North Dakota Hazardous Waste Management Rules, North Dakota Administrative Code Article 33-24.

TABLE A-3
FEDERAL AND STATE ACTION-SPECIFIC ARARs
(CONTINUED)

Action(s) Triggering ARAR	Federal/ State	Action-Specific ARAR	Description	Applicable/ Relevant and Appropriate	Summary of ARAR Assessment
Installation of Groundwater Extraction System and Monitoring Wells; Operation of Groundwater Treatment System	Federal/ State*	RCRA, 40 CFR, Part 262: Standards Applicable to Generators of Hazardous Waste	Establishes standards for generators of hazardous waste.	Potentially Applicable	Potentially applicable for remedial actions that involve the offsite disposal of soils or wastes. A potential site activity that could trigger this ARAR is the production of contaminated drill cuttings. The standards would be applicable if the soils or wastes are classified as RCRA hazardous wastes.
Installation of Groundwater Extraction System and Monitoring Wells; Operation of Groundwater Treatment System	Federal/ State*	RCRA, 40 CFR, Part 263: Standards Applicable to Transporters of Hazardous Waste	Establishes standards for the transportation of a RCRA hazardous waste.	Potentially Applicable	Potentially applicable for remedial actions that involve the offsite transport of soils or wastes. The standards would be applicable if the soils or wastes are classified as RCRA hazardous wastes.
Installation of Groundwater Extraction System and Monitoring Wells; Operation of Groundwater Treatment System	Federal/ State*	RCRA, 40 CFR, Part 264: Standards for Owners and Operators of Hazardous Waste Treatment, Storage and Disposal Facilities	Establishes minimum standards which define the acceptable management of hazardous waste for owners and operators of facilities which treat, store, or dispose of hazardous waste.	Potentially Applicable	Some requirements are potentially applicable for remedial actions that require the storage and/or offsite disposal or incineration of soils or wastes. The requirements would be applicable if the soils or wastes are classified as RCRA hazardous wastes.
Installation of Groundwater Extraction System and Monitoring Wells	Federal/ State*	RCRA, 40 CFR, Part 268: Land Disposal Restrictions	Identifies hazardous wastes that are restricted from land disposal.	Potentially Applicable	If soils or wastes generated during remedial action are characterized as RCRA hazardous wastes, the land ban restrictions may apply for off-site disposal of the materials.

* North Dakota has adopted federal hazardous waste management rules as the North Dakota Hazardous Waste Management Rules, North Dakota Administrative Code Article 33-24.

TABLE A-2
FEDERAL AND STATE ACTION-SPECIFIC ARARs
(CONTINUED)

Action(s) Triggering ARAR	Federal/State	Action-Specific ARAR	Description	Applicable/Relevant and Appropriate	Summary of ARAR Assessment
Air Stripping, Venting of Landfill Cap	Federal	Clean Air Act, National Primary and Secondary Ambient Air Quality Standards (NAAQs), 40 CFR, Part 60	Establishes standards for ambient air quality to protect public health and welfare.	Relevant and Appropriate	Since the potential remedial actions do not qualify as major pollutant sources, the standards are not considered applicable.
Air Stripping, Venting of Landfill Cap	Federal	Clean Air Act, National Emission Standards for Hazardous Pollutants (NESHAPs), 40 CFR, Part 261	Establishes national emission standards for hazardous air pollutants.	Relevant and Appropriate	Potential action-specific ARAR for remedial action. The NESHAPs are not applicable since potential remedial actions do not fall under a regulated source category. However, portions of the standards may be relevant and appropriate. For example, emission levels of vinyl chloride from an air stripper.
6-V Air Stripping, Venting of Landfill Cap	Federal	Clean Air Act, New Source Performance Standards (NSPs), 40 CFR, Part 60	Establishes new source performance standards for air emission sources.	Relevant and Appropriate	The NSPs are not applicable since the potential remedial actions do not fall under the source-specific requirements. However, the standards may be relevant and appropriate to air stripping.
Air Stripping, Venting of Landfill Cap	State	North Dakota Air Pollution Control Regulations, Article 33-15; Chapter 33-15-14	Establishes Federal NAAQs, NESHAPs, and NSPs as North Dakota air pollution control regulations. (Air permit requirements are established under these State regulations).	Relevant and Appropriate	See discussions for NAAQs, NESHAPs, and NSPs (North Dakota permit requirements are applicable).
Discharge of Landfill Cell Water to GFAPB Wastewater Stabilization Lagoons	Federal	Clean Water Act, National Pollutant Discharge Elimination System, 40 CFR, Parts 122 and 125	Requires permits, with set discharge limits, for the discharge of pollutants from any point source into U.S. waters.	Applicable	If extracted landfill cell water is discharged to the GFAPB wastewater stabilization lagoons, the facility's NPDES permit would have to be modified, and the permit discharge limits still achieved.

* North Dakota has adopted federal hazardous waste management rules as the North Dakota Hazardous Waste Management Rules, North Dakota Administrative Code Article 33-24.

TABLE A-8
FEDERAL AND STATE ACTION-SPECIFIC ARARs
(CONTINUED)

Action(s) Triggering ARAR	Federal/ State	Action-Specific ARAR	Description	Applicable/ Relevant and Appropriate	Summary of ARAR Assessment
Discharge of Landfill Cell Water to GFAPB Wastewater Stabilization Lagoons	State	North Dakota Pollutant Discharge Elimination System, North Dakota Rule 33-16-01	Establishes the regulations dictating the surface water effluent standards set in the GFAPB wastewater stabilization lagoon NPDES permit.	Applicable	If extracted landfill cell water is discharged to the GFAPB wastewater stabilization lagoons, the facility's NPDES permit would have to be modified, and the permit discharge limits still achieved.
Discharge of Landfill Cell Water to GFAPB Wastewater Stabilization Lagoons	Federal	Clean Water Act National Pretreatment Standards, 40 CFR, Part 403	Sets standards to control pollutants which pass through or interfere with treatment processes in publicly owned treatment works or which may contaminate sewage sludge.	Relevant and Appropriate	If extracted landfill cell water is discharged to the GFAPB wastewater stabilization lagoons, the pretreatment standards are considered relevant and appropriate.
Remedial Actions, General	Federal	OSHA 29 CFR 1910	Regulates worker health and safety.	Applicable	Health and safety requirements are applicable to all remedial actions.

A-10

* North Dakota has adopted federal hazardous waste management rules as the North Dakota Hazardous Waste Management Rules, North Dakota Administrative Code Article 33-24.

SWMU-5

Stormwater Sewer System

Closure Documentation

DRAFT

Closure Documentation

January 1997 meeting between NDDH and GFAFB agreed to SWMU-5 closure.

SWMU-6

Wastewater Treatment Lagoons

Closure Documentation

DRAFT

Closure Documentation

January 1997 meeting between NDDH and GFAFB agreed to SWMU-6 closure.

DRAFT

SWMU-7

Oil/ Water Separators (7a-q)

Closure Documentation

DRAFT

Decision Document
Oil/Water Separators
Solid Waste Management Unit 7



1.0 Site and Location

Grand Forks Air Force Base, North Dakota

2.0 Statement Of Basis

The decision described herein concerns the selected remedy (SR) at 17 Oil/Water Separators (OWS), identified as Solid Waste Management Units (SWMU) 7 a-q and located at various locations throughout the installation. It is based on an evaluation of the results received from corrective action performed under the United States Air Force Installation Restoration Program (IRP). Documented studies include Facility Assessments 1990, 1992; Facility Investigation 1997; Corrective Measures Studies 1994 -1998 and Corrective Measure Implementation 1994-1999.

3.0 Remedy Selection

A remedy was selected depending on the presence of contamination, its concentration, practicality of remediation and risk posed. The OWS were investigated and classified one of five ways: 1. No contamination present. 2. Contamination present but below regulated levels. 3. Contamination present above regulated levels but below risk based levels. 4. Contamination present above regulated levels and above risk based levels but technically impractical to remove. 5. Contamination present above regulated and risk-based levels and accessible.

4.0 Declaration Of Consistency With CERCLA And NCP

This document presents the selected remedy for these sites developed in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended by the Superfund Amendments and Reauthorization Act (SARA) of 1986, National Contingency Plan (NCP), and the Resource Conservation and Recovery Act (RCRA) of 1976, as amended.

5.0 Facility

5.1 Grand Forks, ND, is located on the North Dakota-Minnesota border at the junction of the Red Lake River and the Red River of the North, 75 miles north of Fargo, ND, and 145 miles south of Winnipeg, Manitoba, Canada. Grand Forks AFB is located on US Highway 2, approximately 15 miles west of Grand Forks and 10 miles west of the Mark Andrews International Airport.

5.2 Grand Forks AFB is situated in a sub humid climate characterized by a wide temperature range, variable precipitation, and rigorous winters. Records from 1900 to 1940 indicate the coldest recorded temperature was -43 degrees Fahrenheit (°F) and the warmest was 109°F.

5.3 The average annual daily maximum temperature is about 50°F with highest temperatures occurring during July and August. The average annual daily minimum temperature is about 28°F with the lowest temperatures occurring during January. The annual average daily temperature is 39°F.

5.4 The average monthly rainfall precipitation ranges from greater than 3.0 inches during June to less than 0.5 inches during February. The average annual rainfall precipitation is about 18.5 inches, three-fourths of which occurs from May to September. Snowfall averages slightly less than three feet each year. The prevailing wind direction is from the northwest.

6.0 Physiography and Land Use

6.1 Grand Forks AFB lies within the Agassiz Lake Plain District of the Western Ground Drift section of the Central Lowland Physiographic Province. The Western Ground Drift section is a lowland prairie upon a gently rolling glacial ground moraine. Ridges of end moraine and flat outwash plains occasionally interrupt it. Strandline deposits associated with Glacial Lake Agassiz form low, narrow linear ridges with a northwesterly trend. The average elevation above sea level is about 890 feet with a maximum local relief of about 25 feet.

6.2 Grand Forks AFB is also located in the Red River Valley topographic area, which corresponds to the Agassiz Lake Plain physiographic division. Geologic processes include the movement of groundwater through underlying rock strata, differential erosion, modification by glaciers, and recent wind and stream forming events. Prior to glaciation, the river became incised until it reached Precambrian rock, and then shifted its course westward as it eroded away Cretaceous shale and sand, thereby forming the Pembina Escarpment. When glaciers deposited a layer of till over the area, the river erosion temporarily ceased. Lake Agassiz sediment now covers the Red River Valley. The modern Red River of the North flows on this lake plain. The Pembina Escarpment was altered by glacial processes but exists today as the western extent of Glacial Lake Agassiz sediments, about 10 miles west of Grand Forks AFB. The present location of the Red River of the North is 20 miles east of Grand Forks AFB, representing the North Dakota-Minnesota state line.

6.3 Land use in Grand Forks County consists primarily of cultivated crops with remaining land used for pasture and hay, urban development, recreation and wildlife habitat. Principal crops are spring wheat, barley, sunflowers, potatoes and sugar beets. Turtle River State Park, located about five miles west of the Base, is the only major recreational area in Grand Forks County. Several watershed protection dams are

being developed for recreational activities. Wildlife habitat is very limited in the County. Kelly Slough National Wildlife Refuge and the adjacent National Waterfowl Production Area are managed for wetland wildlife and migratory waterfowl, but they also include a significant acreage of open land wildlife habitat in the county.

7.0 Geology

7.1 Geologic data was collected from previous investigations at Grand Forks AFB. During investigations, soil borings were logged to distinguish between in situ soils (till and lacustrine sediments), disturbed soil (reworked till/lacustrine), and Emerado sand (Emerado Aquifer).

7.2 Beneath the glacial drift of Grand Forks County, up to 2050 feet of westward-dipping sedimentary rocks of Paleozoic and Mesozoic age overlie igneous and metamorphic rocks of Precambrian age. Paleozoic and Mesozoic sedimentary rocks thin to the east and are absent in the southeast part of the country. All of the Paleozoic and Mesozoic rocks, except for the basal Cretaceous rocks, are of marine origin. The basal Cretaceous rocks are most likely a mixture of terrestrial and marine beds. Most of the bedrock topography was formed during the late Tertiary and early Quaternary time. (Hansen and Kume, 1970)

7.3 The surface fill material across Grand Forks AFB consists of brown coarse sand, gravel, and silty clay. The thickness of the fill ranges from 2 to 6 feet. The fill is underlain by 15 to 40 feet of brown and gray mottled silty lacustrine clay containing decayed vegetation. A gray clay stratigraphic unit with gravel and occasional cobbles occurs beneath the brown and gray silty clay. This unit varies in thickness and is a glacial till. Beneath this unit, a second lacustrine unit occurs as a gray silty clay layer that is approximately 16 to 32 feet thick. This lacustrine unit is underlain by a gray sand unit followed by undifferentiated Pleistocene glacial drift sediments consisting of gray silty to sandy clay with gravel. The total thickness of glacial sediments overlying bedrock is approximately 200 to 250 feet at Grand Forks AFB (IT Corporation, 1991).

8.0 Hydrogeology

8.1 The Precambrian rocks beneath Grand Forks County contain small amounts of water in joints or fractures and are not thought to be capable of producing sustainable quantities of water. The Paleozoic and Mesozoic sedimentary rocks contain at least three aquifers. The Paleozoic rocks containing aquifers are of Ordovician age, and have been subdivided by the North Dakota Geological Survey into two units, the Winnipeg Group and the overlying Red River Formation. The Mesozoic rocks are of Cretaceous age and include the Dakota Group and the Pierre Formation (IT Corporation, 1991).

8.2 Five major aquifers are contained in the glacial drift sediments overlying bedrock. They are the Elk Valley, Inkster, Emerado, Grand Forks, and Thompson aquifers. The

Emerado, Grand Forks, and Thompson aquifers are generally small, poorly defined water-bearing zones in the glacial drift. The water in these aquifers is too highly mineralized for most uses, and ground water wells in the aquifers recharge slowly. In addition to these aquifers, minor glacial drift aquifers either contain small storage volumes of water or have low permeability. The Emerado aquifer has an aerial extent of approximately 15 miles and underlies most of Grand Forks AFB. The city of Emerado directly overlies the central portion of the Emerado aquifer. A well drilled in Emerado penetrated 30 feet of water-bearing "quicksand" between the depths of 50 to 80 feet Below Ground Surface (BGS). The principal soil classification (according to the Unified Soil Classification System) of the Emerado aquifer is medium to coarse-grained poorly sorted sand with abundant gravel and little intermixed silt and clay. Generally, the aquifer interfingers with glacial till which confines it above and below under pressure. The aquifer is separated from the bedrock by more than 60 feet of glacial till in most places. Test hole data indicate that there is a hydrostatic head of more than 70 feet above the top of the aquifer. The water quality of the Emerado aquifer is generally poor, probably due to upward leakage of poor quality water from bedrock aquifers, and is not considered satisfactory for municipal use. Data obtained from water samples collected from the aquifer in 1962 indicated concentrations of dissolved solids, chloride, and sulfate content above the recommended maximums set by the US Public Health Service in 1962. Current water quality data measured against current water quality standards are not available. In 1968, several wells were constructed in the Elk Valley aquifer and the water is piped 8 miles to Emerado for municipal use.

8.3 Groundwater levels were measured throughout the base at various sampling locations from previous investigations. Groundwater depths vary based on the time of year and precipitation amounts but normally are encountered at depths 3 to 15 feet below the ground surface. The shallow groundwater is unconfined and has an estimated hydraulic conductivity of 6×10^{-4} centimeters per second (cm/sec) to 1.1×10^{-8} cm/sec.

8.4 Grand Forks AFB is situated in the drainage basin of the Red River of the North. The major tributary of this river in the vicinity of Grand Forks AFB is the Turtle River, which flows to the northeast. Based on the topography of Grand Forks AFB and surface water flow in the area, it is presumed that ground water flow is in a northeast direction.

8.5 During previous investigations at Grand Forks AFB, ground water was encountered at depths ranging from approximately 3 feet to 15 feet BGS across Grand Forks AFB. According to these measurements, ground water flow direction is variable across Grand Forks AFB. Observations made during previous soil sampling activities suggest that ground water flow is preferential along fractures in the clay sediments, which do not appear to be interconnected. Gypsum mineralization was observed along fractures at depths below the ground water table. Previous experience at Grand Forks AFB has shown that at locations where petroleum hydrocarbon compounds had

impacted soils away from source areas, contamination was concentrated along the fractures. Based on these observations, it appears that ground water flow is mostly confined to the discontinuous fractures observed in the soils. Significant migration of ground-water contaminants away from source areas is generally minimal.

9.0 Surface Hydrology

Natural surface water features on Grand Forks AFB are limited to a small stretch of the Turtle River that flows across the northwestern portion of the Base. In general, surface water runoff from the maintenance apron (east of the runway) is routed north through the west drainage ditch to the Turtle River. The remaining surface water flows through north and south drainage ditches that flow into the Kelly Slough. Kelly Slough is a wide marshy area with a poorly defined stream channel. Vegetation at Kelly Slough is characterized by salt grass marshes. The slough is interpreted as a discharge area for the Emerado Aquifer. Kelly Slough is designated as a National Wildlife Refuge. The slough flows northeast into the Red River.

10.0 Background

10.1 A RCRA Facility Assessment (RFA) was conducted for Grand Forks AFB by the Environmental Protection Agency (EPA) in April 1990. The RFA identified four SWMU at the base and recommended further action at three of the identified Solid Waste Management Units.

10.2 Comparison of the Grand Forks AFB RFA Report with those performed at other Air Force Bases indicated that the number and type of SWMU normally associated with an Air Force Base were not identified. Based upon this comparison, the Environmental Protection Agency (EPA) elected to perform a second RFA for Grand Forks AFB in 1993 to ensure that all SWMU were identified and that the potential for release of hazardous constituents to the environment from these SWMU were evaluated.

10.3 The second RFA performed at Grand Forks AFB identified a total of 32 SWMU. Of these 32, 20 required further action, one being OWS. The OWS were added to the Grand Forks IRP Program as SWMU-7 in 1993. There are 17 OWS included in this SWMU, all located underground.

10.4 The 17 OWS are located throughout Grand Forks AFB and are noted in the accompanying figures. The OWS manage wastewater discharged from its associated building(s). The buildings house various industrial operations to support current and past missions. The exact constituents in the wastewater vary from site to site, however the wastes generally consisted of oil and grease. Prior to the mid 1980's, wastes such as cleaning solvents and acids may have also been discharged to the OWS.

10.5 The OWS were investigated under the Grand Forks Air Force Base Installation Restoration Program (IRP) in 1995. There are no historical records of releases from OWS. These sites were included as SWMU because of the potential to contaminate soil and/or groundwater.

10.6 During the RFI, borings were advanced and soil samples were collected for immunoassay testing, chemical analysis, headspace screening, and lithologic data. Groundwater samples were collected for immunoassay testing for benzene, Polycyclic Aromatic Hydrocarbons (PAH) and TPH. Laboratory analysis of groundwater consisted of Benzene, Toluene, Ethylbenzene and Xylene (BTEX), TPH, and PAH. Visible signs of stressed or stained vegetation were also noted where applicable.

10.7 Soil and Groundwater samples were taken at various locations around the OWS. Total Petroleum Hydrocarbons (TPH) were detected in some locations above action levels. The action levels used for this investigation are as follows.

Contaminated Media	Contaminant	Action Level
Groundwater	Benzene	5 parts per billion (PPB)
	Total Petroleum Hydrocarbons	500 PPB
Soil	Total Petroleum Hydrocarbons	100 parts per million (PPM)

10.8 During the Corrective Measures Implementation (CMI), samples were obtained and tested for metals, semi-volatile organic compounds (SVOC), and volatile organic compounds (VOC). These samples supplemented investigations conducted previously.

11.0 Public Relations

11.1 An Administrative Record (AR) is the legal record of the physical situation at an installation by which response actions are reviewed and defended. An AR must be established at each installation, which has conducted or is conducting IRP activities, and must be available to the public at or near the installation. The AR at Grand Forks AFB is available at the following location and is updated as needed by the base Remedial Project Manager.

319 CES/CEV
525 Tuskegee Airmen Blvd.
Grand Forks AFB ND 58205-6434

11.2 An Information Repository (IR) is a project file on IRP activities at Air Force (AF) installations. The repository is to be established for all remedial action sites and for all sites where removal actions last longer than 120 days. It is located either on or

off base at a place convenient to the community and contains site information, investigatory reports, information about the sources and nature of the contaminants, and a schedule for cleanup operations. The IR is intended to address community relations' requirements and is a source of reading material for the public. Many of the documents are the same in the IR and the AR. In Jan 1993, Grand Forks AFB established an IR, which is maintained at the Grand Forks City Library, in the reference section, to insure public access. Following is the location of the IR.

Grand Forks Public Library
2100 Library Circle
Grand Forks, ND 58201

11.3 Restoration Advisory Board

11.3.1 A Technical Review Committee (TRC) later renamed a Restoration Advisory Board (RAB) was established at Grand Forks AFB Dec. 1991 to review and comment on Department of Defense actions and proposed actions with respect to releases or threatened releases of hazardous substances into the environment. The RAB was also established to ensure open communication and exchange of ideas with the general public about Grand Forks AFB IRP and CERCLA (1980), SARA (1986), and RCRA (1976).

11.3.2 All RAB members understand and agree that the primary purpose and function of the RAB is informational, specifically to foster community and interagency awareness and understanding of Grand Forks AFB IRP remedial actions related to the releases or threatened releases of hazardous substances at Grand Forks AFB.

11.3.3 The Grand Forks AFB community relation's plan, news releases, newsletters, and fact sheets are periodically distributed to the local media and RAB members to inform the public about past, present, and future IRP events.

12.0 Selected Remedy

One remedy was selected for remediation of the contaminated media at the OWS.

Contaminated soil is to be excavated and land treated at a permitted site until a level of 10 parts per million total petroleum hydrocarbons has been reached at which time the soil is considered clean and reusable.

13.0 Evaluation of Selected Remedy

13.1 An analysis of the remedy was conducted to evaluate the remedy with respect to its relative performance in meeting nine criteria. These evaluation criteria are divided into three categories and have been developed by the EPA to address the

technical and policy considerations that have proven important for selecting remedies. The nine criteria are found in [40 CFR 300.430(f)(1)(i)].

13.2 Threshold Criteria

1. Overall protection of human health and the environment
2. Compliance with Applicable or Relevant and Appropriate Requirements (ARAR)

Primary Balancing Criteria

3. Long-term effectiveness and permanence.
4. Reduction of toxicity, mobility, or volume (TMV)
5. Short term effectiveness
6. Implementability
7. Cost

Modifying Criteria

8. State Acceptance
9. Community Acceptance

13.3 Criterion 1: Overall Protection of Human Health and the Environment

a. Protectiveness is the primary requirement that remedial actions must meet under CERCLA. A remedy is protective if it adequately eliminates, reduces, or controls all current and potential risks posed through each pathway at the site.

b. Remedy 1 - Excavation of the contaminated soil will remove the contamination from the immediate vicinity of the industrial area to an isolated treatment site. Remediation at the land treatment site will immediately begin to reduce and eliminate current risks posed by the contaminated soil and prevents further contamination of ground water. The potential for human exposure to contamination at the OWS is eliminated.

13.4 Criterion 2: Compliance with ARAR

a. Compliance with ARAR is one of the statutory requirements of remedy selection. Applicable requirements are cleanup standards, criteria or limitations promulgated under federal or state law that specifically address a hazardous substance, pollutant, contaminant, remedial action, location or other circumstance at a site. Relevant and appropriate requirements address problems or situations sufficiently similar to those encountered at the site and that their use is well suited to the environmental and technical factors at a particular site. The primary ARAR at the OWS include site-specific contaminant levels, Land Treatment of Petroleum Contaminated Soil Guideline, MCL and potentially the National Pollutant Discharge Elimination System (NPDES) under the Clean Water Act.

b. Remedy 1 - This remedy seeks a cleanup level of ten parts per million total petroleum hydrocarbons. Other contaminants will be reviewed on a case-by-case basis

for determining corrective measures to be implemented. Land treatment according to these guidelines, will reduce the contamination to below MCL. Proper management of the contaminated soil will prevent discharges in violation of the NPDES.

13.5 Criterion 3: Long Term Effectiveness and Permanence

a. This criterion reflects CERCLA emphasis on implementing remedies that will ensure protection of human health and the environment in the long term. The assessment of remedies against this criterion evaluates the residual risks at a site after completion of a remedial action.

b. Remedy 1 - This remedy will achieve long-term effectiveness and permanence through remediation of contaminated media to a "clean" condition. Upon completion, the residual risks will be less than industrial screening levels.

13.6 Criterion 4: Reduction of Toxicity, Mobility, and Volume (TMV)

a. This criterion addresses the statutory preference for remedies that employ treatment as a principal element. The assessment against this criterion evaluates the anticipated performance of the specific treatment technologies a remedy may employ.

b. Remedy 1 - Treatment of the contaminants in a permitted land treatment site through the activity of resident microorganisms in the soil has been shown effective in reducing the TMV. Petroleum hydrocarbons serve as food for the microorganisms. An increase in microbiological activity and numbers of organisms confirms the activity taking place. Analysis of contaminant concentrations will be reduced in response to microbe activity.

13.7 Criterion 5: Short Term Effectiveness

a. This criterion addresses short-term impacts of the remedy. The assessment against this criterion examines the effectiveness of remedies in protecting human health and the environment during the construction and implementation of a remedy.

b. Remedy 1 - This remedy will create short-term exposure pathways during the excavation and land farming activity, during repair of OWS and during well installation and sampling events.

13.8 Criterion 6: Implementability

a. The assessment against this criterion evaluates the technical and administrative feasibility of the remedy and the availability of the goods and services needed to implement them.

b. Remedy 1 - This remedy is technically low in goods and services needed for implementation and are readily available. Administrative functions are minimal once a permitted land treatment site is established.

13.9 Criterion 7: Cost

a. Cost encompasses all engineering, construction, and operation and maintenance costs incurred over the life of the project. The assessment against this criterion is based on the present worth of these costs for each alternative.

b. Remedy 1 - The cost for this remedy varies according to the amount of soil and the concentration of contamination at each oil/water separator location. The range will be approximately \$10-125,000. These costs included replacing the OWS if necessary. The total cost for all OWS corrective action is approximately \$550,000. GFAFB expedited corrective measures by removing and treating contaminated soil during the investigation phase. This procedure saved GFAFB time and money in the remediation process by removing contamination when discovered rather than returning to the site at later time.

13.10 Criterion 8: State Acceptance

a. This criterion, which is an ongoing concern throughout the corrective action process, reflects the statutory requirement to provide for substantial and meaningful State involvement.

b. Remedy 1 - North Dakota Department of Health (NDDH) recognizes this remedy as an acceptable form of remedial action.

13.11 Criterion 9: Community Acceptance

a. This criterion reflects the community's apparent preferences or concerns about remedies.

b. The RAB, and IR have been the avenues by which the base has informed the community of IRP and RCRA Corrective Action activities. RAB meetings are held twice each year to update members on corrective action activity. RAB meetings, and the IR have provided an opportunity for public comment/involvement in this and other base IRP activities. A 30-day notice of a 45-day public comment period regarding the permit to be issued and incorporating this selected remedy will be given.

c. With the exception of some University academic interest, there has been little public interest in this activity based on the questions/comments posed by community members.

d. Remedy 1 - The RAB members have been favorable toward this remedy.

14.0 Corrective Measures Implemented

Contamination was remediated during the investigation phase at sites 7-h, 7-m.2, and 7-b. During the investigation, some sites were excavated and repairs made to separators or the OWS were removed if no longer needed. The GFAFB expedited corrective measures for some sites by removing and treating contaminated soil during the investigation phase. This procedure saved GFAFB time and money in the remediation process by removing contamination when discovered rather than returning to the site at later time. All contaminated soils were removed at these sites and hauled to GFAFB permitted Land Treatment Facility.

15.0 Corrective Measures Partially Implemented

There are three sites (7-a, 7-n, and 7-p) where contamination remains but is not practicable to remediate. Some contamination was removed and remediated at these locations but some of the contamination was not accessible due to overlying buildings, roads, utilities and other structures. This contamination will be monitored for risk posed to human health and the environment as appropriate. The potential for human health exposure exists at SWMU 7a and n. The potential for environmental impact exists at 7a, n and p. If, in the future, construction in the area exposes any remaining contaminated soil it will be remediated in an appropriate manner.

16.0 No Corrective Measures Required

During the RCRA Facility Investigation, sampling at SWMU 7-f, 7-i, 7-j, 7-m.1 and 7-q revealed no contamination. At six sites: 7-c, 7-d, 7-e, 7-g, 7-l/k and 7-o contamination was detected but below regulatory and risk based levels. None of these sites required further corrective action.

17.0 Status of SWMU

The table below gives past and present information about the OWS.

Building & SWMU (#)	Installation Date	Capacity (Gallons)	Construction Material	Status & Date of Corrective Action	Contamination
303 (7-a)	1962	1000	Steel	Replaced 1998	Remains
304 (7-b)	1969	3500	Concrete	Removed 1998	Removed and remediated
314 (7-q)	1970	250	Concrete	In service	None
415 (2 OWS) (7-c)	1958	72/1850	Concrete	Removed 1998	Below risk based levels
416 (7-d)	1964	1000	Steel	Replaced 1998	Below risk based levels
524 (7-e)	1959	7330	Concrete	Removed 1998	Below risk based levels
525 (7-f)	1960	300	Concrete	In service	None
600/602 (7-g)	1959	2200	Concrete	In service	Below risk based levels
601/603 (7-h)	1959	2500	Concrete	Out of service; 1998	Removed and remediated
605 (7-i)	1961	12,500	Concrete	In service	None
607 (7-j)	1959	4300	Concrete	In service	None
611/612 (7-l, k)	1958	2500	Concrete	In service	Below risk based levels
613 (7-m.1, m.2)	1962	2500	Concrete	7-m.1 in service; 7-m.2 removed 1999	7-m.1 None; 7-m.2 Removed and remediated
661 (7-n)	1988	1000	Steel	Repaired 1998	Remains
701 (7-o)	1959	50,000	Concrete	In service	Below risk based levels
822 (7-p)	Not Available	55,000	Concrete	Repaired 1998	Remains

18.0 Conclusion

18.1 The selected remedy for the contaminated OWS, where practical, was removal and treatment of the contaminated soil. This action includes repair of leaking OWS and removal of those no longer needed. Removal and treatment of contaminated soils will be protective of human health and the environment by eliminating the contaminants of concern, thus eliminating human exposure and preventing the migration of contaminants.

18.2 At those contaminated sites which were technically impracticable to remediate due to existing structures, monitoring will be conducted for unacceptable risks to human health and the environment as appropriate. This will continue until contaminants have been eliminated through natural attenuation or feasible access to the contamination is possible at which time appropriate corrective measures will be reviewed.

18.3 In summary, all contamination at the OWS designated as SWMU that was technically feasible to remove has been removed and treated to reduce the contamination to below regulatory and risk based levels. Those sites where contamination remains will be monitored for unacceptable risks to human health and the environment. If access to these contaminated soils becomes available further corrective measures will be reviewed and implemented if necessary. No Further Action is required at this SWMU at this time.


MARY A. GILTNER, GM-13
Deputy Civil Engineer



SWMU 7

Oil/Water Separators

Figure 1





SWMU 7A
 W corner of building 303
 Scale = 1:600

General Legend

 Base Boundary

SWMU

 Active

 Removed

Utility Lines

 Abandoned Sanitary

 Active Sanitary

 Abandoned Storm

 Active Storm



SWMU 7B
 NE corner of building 304
 scale = 1:600

General Legend

 Base Boundary

SWMU

 Active

 Removed

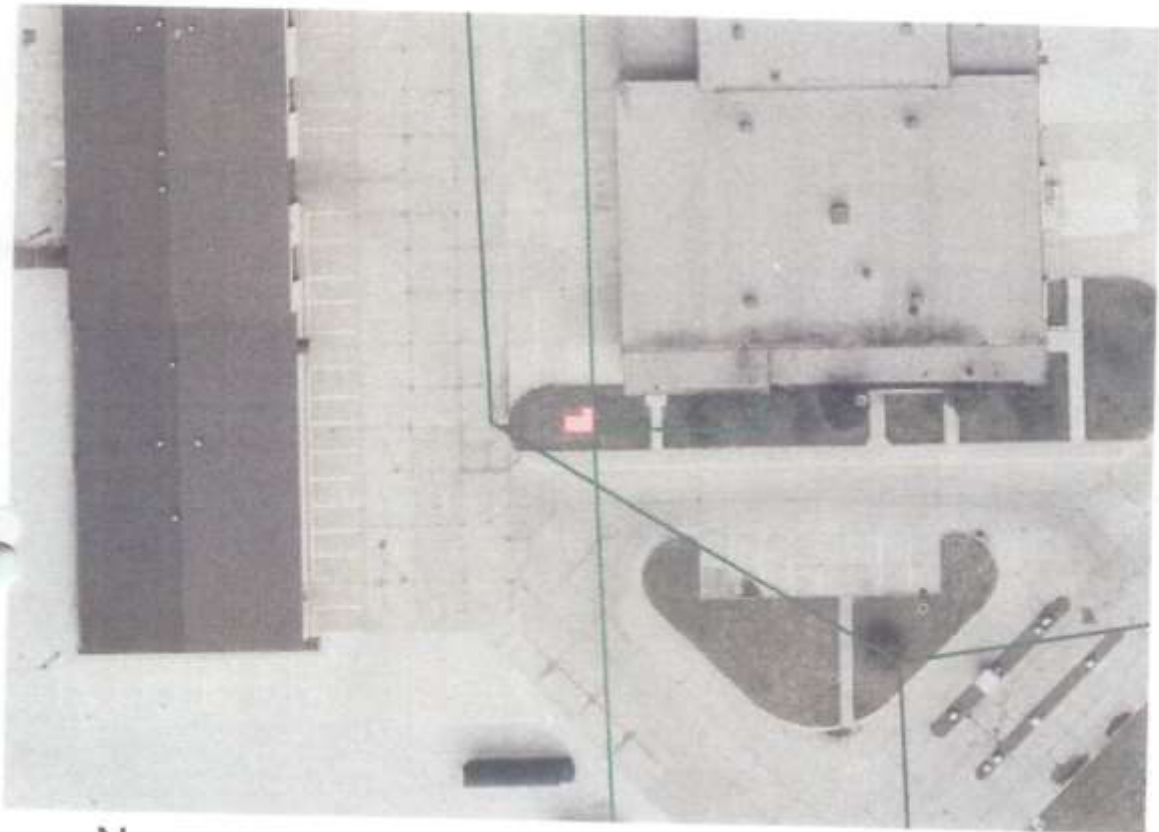
Utility Lines

 Abandoned Sanitary

 Active Sanitary

 Abandoned Storm

 Active Storm



SWMU 7C
SW corner of building 415
Scale = 1:600

General Legend

-  Base Boundary
- SWMU**
-  Active
-  Removed
- Utility Lines**
-  Abandoned Sanitary
-  Active Sanitary
-  Abandoned Storm
-  Active Storm



SWMU 7D
SE corner of building 416
Scale = 1:600

General Legend

 Base Boundary

SWMU

 Active

 Removed

Utility Lines

 Abandoned Sanitary

 Active Sanitary

 Abandoned Storm

 Active Storm



SWMU 7E
SOUTH of building 524
Scale = 1:600

General Legend

-  Base Boundary
- SWMU**
-  Active
-  Removed
- Utility Lines**
-  Abandoned Sanitary
-  Active Sanitary
-  Abandoned Storm
-  Active Storm



SWMU 7F
SW corner of building 525
Scale = 1:600

General Legend

 Base Boundary

SWMU

 Active

 Removed

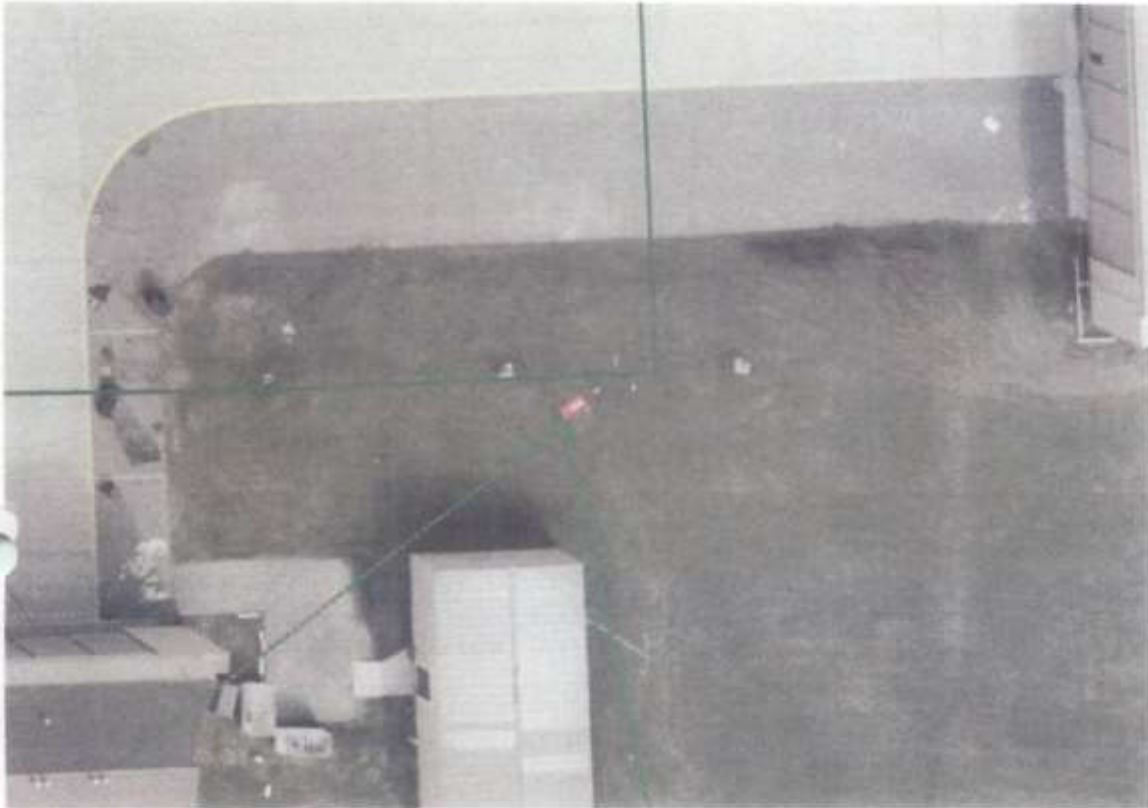
Utility Lines

 Abandoned Sanitary

 Active Sanitary

 Abandoned Storm

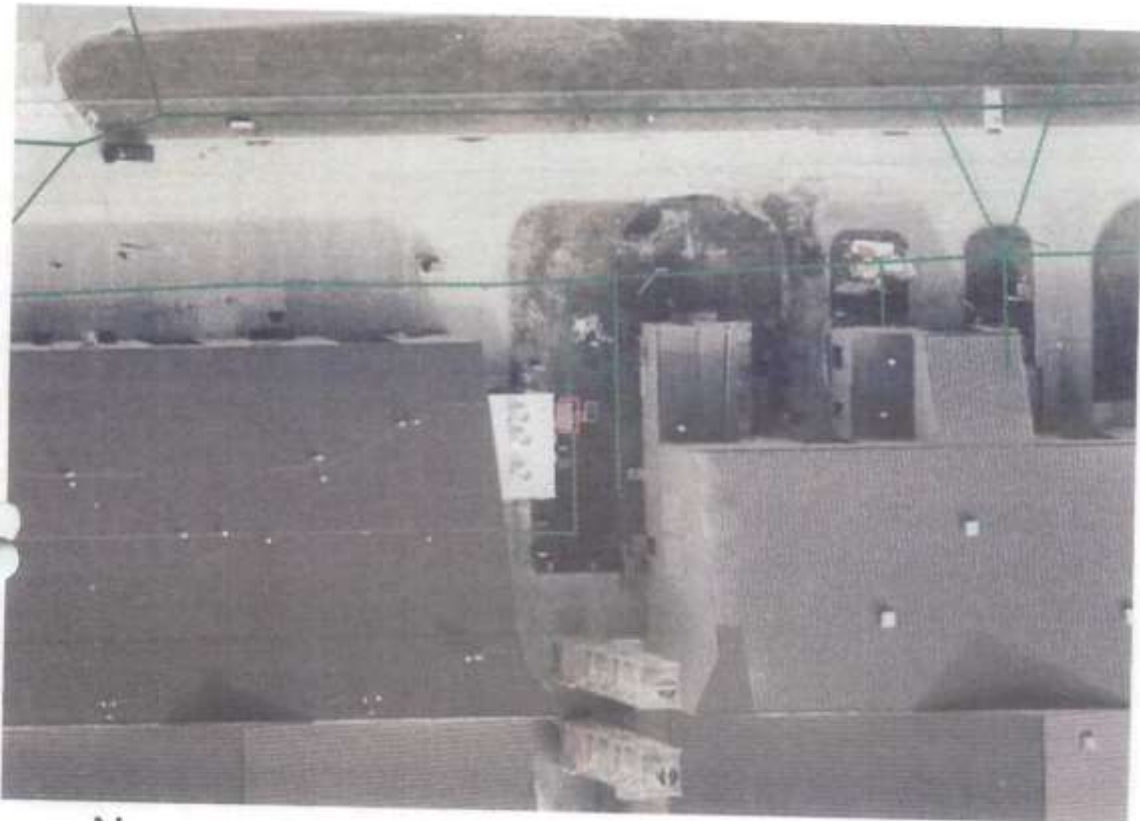
 Active Storm



SWMU 7G
SE corner of building 600/602
Scale = 1:600

General Legend

-  Base Boundary
- SWMU**
-  Active
-  Removed
- Utility Lines**
-  Abandoned Sanitary
-  Active Sanitary
-  Abandoned Storm
-  Active Storm



SWMU 7H
SE corner of building 603
Scale = 1:600

General Legend

 Base Boundary

SWMU

 Active

 Removed

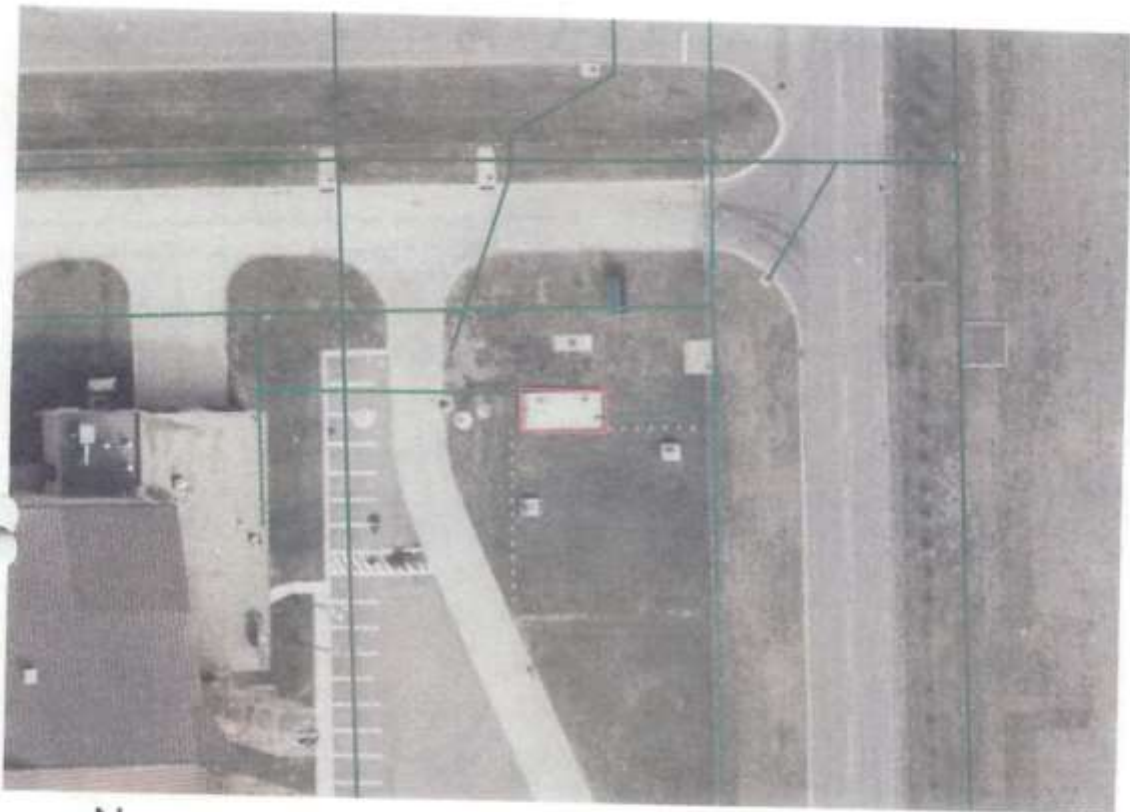
Utility Lines

 Abandoned Sanitary

 Active Sanitary

 Abandoned Storm

 Active Storm



SWMU 71
NE corner of building 605
Scale = 1:600

General Legend

 Base Boundary

SWMU

 Active

 Removed

Utility Lines

 Abandoned Sanitary

 Active Sanitary

 Abandoned Storm

 Active Storm



SWMU 7J
SE corner of building 607
scale = 1:600





General Legend

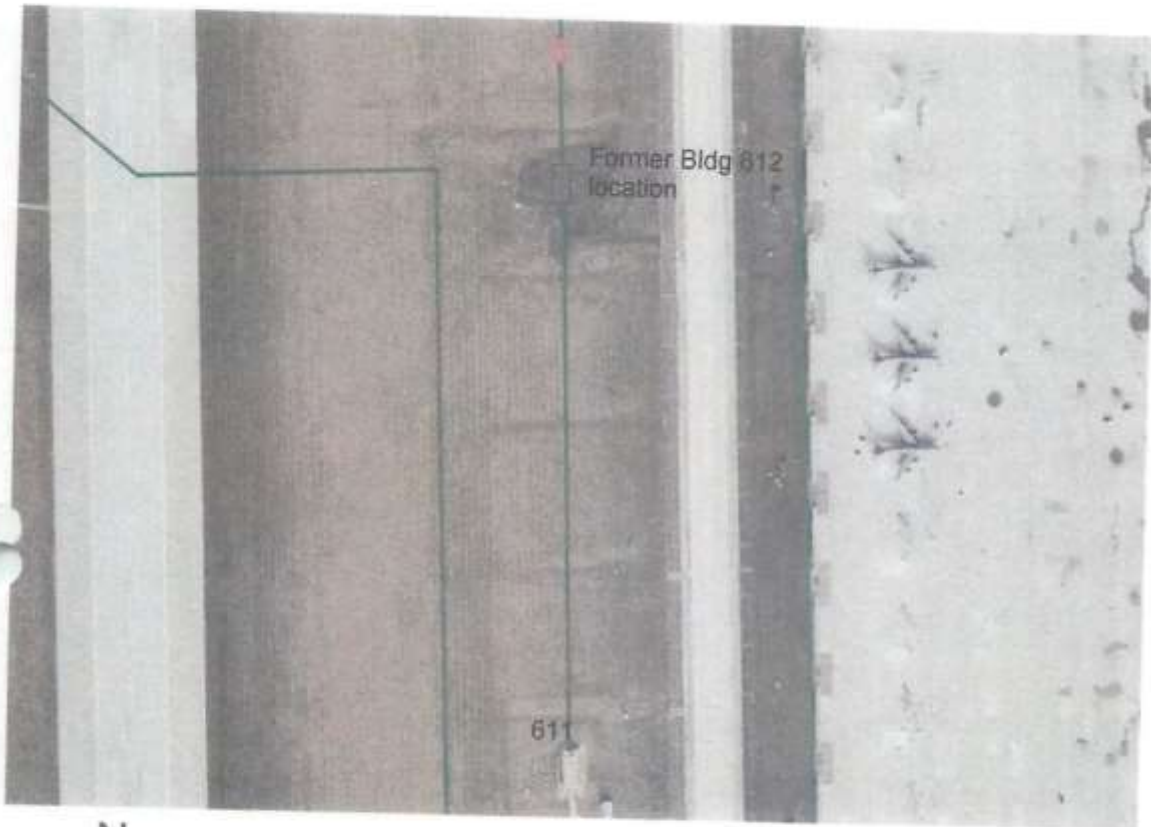
 Base Boundary

SWMU

 Active
 Removed

Utility Lines

 Abandoned Sanitary
 Active Sanitary
 Abandoned Storm
 Active Storm



SWMU 7L/K
SW corner of former building 612 location
Scale = 1:600

General Legend

 Base Boundary

SWMU

 Active

 Removed

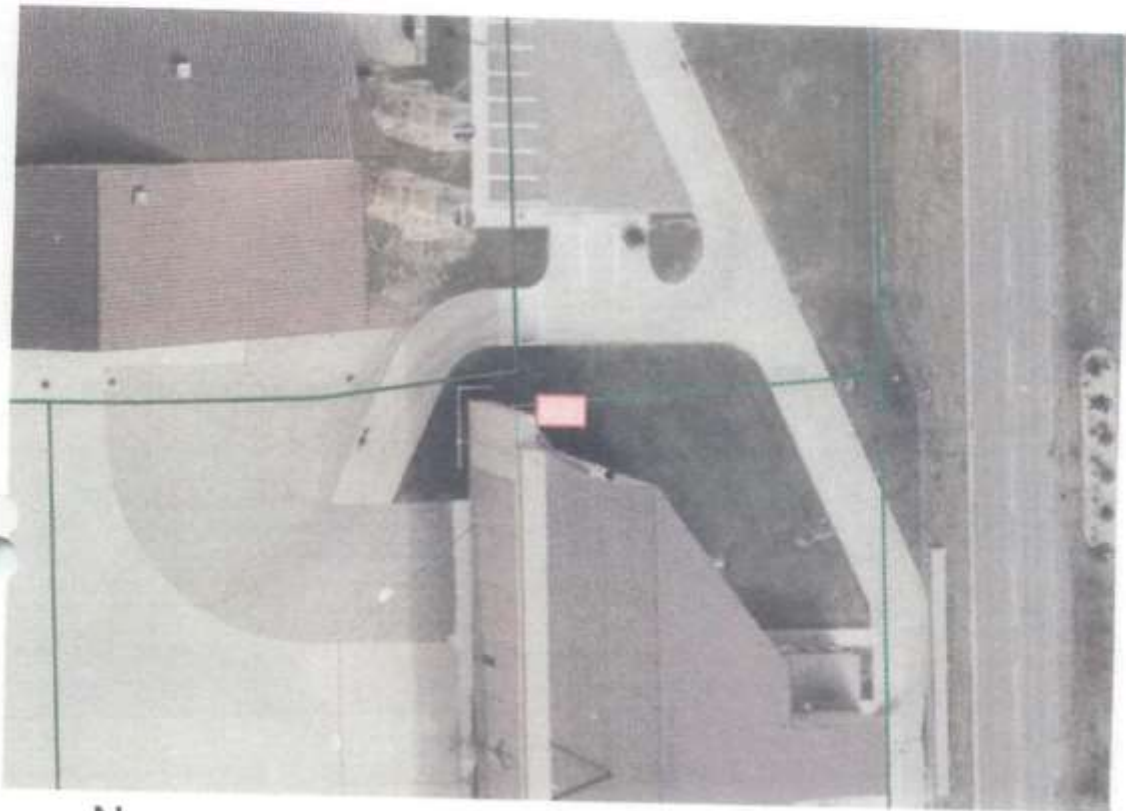
Utility Lines

 Abandoned Sanitary

 Active Sanitary

 Abandoned Storm

 Active Storm



SWMU 7M1
SE corner of building 613-1
Scale = 1:600

General Legend

 Base Boundary

SWMU

 Active

 Removed

Utility Lines

 Abandoned Sanitary

 Active Sanitary

 Abandoned Storm

 Active Storm



SWMU 7M2
East of building 613
Scale = 1:600

General Legend

 Base Boundary

SWMU

 Active

 Removed

Utility Lines

 Abandoned Sanitary

 Active Sanitary

 Abandoned Storm

 Active Storm



SWMU 7N
NE of building 661
Scale = 1:600

General Legend

-  Base Boundary
- SWMU**
-  Active
-  Removed
- Utility Lines**
-  Abandoned Sanitary
-  Active Sanitary
-  Abandoned Storm
-  Active Storm



SWMU 70 (701)
Stormwater
Scale = 1:600





General Legend

 Base Boundary

SWMU

 Active
 Removed

Utility Lines

 Abandoned Sanitary
 Active Sanitary
 Abandoned Storm
 Active Storm



SWMU 7P (822)
Lightline Stormwater
Scale = 1:600





General Legend

 Base Boundary

SWMU

 Active
 Removed

Utility Lines

 Abandoned Sanitary
 Active Sanitary
 Abandoned Storm
 Active Storm



SWMU 7Q
building 314
Scale = 1:600

General Legend

-  Base Boundary
- SWMU**
-  Active
-  Removed
- Utility Lines**
-  Abandoned Sanitary
-  Active Sanitary
-  Abandoned Storm
-  Active Storm

SWMU-8

Waste Satellite Accumulation Areas Outdoor (8a through 8e)

Closure Documentation

DRAFT

Closure Documentation

January 1997 meeting between NDDH and GFAFB agreed to SWMU-8 closure.

DRAFT

SWMU-9

Building 622 Acid Dip Room

Closure Documentation

DRAFT

Closure Documentation

January 1997 meeting between NDDH and GFAPB agreed to SWMU-9 closure.

DRAFT

SWMU-10

POL Unloading Area

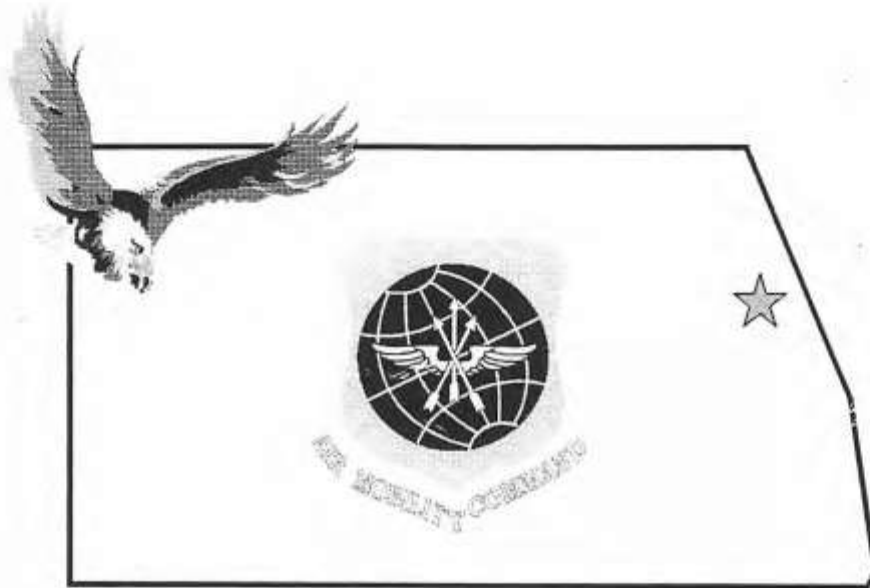
Closure Documentation

DRAFT

DECISION DOCUMENT

TANK CAR/TANK TRUCK UNLOADING HEADER AREA

IRP SITE ST-07



GRAND FORKS AIR FORCE BASE, NORTH DAKOTA

Sep 95

EXECUTIVE SUMMARY

The following Decision Document was written to fulfill the requirements of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). The purpose of a Decision Document is to highlight key aspects of investigation/study reports, provide a brief analysis of remedial alternatives under consideration, and identify the selected alternative.

The Decision Document described herein summarizes the remedial alternatives suggested for the Tank Car/Tank Truck Unloading Header Area (TC/TTUHA), also known as the Petroleum, Oil, Lubricants (POL) Unloading Area (ST-07). The TC/TTUHA is part of the POL system and has been in operation since 1958. It is located in the south-central portion of the base between the POL tank farms and the central heating plant (Figure ES-1). The area consists of 17 unloading/transfer manifolds extending for approximately 1200 feet and is used for receiving and dispensing JP-4 jet fuel, de-icer fluid, and fuel oil to and from tanker trucks. Other facilities at or near the site include aboveground fuel oil and JP-4 jet fuel storage tanks, two aboveground de-icer storage tanks, a pump house, and associated aboveground and underground piping.

Four alternatives were identified as remedial alternatives for ST-07: 1) No Further Action and Institutional Controls; 2) Natural Attenuation; 3) Oxygen Enhancement with Air Sparging; and 4) Pump and Treat with Air Stripping. These alternatives are described in Section 12.0 of the Decision Document.

A comparative analysis of the four alternatives was conducted to evaluate the alternatives with respect to their relative performance concerning nine criteria. These evaluation criteria are described in Section 12.2 of the Decision Document. The selected alternative for ST-07 is alternative 2, natural attenuation. Natural attenuation was evaluated at the TC/TTUHA because the contaminants of concern are hydrocarbons, which have been proven to be naturally biodegradable at numerous sites. Groundwater flow is very slow, so contaminants will not be transported rapidly from the source area. In addition, the site is located on base in an area where there are few potential receptors, and groundwater is not used for drinking water on base. This alternative includes field sampling and groundwater modeling using BIOPLUME II to quantify and predict natural attenuation rates. A long-term monitoring program is also implemented to verify natural attenuation model predictions.

Technical Review Committee (TRC) meetings, held since Dec 91, have been one avenue in which the base has informed the community of IRP activities. In Dec 94, TRCs were converted to Restoration Advisory Boards (RABs), which are held quarterly. The current RAB members have been informed of the proposed plan to finish the TC/TTUHA by natural attenuation. A few members have expressed that remediation has been very costly in the past and prefer the most cost effective solution that will protect human health and the environment. A fact sheet discussing the TC/TTUHA and natural attenuation has been prepared and distributed to RAB members and other interested parties as well as placed in the IR. A Proposed Plan, RABs, and the IR have all provided an opportunity for public comment/involvement in this and other base IRP activities. The Proposed Plan was placed in the IR at the Grand Forks Public Library for a 30-day period during which the community was invited to review and comment on the Plan. An article advertising the Plan's availability at the Library was placed in the Grand Forks Herald, a local newspaper. A Public Hearing to discuss the Proposed Plan was held on 6 Sep 95 at Grand Forks AFB. No comments were received from the public.

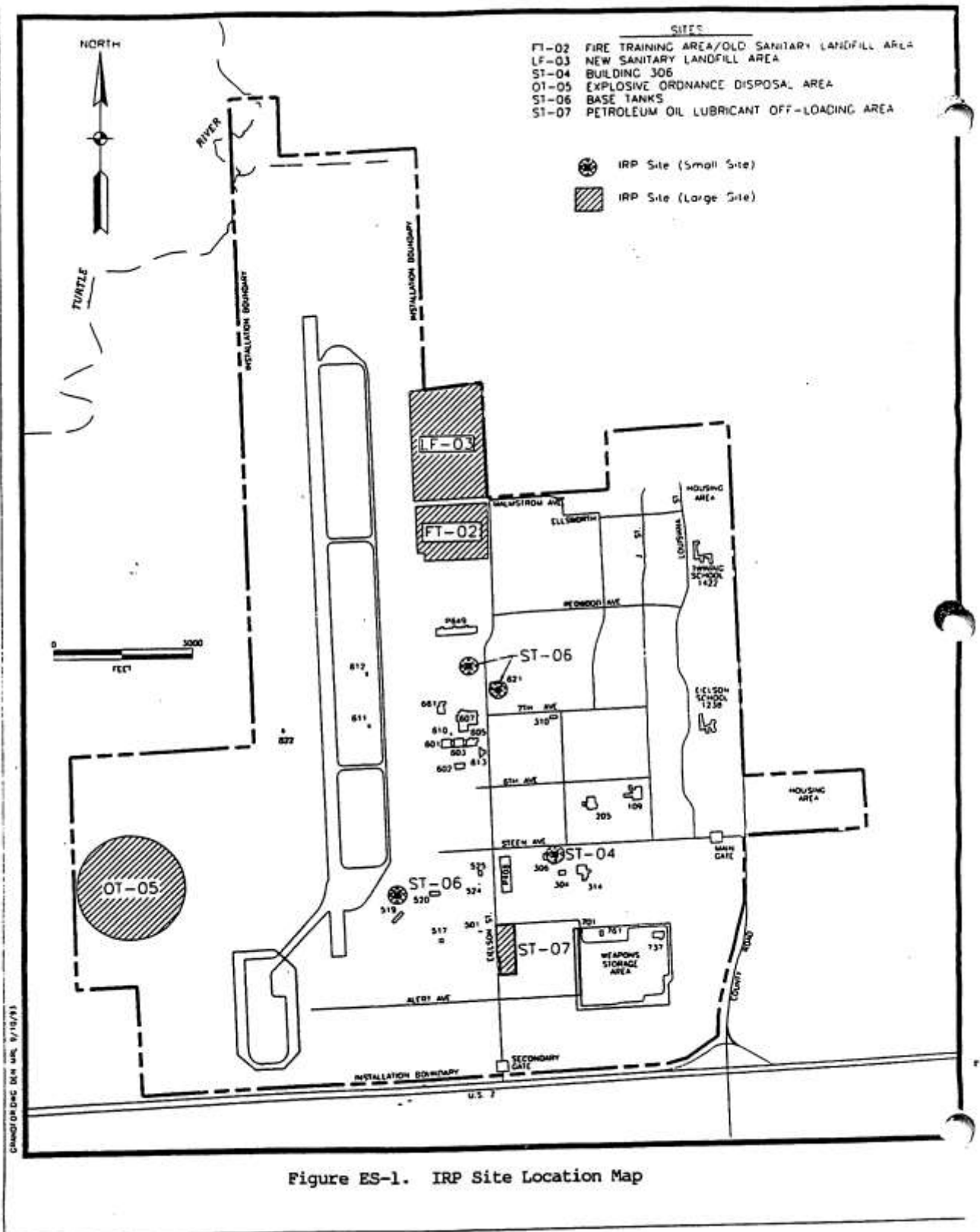


Figure ES-1. IRP Site Location Map

**DECISION DOCUMENT
TANK CAR/TANK TRUCK UNLOADING HEADER AREA
INSTALLATION RESTORATION PROGRAM SITE ST-07
GRAND FORKS AIR FORCE BASE, NORTH DAKOTA**

1.0 INSTALLATION NAME AND LOCATION

- 1.1 Grand Forks AFB
Grand Forks, North Dakota

2.0 STATEMENT OF BASIS

2.1 The decision described herein concerning the remedial alternative at the Tank Car/Tank Truck Unloading Header Area (TC/TTUHA), also known as the Petroleum, Oil, Lubricants (POL) Unloading Area, is based on an evaluation of the results received from investigations performed under the U.S. Air Force Installation Restoration Program (IRP). Relevant documents include:

- A-E Work Plan, Chemical Data Acquisition Plan, and Site Safety and Health Plan Addenda (Montgomery Watson, Apr 93)
- Preliminary Assessment/Site Investigation Report Tank Car/Tank Truck Unloading Header Area (Montgomery Watson, Feb 94)
- Final Natural Attenuation Modeling Report for the Tank Car/Tank Truck Unloading Header Area (Montgomery Watson, Jun 95)
- Final Sampling and Analysis Plan Long Term Monitoring Program (Foothill Engineering Consultants, Inc., Jun 95)

2.2 This plan highlights key aspects of the investigations performed at the TC/TTUHA, provides a brief analysis of remedial alternatives considered, and identifies the selected alternative.

3.0 DESCRIPTION OF THE SELECTED REMEDY

3.1 The selected remedial action for this site is natural attenuation. Natural attenuation, also called intrinsic bioremediation, of contaminants is achieved when naturally occurring mechanisms, including aerobic and anaerobic biodegradation, degrade contaminants without requiring engineering steps to enhance the process. Natural attenuation is non-intrusive and does not disrupt existing facilities during remediation. Contaminants are transformed into harmless byproducts rather than being transferred to other media and remediation is conducted in situ so there is no risk of exposure during remediation. In addition, natural attenuation is generally less costly than most conventional remediation alternatives.

3.2 Natural attenuation is located at the top of the hierarchy of preferred alternatives according to the Air Force Center for Environmental Excellence (AFCEE) remediation matrix. AFCEE's matrix attempts to rank technologies/processes that should be considered for use at common Air Force sites, such as petroleum spill sites. According to the hierarchy, natural attenuation should always be considered first and, if selected, should be based on a scientifically defensible risk assessment. Selection of this technology/process should be accompanied by field sampling and modeling to quantify and predict natural attenuation rates. A long-term monitoring program should be implemented to verify natural attenuation model predictions.

3.3 At the TC/TTUHA, natural attenuation was evaluated because the contaminants of concern are hydrocarbons, which have been proven to be naturally biodegradable at numerous sites. Groundwater flow is very slow (0.25 feet/year) so contaminants will not be transported rapidly from the

source area, and the site is located on base in an area where there are few potential receptors. In addition, groundwater at the site is not being used.

4.0 DECLARATION OF CONSISTENCY WITH CERCLA AND THE NCP

4.1 This document presents the selected remedy for the TC/TTUHA developed in accordance with the Resource Conservation and Recovery Act (RCRA) of 1976, Comprehensive Environmental Response, Compensation, and Liability Act [(CERCLA), Section 117(a)], as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA), the National Contingency Plan (NCP), Safe Drinking Water Act (SDWA), and the North Dakota Water Pollution Control Act. It has been determined that natural attenuation in conjunction with a groundwater monitoring program is the most effective way of remediating the site.

5.0 SITE IDENTIFICATION

5.1 Grand Forks, ND is located on the North Dakota-Minnesota border at the junction of the Red Lake River and the Red River of the North, 75 miles north of Fargo, ND and 145 miles south of Winnipeg, Manitoba, Canada. Grand Forks Air Force Base is located on U.S. Highway 2, approximately 15 miles west of Grand Forks and 10 miles west of the Mark Andrews International Airport.

5.2 Grand Forks AFB is situated in a subhumid climate characterized by a wide temperature range, variable precipitation, and rigorous winters. Base records indicate the coldest recorded temperature was -36 degrees Fahrenheit (°F) and the warmest was 106°F. The average annual daily maximum temperature is about 50°F with the highest temperatures occurring during July and August. The average annual daily minimum temperature is about 30°F with the lowest temperature occurring during January. The annual average daily temperature is 40°F.

5.3 The average monthly precipitation ranges from greater than 3.0 inches during June to less than 0.3 inches during February (rainfall). The average annual rainfall precipitation is about 18.5 inches, three-fourths of which occurs from May to September. Snowfall averages slightly less than three feet annually. The prevailing wind direction is from the northwest.

5.4 The TC/TTUHA is part of the POL system and has been in operation since 1958. It is located in the south-central portion of the base between the POL tank farms and the central heating plant (Figure 1). The area consists of 17 unloading/transfer manifolds extending for approximately 1200 feet and is used for receiving and dispensing JP-4 jet fuel, deicer fluid, and fuel oil to and from tanker trucks. Other facilities at or near the site include aboveground fuel oil and JP-4 jet fuel storage tanks, two aboveground de-icer storage tanks, a pump house, and associated aboveground and underground piping. In Sep 94, Grand Forks AFB began converting from JP-4 to JP-8 jet fuel for safety and environmental reasons.

6.0 PHYSIOGRAPHY AND LAND USE

6.1 Grand Forks AFB lies within the Agassiz Lake Plain District of the Western Ground Drift section of the Central Lowland Physiographic Province. The Western Ground Drift section is a lowland prairie upon a gently rolling glacial ground moraine. It is occasionally interrupted by ridges of end moraine and flat outwash plains. Strandline deposits associated with Glacial Lake Agassiz form low, narrow linear ridges with a northwesterly trend. The average elevation above sea level is about 890 feet with a maximum local relief of about 25 feet.

6.2 Grand Forks AFB is also located in the Red River Valley topographic area which corresponds to the Agassiz Lake Plain physiographic division. Geologic processes include the movement of groundwater through underlying rock strata, differential erosion, modification by glaciers,

and recent wind and stream-forming events. Prior to glaciation, the river became incised until it reached Precambrian rock, then shifted its course westward as it eroded away Cretaceous shale and sand, thereby forming the Pembina Escarpment. When glaciers deposited a layer of till over the area, the river erosion temporarily ceased. Lake Agassiz sediment now covers the Red River Valley. The modern Red River of the North flows on this lake plain. The Pembina Escarpment was probably altered by glacial processes but exists today as the western extent of Glacial Lake Agassiz sediments, about 10 miles west of Grand Forks AFB. The present location of the Red River of the North is 18 miles east of Grand Forks AFB, representing the North Dakota-Minnesota state line.

6.3 Land use in Grand Forks County consists primarily of cultivated crops with remaining land used for pasture and hay, urban development, recreation and wildlife habitat. Principal crops are spring wheat, barley, sunflowers, potatoes and sugar beets. Turtle River State Park, located about five miles west of the Base, is one of the major recreational areas in Grand Forks County. Several watershed protection dams are being developed for recreational activities. Kellys Slough National Wildlife Refuge, located approximately 5 miles east of the base, and the adjacent National Waterfowl Production Area are managed for wetland wildlife and migratory waterfowl, but they also include a significant acreage of openland wildlife habitat in the county.

6.4 Land use in the vicinity of the TC/TTUHA is exclusively industrial and includes the Central Heating Plant (Building 423) and a contractor staging area to the east. Abandoned railroad tracks are also located in the area.

7.0 GEOLOGY AND HYDROGEOLOGY

7.1 The native soil is a lean inorganic clay of low to moderate plasticity. The clay is pebbly and moderately stiff. The upper 10 feet of clay is weathered as evidenced by the presence of fractures. The weathered clay is gray to light olive gray in color with zones of reddish oxidation. The lower clay zone is less weathered, contains less oxidation, and is dark gray in color.

7.2 The upper 5 feet of soil in large portions of the TC/TTUHA consists of clean, fine to medium grained poorly-sorted sand with local pockets of clayey sand. The sand was used as fill material during construction of the POL facilities, railways, and roads. Figure 2 is a geologic cross section constructed from soil boring logs.

7.3 The depth to groundwater varies between 1.5 and 7.5 feet below ground surface across the site. The hydraulic conductivity of the native clay and fill is approximately 8×10^{-5} cm/sec and 1×10^{-4} cm/sec, respectively. The vertical permeability of the clay and sand fill is 8×10^{-8} cm/sec and 3×10^{-3} cm/sec, respectively. An assumption of 8×10^{-6} cm/sec was made for the horizontal permeability of the native clay soil, based on the vertical permeability.

7.4 The groundwater flow direction at the site is predominantly to the northeast, although the groundwater appears to be mounded below the site. The mound appears to be caused as a result of a layer of sand fill that transmits precipitation faster than the underlying native clay. In the vicinity of the groundwater mound, the groundwater flows radially away from the recharge area. The hydraulic gradient in this area is approximately 0.03 feet/feet and the groundwater velocity is approximately 0.25 feet/year. Because a portion of the sand fill is saturated, there is also horizontal flow in the sand layer in the mounded area with a groundwater velocity of 3 feet/year.

8.0 SURFACE HYDROLOGY

8.1 Natural surface water features on Grand Forks AFB are limited to small wetlands (prairie potholes) and a small stretch of the Turtle River that flows across the northwestern portion of the Base approximately 3 miles northwest of the TC/TTUHA. In general, surface water runoff from the site is

routed to the south drainage ditch which flows into Kellys Slough National Wildlife Refuge, located approximately 4.5 miles to the east of the site.

8.2 The Turtle River channel is very sinuous and generally flows in a northeasterly direction. It eventually empties into the Red River of the North which flows north to Lake Winnipeg in Canada. The Red River drainage basin is part of the Hudson River drainage system. At Manvel, North Dakota, approximately 10 miles northeast of Grand Forks AFB, the mean discharge of the Turtle River is 50.3 cubic feet per second. Peak flows result from spring runoff in April, and minimum flows (or no flow in some years) occur in January and February.

9.0 BACKGROUND

9.1 Discovery and Notification

a. During the summer of 1991, workers observed hydrocarbon odors and a sheen on the surface of the shallow groundwater while excavating the area. The IRP process was then initiated to identify and evaluate the nature and extent of contamination at the site.

9.2 Preliminary Assessment/Site Investigation (PA/SI)

a. A PA/SI was conducted from 1992 to 1994. Results from the PA/SI indicated that benzene, ethylbenzene, toluene and xylenes (BTEX) compounds were present in the groundwater and subsurface soils. Figures 3-6 show the groundwater BTEX contaminant plumes. Deicing chemicals (glycols) were not detected in any samples collected at the site.

b. The source of the subsurface contamination is believed to be from periodic spillage during fuel transfer operations. This source is believed to have discontinued as a result of measures taken to ensure that future spills are reclaimed. In addition, spill pads have been installed at the site to direct fuel through an oil/water separator.

9.3 Remedial Investigation (RI)/Computer Modeling

a. An RI began in September 1994 and consisted of two phases. The first phase was conducted to gather data to define the extent and levels of hydrocarbon contamination, to characterize the aquifer materials, and to provide data to evaluate whether biodegradation was occurring at the site. The second phase consisted of modeling, which included interpretation of all the field data collected to date, development of a conceptual model of the site, pre-modeling calculation, and computer modeling of groundwater flow using BIOPLUME II. Three groundwater monitoring wells, three soil vapor probes, and eleven temporary piezometers were installed to supplement the four monitoring wells already in place at the site. Soil, soil gas, groundwater sampling, and in situ permeability tests were conducted to characterize chemical and hydrogeologic conditions at the site.

b. Results of the RI confirmed the presence of BTEX in the groundwater and subsurface soils. Table 1 provides the concentrations of organic contaminants found in the groundwater and provides the maximum contaminant levels (MCLs), as regulated by the Safe Drinking Water Act (40 CFR141-149). It is important to note that groundwater is not used for drinking water on base and most likely will not be used in the future due to poor water quality. Figures 7 - 10 show the groundwater BTEX contaminant plumes generated from data obtained during this second round of groundwater sampling and analysis.

c. Table 2 provides a summary of organic contaminants in soil samples. Based on these analytical results, the area of contaminated soil is about 120 feet wide and 400 feet long (Figure 11). Comparing the extent of contamination in groundwater with the soil and fuel sheen locations, it appears that the source of dissolved BTEX constituents in groundwater is the contaminated upper two feet of the clay soil in the fuel header area. Although the source of contamination (spills and/or leaks of

fuels) to the subsurface is believed to have been discontinued, BTEX constituents present in the soil are most likely continuing to provide a source of dissolved contaminants to the groundwater.

d. Biodegradation was assessed by performing a laboratory microcosm study using site soil. This involved evaluating the concentrations of electron acceptors and metabolic byproducts in groundwater and soil gas, calculating the total assimilative capacity of the groundwater for dissolved contaminants, and evaluating the transport behavior of a recalcitrant tracer relative to that of the BTEX constituents. All the biodegradation assessment methods showed strong indications of biodegradation. The biodegradation processes appear to be mainly anaerobic, although there is evidence of aerobic biodegradation as well. The total assimilative capacity of the groundwater (61,000 $\mu\text{g/L}$) exceeds the total maximum concentration of BTEX observed at the site (52,000 $\mu\text{g/L}$). Therefore, there appears to be sufficient electron acceptors in the groundwater to biodegrade the hydrocarbons present.

e. A BIOPLUME II model, developed by Hanadi Rifai et al at Rice University, was used to predict the effects of biodegradation and contaminant transport upon the levels and extent of dissolved benzene in the groundwater. BIOPLUME II is a two-dimensional numerical aqueous phase flow and dissolved constituent transport model that computes changes in constituent concentrations as a function of time due to convection, hydrodynamic dispersion, mixing, first order decay, and oxygen-limited hydrocarbon biodegradation. The simulations predicted that the extent and levels of benzene contamination in the plume would decrease over time due to biodegradation. Table 3 shows the predicted results of BIOPLUME II modeling scenarios with and without biodegradation.

f. Overall, the results of the RI study showed that the natural biodegradation mechanisms are actively removing contaminant mass from the subsurface and that natural attenuation is a viable alternative for remediating the site.

9.4 Risk Receptor Evaluation

a. A risk receptor evaluation was also performed for the TC/TTUHA during the RI to determine if contaminant levels at the site are acceptable based on risk. Although all the BTEX constituents were detected at concentrations above MCLs in groundwater, benzene is the primary contaminant of concern since it is a carcinogen.

b. Potential migration pathways for the BTEX constituents include dissolution into groundwater, transport in groundwater as dissolved phase contamination, volatilization into soil gas, and migration in the gas phase.

c. The human risk evaluation was performed for inhalation of contaminants in the vapor phase that may volatilize from underlying groundwater. The potential human receptors were assumed to be the workers in Buildings 446 and 423. There are no current risks to human health due to exposure to contaminants from the site. This conclusion is supported by industrial hygiene sampling, regulated under the Occupational Safety and Health Act (OSHA), conducted by the base Bioenvironmental Engineering office at the TC/TTUHA. There is potential future risk to people in Buildings 423 and 446 due to inhalation of contaminants that may volatilize from underlying groundwater. However, the potential risk is minimal due to the limited extent of the saturated sand fill and very slow groundwater flow rates in the native clay. In addition, both buildings have sound concrete foundations which make transport of vapors into the buildings unlikely.

d. The risk receptor evaluation did not identify a complete exposure pathway from the site to local wildlife. Ecological risks may become important if contaminants are transported to a surface water body where wildlife could be exposed. Given the slow groundwater velocities, the distance from the site to the nearest ecological receptor location, and indications that biodegradation is taking place, it is unlikely that ecological risks from this site will be significant.

9.5 Long Term Monitoring (LTM)

a. In Jun 95, a LTM program was initiated to collect additional groundwater samples at the site to support natural attenuation. Seven existing monitoring wells (MW01-MW07) were purged and sampled. Results are shown in Table 4. LTM will be conducted quarterly to track the degradation of contaminants at the site.

10.0 PUBLIC RELATIONS - Administrative Record and Information Repository

10.1 An Administrative Record (AR) is a legal record of the physical situation at an installation by which response actions are reviewed and defended. An AR must be established at each installation which has conducted or is conducting IRP activities and must be available to the public at or near the installation. The AR at GFafb is maintained at the following location and is updated as needed by the base Remedial Project Manager.

319 CES/CEVR
525 6th Ave
Grand Forks AFB ND 58205-6434

10.2 An Information Repository (IR) is a project file on IRP activities at AF installations. The repository is to be established for all remedial action sites and for all sites where removal actions last longer than 120 days. It is located either on or off base at a place convenient to the community and contains site information, investigatory reports, information about the sources and nature of the contaminants, and a schedule for cleanup operations. The IR is intended to address community relations requirements and is a source of reading material for the public. Many, if not all, of the documents may be the same in the IR and the AR. In Jan 93, GFafb established an IR which is maintained at the Grand Forks City Library in the reference section to ensure public access. Following is the location of the IR:

Grand Forks Public Library
2100 Library Circle
Grand Forks, ND 58201

11.0 TECHNICAL REVIEW COMMITTEE/RESTORATION ADVISORY BOARD

11.1 A Technical Review Committee (TRC) was established at Grand Forks AFB in Dec 91 to review and comment on Department of Defense actions and proposed actions with respect to releases or threatened releases of hazardous substances into the environment at Grand Forks AFB. The TRC was also established to ensure open communication and exchange of ideas with the general public about the Grand Forks AFB IRP and CERCLA (1980), SARA (1986), and RCRA (1976).

11.2 The TRC was a body comprised of members from Grand Forks AFB, U.S. Environmental Protection Agency, North Dakota Department of Health, Grand Forks Health Department, and community representatives. All TRC members understood and agreed that the primary purpose and function of the TRC was informational, specifically to foster community and interagency awareness and understanding of the Grand Forks AFB IRP.

11.3 In Dec 94, the TRC was replaced by a Restoration Advisory Board (RAB) to enhance community involvement. The RAB provides an environment for an open exchange of ideas, opinions, and information and includes a more thorough representation of the community. The purpose of the RAB is to promote community awareness and obtain constructive community review and comment on environmental restoration actions to accelerate overall cleanup at Grand Forks AFB. It is used to disseminate information about the IRP and to ensure opinions about environmental restoration reflect

diverse interests within the community. The RAB serves in an advisory capacity to Grand Forks AFB, US Environmental Protection Agency Region VIII, and the North Dakota Department of Health.

11.4 As part of the Grand Forks AFB community relations plan, news releases and newsletters are periodically distributed to the local media and RAB members to inform the public about past, present, and future IRP events.

12.0 ALTERNATIVES EVALUATED

12.1 The following four alternatives were identified for the TC/TTUHA:

1. No Further Action and Institutional Controls

a. The no action response is allowable only if the remedial action objectives can be achieved in an acceptable period of time without remedial action. Institutional controls include prohibiting shallow groundwater use until ARARs are met. The no action and institutional controls scenario may achieve ARARs as a response action through the natural biodegradation of contaminants, but the restoration time frame would be uncertain and most likely extensive.

2. Natural Attenuation

a. Natural attenuation was evaluated at the TC/TTUHA because the contaminants of concern are hydrocarbons, which have been proven to be naturally biodegradable at numerous sites. Groundwater flow is very slow (0.25 feet/year) so contaminants will not be transported rapidly from the source area. In addition, the site is located on base in an area where there are few potential receptors, and groundwater is not used for drinking water on base.

b. Natural attenuation is located at the top of the hierarchy of preferred alternatives for remediating sites contaminated by dissolved fuel in groundwater (BTEX) according to the Air Force Center for Environmental Excellence (AFCEE) remediation matrix. AFCEE's matrix attempts to rank technologies/processes that should be considered for use at common Air Force sites, such as petroleum spill sites. According to the hierarchy, natural attenuation should always be considered first at sites with dissolved fuel in groundwater and, if selected, should be based on a scientifically defensible risk assessment. Other technologies listed in AFCEE's hierarchy of preferred alternatives for this type of contamination include air sparging and conventional pump and treat systems.

c. Natural attenuation differs from alternative 1 (No Further Action) in that the technology/process is accompanied by field sampling and modeling to quantify and predict natural attenuation rates. A long-term monitoring program is also implemented to verify natural attenuation model predictions.

3. Oxygen Enhancement with Air Sparging

a. In this response action, air is injected under pressure below the water table to increase groundwater oxygen concentrations and enhance the rate of biological degradation of organic contaminants by naturally occurring microbes. Groundwater monitoring will be required to evaluate the effectiveness of this alternative.

4. Pump and Treat with Air Stripping

a. Air stripping is a mass transfer process used to move volatile contaminants from water to air. The process is effective for aqueous waste streams with low concentrations of wastes that are highly volatile and have low water solubility. Offgases may require treatment to recapture contaminants and process effluent would have to be discharged in accordance with NPDES. Although air stripping is an established, relatively inexpensive technology for treating water contaminated by volatile organic

compounds, pumping the groundwater to the air stripping unit adds a substantial expense. In addition, biological fouling and clogging of equipment due to inorganics are common problems. Groundwater monitoring is also required to evaluate the effectiveness of this alternative.

12.2 Screening of Control Measures

a. The comparative analysis of the four alternatives was conducted to evaluate the alternatives with respect to their relative performance concerning nine criteria. These evaluation criteria are divided into three categories and have been developed by the EPA to address the technical and policy considerations that have proven important for selecting remedial alternatives. The nine criteria are [40 CFR 300.430 (f)(1)(i)]:

- b. **THRESHOLD CRITERIA**
 - 1. Overall protection of human health and the environment
 - 2. Compliance with Applicable or Relevant and Appropriate Requirements (ARARs)
- PRIMARY BALANCING CRITERIA**
 - 3. Long term effectiveness and permanence
 - 4. Reduction of toxicity, mobility, or volume (TMV)
 - 5. Short term effectiveness
 - 6. Implementability
 - 7. Cost
- MODIFYING CRITERIA**
 - 8. State acceptance
 - 9. Community acceptance

c. The objectives of the comparison are to assess the relative advantages and disadvantages among the alternatives and to identify the key tradeoffs which must be balanced in selecting a preferred alternative.

12.3 Criterion 1: Overall Protection of Human Health and the Environment

a. Protectiveness is the primary requirement that remedial actions must meet under CERCLA. A remedy is protective if it adequately eliminates, reduces, or controls all current and potential risks posed through each pathway at the site.

b. Alternative 1 - This alternative does not provide for overall protection of human health and the environment because it does not track the natural attenuation of groundwater contaminants. By implementing this alternative, potential future risk, due to contaminant migration, would be unknown.

c. Alternative 2 - Natural attenuation in conjunction with groundwater modeling and monitoring will effectively allow for the tracking of contaminant concentrations and plume movement. The RI results showed the natural biodegradation mechanisms are actively removing contaminant mass from the subsurface and natural attenuation is a viable alternative for remediating the site. In addition, risk receptor evaluations were performed to determine if contaminant levels at the site are acceptable based on risk.

1. The human risk evaluation was performed for inhalation of contaminants in the vapor phase that may volatilize from underlying groundwater. The potential human receptors were assumed to be the workers in Buildings 446 and 423. There are no current risks to human health due to exposure to contaminants from the site. This conclusion is supported by industrial hygiene sampling, regulated under the Occupational Safety and Health Act (OSHA), conducted by the base Bioenvironmental Engineering office at the TC/TTUHA. There is potential future risk to people in Buildings 423 and 446 due to inhalation of contaminants that may volatilize from underlying groundwater. However, the potential risk is minimal due to the limited extent of the saturated sand fill and very slow

groundwater flow rates in the native clay. In addition, both buildings have sound concrete foundations which currently make transport of vapors into the buildings unlikely.

2. The risk receptor evaluation did not identify a complete exposure pathway from the site to local wildlife. Ecological risks may become important if contaminants are transported to a surface water body where wildlife could be exposed. Given the slow groundwater velocities, the distance from the site to the nearest ecological receptor location, and indications that biodegradation is taking place, it is unlikely that ecological risks from this site will be significant.

d. Alternative 3 - This alternative does not satisfy all of the objectives necessary to ensure the overall protection of human health and the environment. Although this technology will be conducted in situ, it will increase volatilization of contaminants from the subsurface, increasing an exposure risk via inhalation pathways to workers in the area. In addition, air sparging can create channeling in the subsurface, causing plume migration from the current localized area.

e. Alternative 4 - This alternative does not satisfy all of the objectives necessary to ensure the overall protection of human health and the environment. Since this technology transfers contaminants from water to air, it produces offgases which increase exposure risks to workers in the area via inhalation pathways. Also, pumping the groundwater from the subsurface to the air stripping unit adds an additional potential exposure pathway via dermal exposure.

12.4 Criterion 2: Compliance with ARARs

a. Compliance with ARARs is one of the statutory requirements of remedy selection. The primary ARARs at the TC/TTUHA include MCLs and stormwater and sewage drainage requirements. ST-07 is also identified as a solid waste management unit under RCRA Corrective Actions and is regulated by the base Hazardous Waste Storage (RCRA Part B) Permit.

b. Alternative 1 - This alternative does not comply with Federal or State ARARs.

c. Alternative 2 - The primary ARARs at the TC/TTUHA are the MCLs and stormwater discharge and drainage requirements (Clean Water Act [CWA] and National Pollutant Discharge Elimination System [NPDES]). Although the BTEX concentrations in the groundwater exceed the MCLs at this time, the results from the RI study showed the natural biodegradation mechanisms are actively removing contaminant mass from the subsurface and natural attenuation is a viable alternative for remediating the site. In addition, the contamination is trapped in the subsurface, and does not intercept surface water so there is no contamination of surface water.

d. Alternative 3 - This alternative complies with Federal and State ARARs.

e. Alternative 4 - In addition to the CWA and NPDES ARARs, this alternative would also have to comply with Federal Clean Air Act as well as the State Air Pollution Control Regulations and Air Toxic Policy due to the use of an air stripper.

12.5 Criterion 3: Long-Term Effectiveness and Permanence

a. This criterion reflects CERCLA's emphasis on implementing remedies that will ensure protection of human health and the environment in the long term. The assessment of alternatives against this criterion evaluates the residual risks at a site after completion of a remedial action or enactment of a no action alternative.

b. Alternative 1 - This alternative will achieve long-term effectiveness and permanence although the contaminant degradation rate and any migration will be unknown if this alternative is implemented. This criterion will be met only if the source of contamination (spills and/or leaks) no longer exists. Better work practices and the installation of spill pads to direct spilled fuel to an oil/water separator have prevented additional fuel from seeping into the subsurface.

c. Alternative 2 - This alternative will achieve long-term effectiveness and permanence based on BIOPLUME II modeling results.

1. There is a potential future risk to people in Buildings 423 and 446 due to inhalation of contaminants that may volatilize from underlying groundwater. However, the potential risk is minimal due to the limited extent of the saturated sand fill and very slow groundwater flow rates in the native clay. In addition, both buildings have sound concrete foundations which currently minimize transport of vapors into the buildings.

2. The risk receptor evaluation did not identify a complete exposure pathway from the site to local wildlife. Ecological risks may become important if contaminants are transported to a surface water body where wildlife could be exposed. Given the slow groundwater velocities, the distance from the site to the nearest ecological receptor location, and indications that biodegradation is taking place, it is unlikely that ecological risks from this site will be significant.

3. This criterion will be met only if the source of contamination (spills and/or leaks) no longer exists. Better work practices and the installation of spill pads to direct spilled fuel to an oil/water separator have prevented additional fuel from seeping into the subsurface.

d. Alternative 3 - This alternative will achieve long term effectiveness and permanence; however, the potential exists for air sparging to cause the plume to migrate to other locations, creating potential exposure hazards in different locations.

e. Alternative 4 - This alternative will achieve long term effectiveness and permanence.

12.6 Criterion 4: Reduction of Toxicity, Mobility, and Volume (TMV)

a. This criterion addresses the statutory preference for remedies that employ treatment as a principal element. The assessment against this criterion evaluates the anticipated performance of the specific treatment technologies an alternative may employ.

b. Alternative 1 - This alternative will eventually reduce the TMV of contaminants due to biodegradation; however, the degradation rate will be unknown since no monitoring or modeling would be conducted.

c. Alternative 2 - This alternative will reduce the TMV of contaminants due to natural attenuation based on results from biodegradation studies and BIOPLUME II modeling efforts. Biodegradation was assessed by performing a laboratory microcosm study using site soil and showed strong indications of both anaerobic and aerobic biodegradation. The study also found that the total assimilative capacity of the groundwater (61,000 µg/L) exceeds the total maximum concentration of BTEX observed at the site (52,000 µg/L). Therefore, there appears to be sufficient electron acceptors in the groundwater to biodegrade the hydrocarbons present. In addition, the BIOPLUME II model predicted that the plume will not travel very far as it is migrating radially outward at a very slow rate (0.25 feet/year) and that the degradation of BTEX contaminants will continue to occur.

d. Alternative 3 - This alternative will reduce the TMV of contaminants present in the subsurface. However, with air sparging the possibility exists that air injection can create channeling in the subsurface, promoting contaminant migration.

e. Alternative 4 - This alternative will reduce the TMV of contaminants present in the subsurface.

12.7 Criterion 5: Short-Term Effectiveness

a. This criterion addresses short-term impacts of the alternative. The assessment against this criterion examines the effectiveness of alternatives in protecting human health and the environment during the construction and implementation of a remedy.

b. Alternative 1 - The current land use at this site defines the short-term effectiveness of this alternative. Short-term risks associated with this alternative include unknown exposure potential to unknown contaminant concentrations. There are, however, no current risks to human health due to exposure to contaminants at the site. This conclusion is supported by industrial hygiene sampling, regulated by OSHA, conducted by the base Bioenvironmental Engineering office at the TC/TTUHA.

c. Alternative 2 - The only short-term risks associated with this alternative involve the potential for contaminant exposure during sampling of monitoring wells. A risk receptor evaluation concluded there are no current risks to human health due to exposure to contaminants from the site or current pathways for exposure of wildlife to contamination at the site.

d. Alternative 3 - Short-term risks involved with this alternative include the potential for exposure to contaminants during sampling of monitoring wells and increased volatilization of contaminants from the subsurface, increasing exposure hazards.

e. Alternative 4 - Short-term risks associated with this alternative include the potential for exposure to contaminants during sampling of monitoring wells and increased risk of exposure via inhalation and dermal contact during pump and treat operations. There is also a potential ecological exposure as a result of pumping contaminated groundwater from the subsurface to the air stripper.

12.8 Criterion 6: Implementability

a. The assessment against this criterion evaluates the technical and administrative feasibility of the alternatives and the availability of the goods and services needed to implement them.

b. All alternatives would be easily implemented.

12.9 Criterion 7: Cost

a. Cost encompasses all engineering, construction, and operation and maintenance costs incurred over the life of the project. The assessment against this criterion is based on the present worth of these costs for each alternative. In ranking costs from least to most expensive, Alternative 1 would be the least expensive choice, followed by Alternatives 2, 3, and 4, respectively.

b. Alternative 1 - There are no costs associated with this alternative since nothing would be done at the site.

c. Alternative 2 - The cost of this alternative is based on the cost of the LTM program established and is estimated at \$75K annually. Over a five-year period, the total cost for LTM would be \$375K. This includes sample collection and analyses.

d. Alternative 3 - The cost for air sparging is similar to that of bioventing, except that air is injected below the water table to promote the remediation of groundwater. In addition to sampling and analyses, estimated at \$75K annually for Alternative 2, operating costs for this alternative are estimated at \$15 per cubic yard. Based on the volume of contaminated groundwater present at the site, costs for this alternative are estimated at \$800K, and include costs for equipment, operation, sampling and analyses. These costs do not include treatability studies which would be required prior to installation at the site.

e. Alternative 4 - Startup costs for this alternative are estimated at \$2M to \$3M depending on the treatment capacity and the type of air stripper system. Operating costs for typical pump and treat systems generally range from \$10K to \$150K per gallon of contaminant removed. These costs are substantial since the volume of contamination has been estimated at 640 gallons. In addition, the cost for this alternative is based on the assumptions that discharge under a modified NPDES permit will be allowed. These costs do not include treatability studies which would be required prior to installation at the site.

12.10 Criterion 8: State Acceptance

a. This criterion, which is an ongoing concern throughout the remedial process, reflects the statutory requirement to provide for substantial and meaningful State involvement. A Proposed Plan was submitted to the North Dakota Department of Health (NDDH) and the US Environmental Protection Agency (EPA). Representatives from NDDH attended the Public Hearing, held on 6 Sep 95, for the Proposed Plan. Comments made by NDDH were addressed at the Public Hearing and are incorporated into this Decision Document. Final NDDH acceptance will be issued upon their receipt of this Decision Document. Grand Forks AFB received no comments from the EPA.

b. Alternative 1 - For this no action alternative to be accepted by the NDDH, verification of contaminant reduction is required. This could only be accomplished by continued groundwater monitoring/modeling.

c. Alternative 2 - Although BTEX concentrations are above the MCLs, the NDDH would most likely approve of this alternative since natural attenuation appears to be occurring at the site, the contaminant plume is migrating outward at a very slow rate, groundwater is not used for drinking water purposes, there is no current human health or ecological risk at the site, and the groundwater appears to have a high enough assimilative capacity to degrade the contaminants. In addition, a current trend in the environmental field is to move away from costly remediation technologies to less costly in situ biodegradation technologies if the contaminated site poses very little risk. Representatives from NDDH attended the Public Hearing, held on 6 Sep 95, for the Proposed Plan describing this alternative as the preferred remedial action. Comments made by the NDDH were addressed and incorporated into this Decision Document. Final NDDH acceptance of this remedial alternative will be issued upon their receipt of this Decision Document.

d. Alternatives 3 and 4 - The NDDH would most likely approve of these alternatives since they are proven technologies that have been used to remediate sites contaminated with BTEX constituents.

12.11 Criterion 9: Community Acceptance

a. This criterion reflects the community's apparent preferences or concerns about alternatives.

b. The TRCs, RABs, and IR have been the avenue in which the base has informed the community of IRP activities. TRC meetings were held from Dec 91 to Dec 94. In Dec 94, TRCs were converted to RABs, which are held quarterly. The current RAB members have been informed of the decision to finish the TC/TTUHA by natural attenuation and have not reacted negatively. Overall, there has been very little public interest in this activity, based on the lack of questions and/or comments posed by the community members of the RABs. A few members have expressed that remediation has been very costly in the past and prefer the most cost effective solution that will protect human health and the environment.

c. A fact sheet discussing the TC/TTUHA and natural attenuation has been prepared and distributed to RAB members and other interested parties as well as placed in the IR. A Proposed Plan, RABs, and the IR have all provided an opportunity for public comment/involvement in this and other base IRP activities.

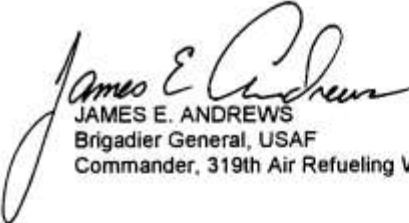
d. The Proposed Plan was placed in the IR at the Grand Forks Public Library for a 30-day period during which the community was invited to review and comment on the Plan. An article advertising the Plan's availability at the Library was placed in the Grand Forks Herald, a local newspaper. A Public Hearing to discuss the Proposed Plan was held on 6 Sep 95 at Grand Forks AFB. No comments were received from the public.

13.0 CONCLUSION

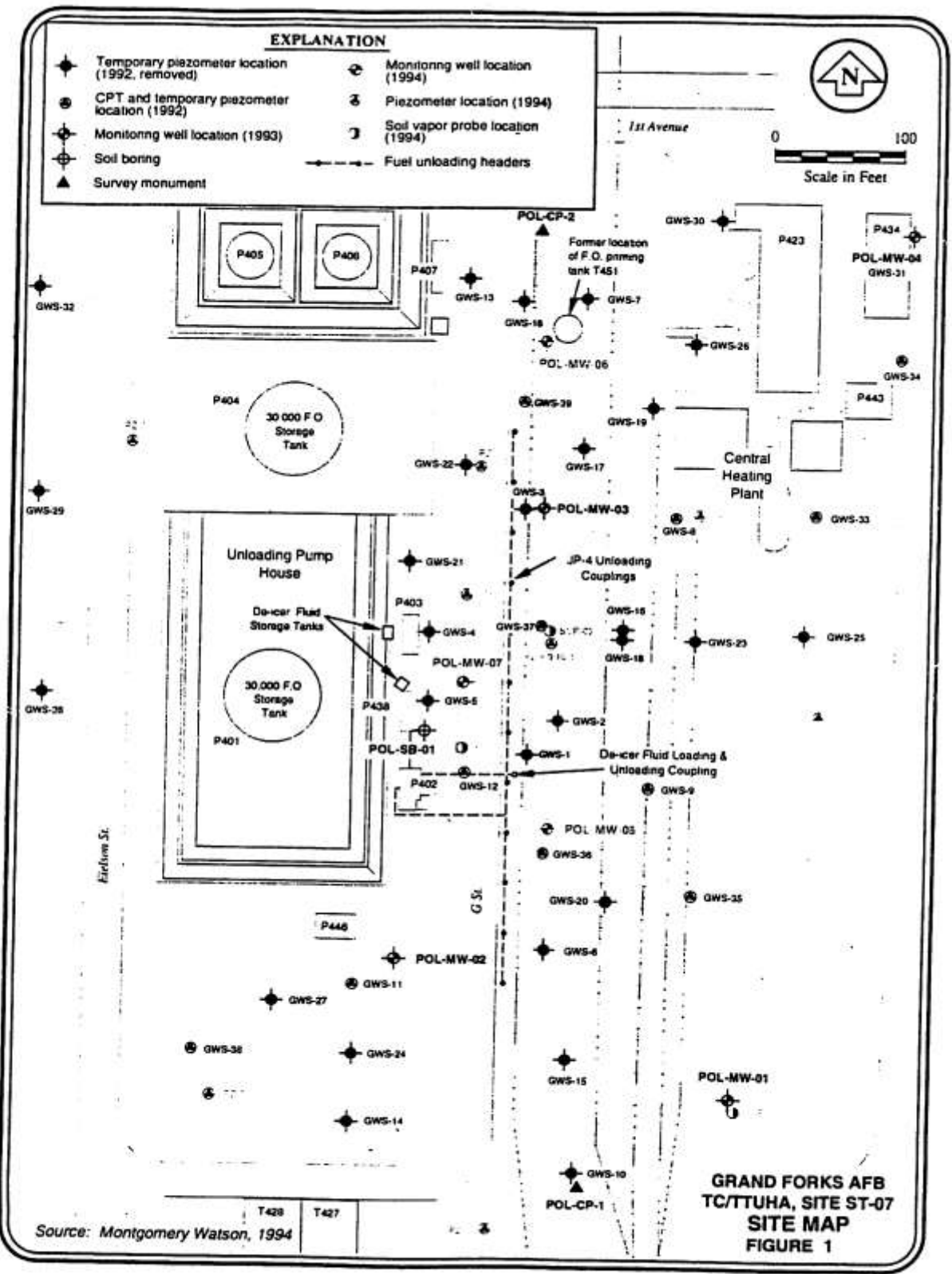
13.1 The selected alternative for the TC/TTUHA is alternative 2, natural attenuation. This alternative includes groundwater modeling and monitoring. Analysis of the selected action indicates that natural attenuation is a viable remediation technology because the contaminants of concern are hydrocarbons, which have been proven to be naturally biodegradable at numerous sites. Groundwater is not used for drinking water on base and the plume migrating very slowly (0.25 feet/year), so contaminants will not be transported rapidly from the source area.

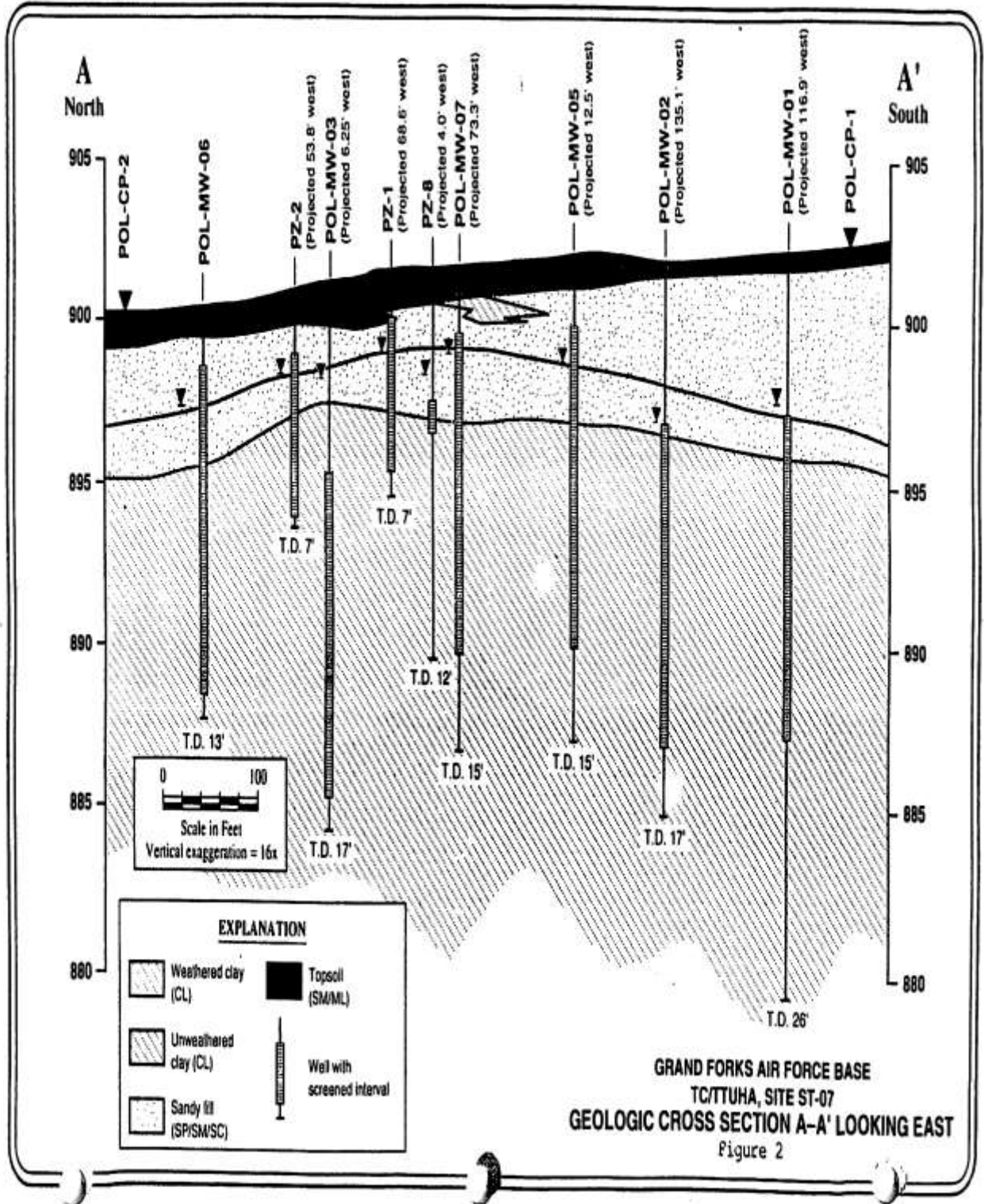
13.2 Biodegradation studies also support natural attenuation by indicating the presence of both anaerobic and aerobic biodegradation. These studies determined that the total assimilative capacity of the groundwater exceeds the total maximum concentration of BTEX observed at the site, indicating there are sufficient electron acceptors in the groundwater to biodegrade the hydrocarbons present. The BIOPLUME II model predicts the plume will not migrate away from the site and the degradation of BTEX contaminants will continue to occur. In addition, a risk receptor evaluation concludes there are no current risks to human health due to exposure to contaminants at the site or pathways for exposure of wildlife to contamination at the site.

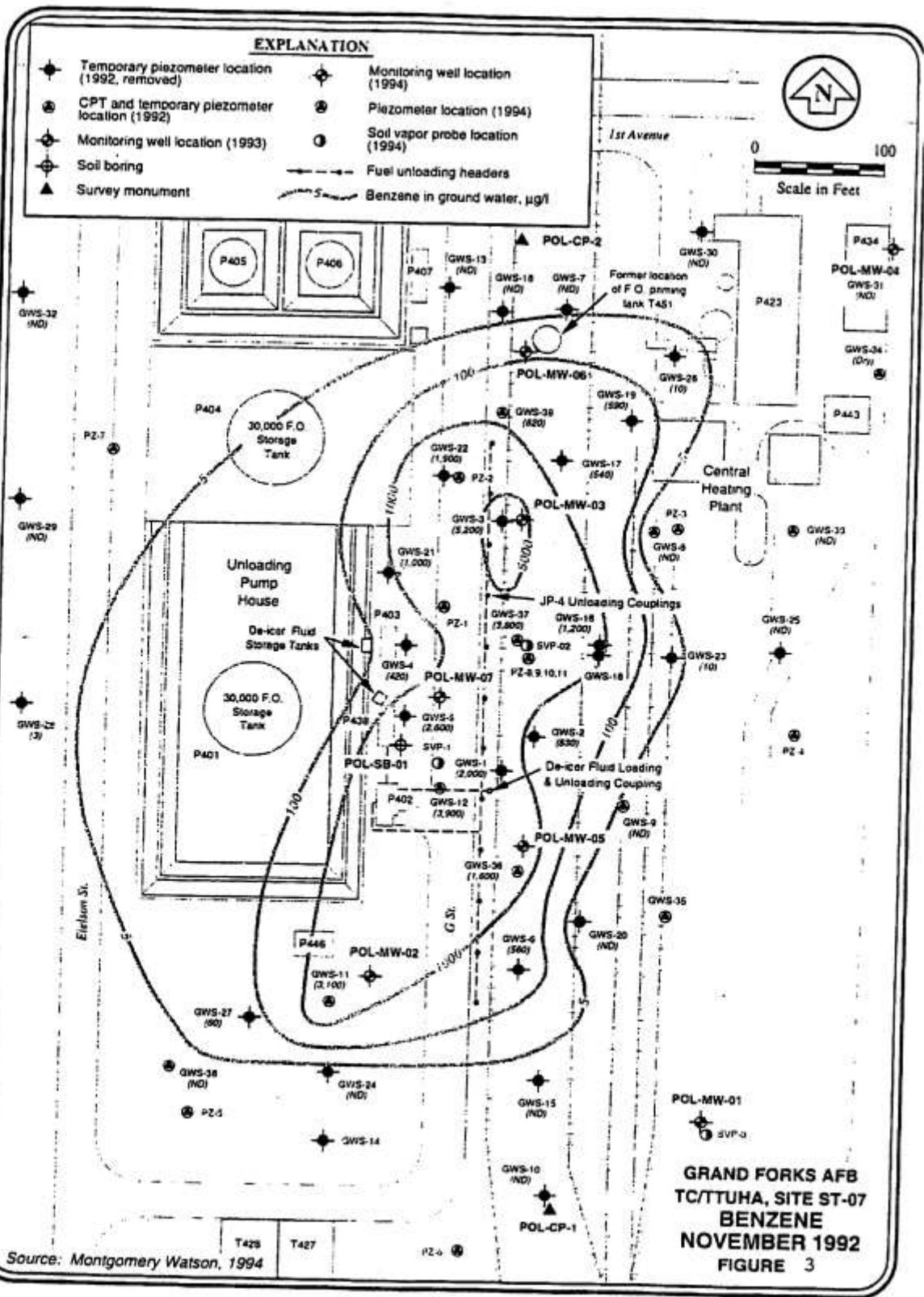
13.3 Alternative 2, natural attenuation, is a viable and pragmatic approach to remediating TC/TTUHA based on the previously mentioned factors.


JAMES E. ANDREWS
Brigadier General, USAF
Commander, 319th Air Refueling Wing

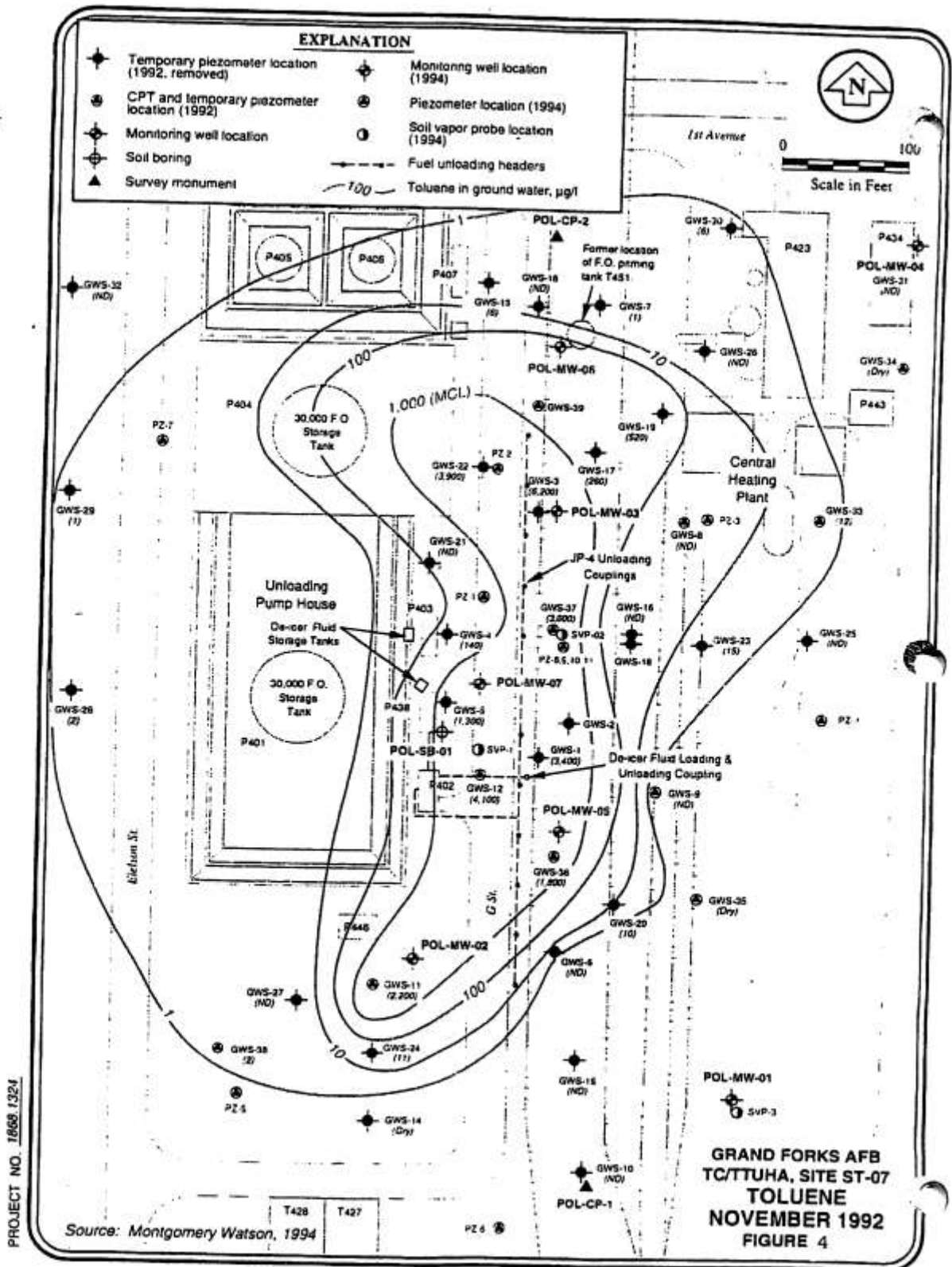
PROJECT NO. 1868.1324

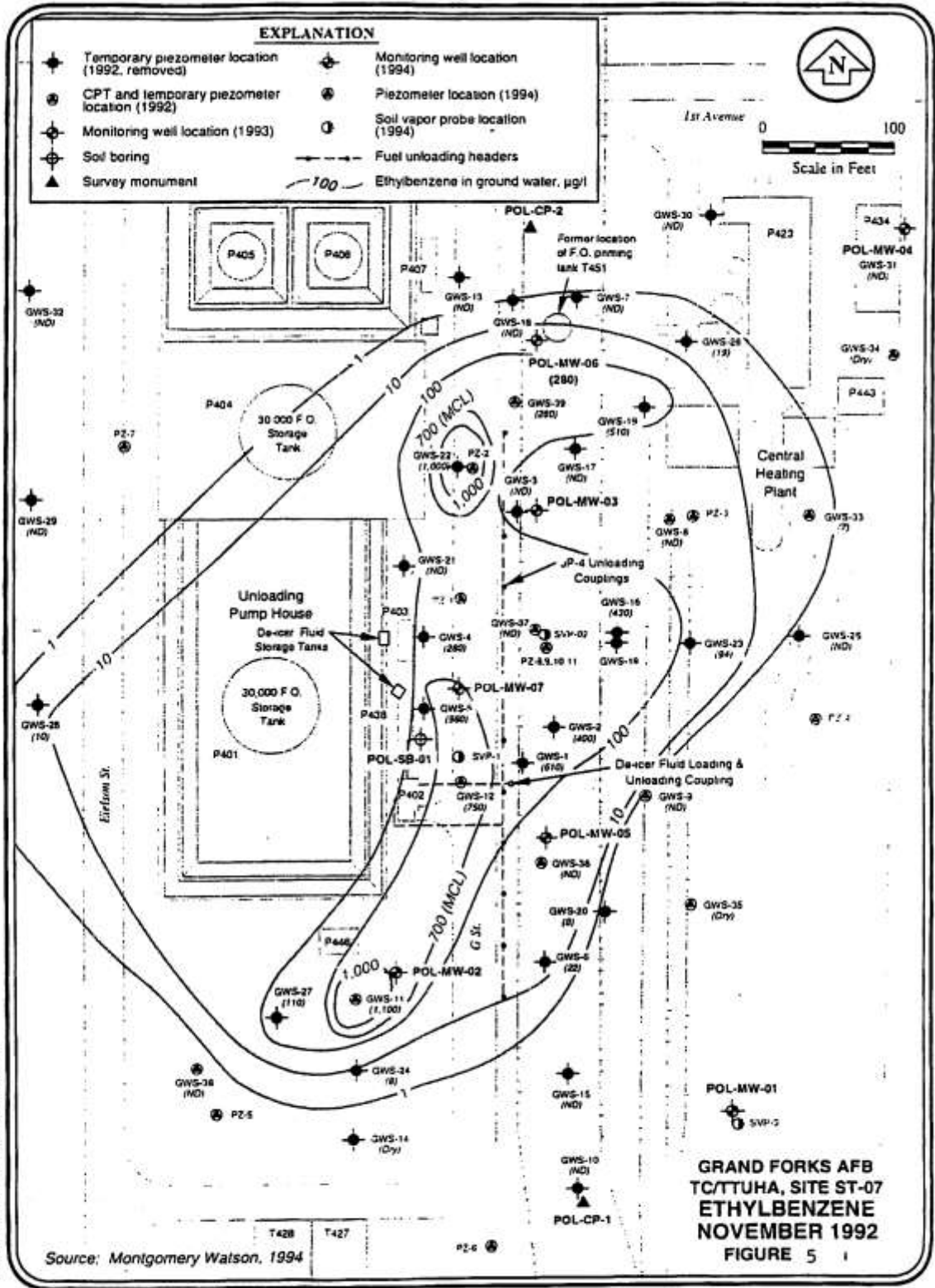






PROJECT NO. 1858.1324





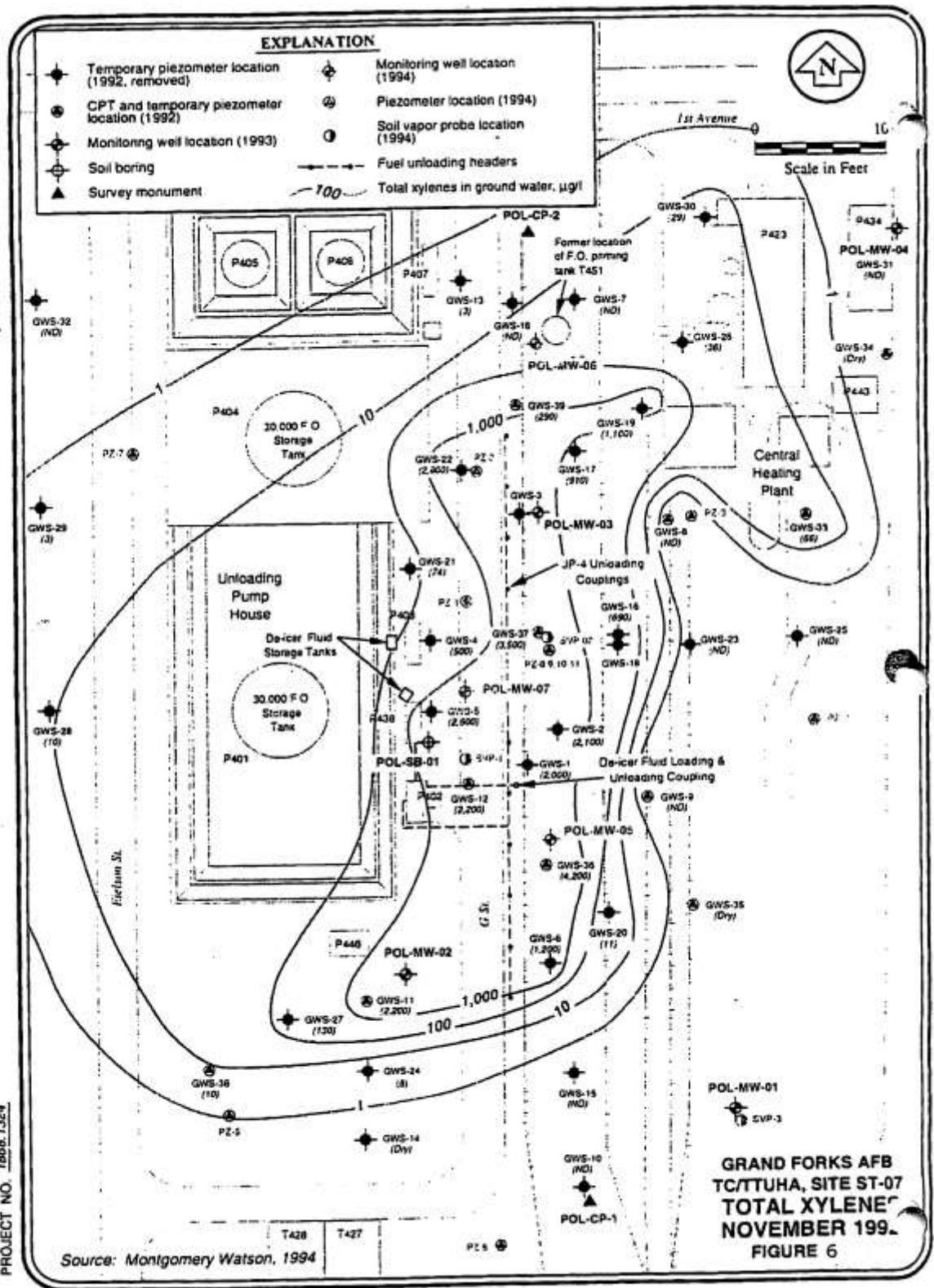


Table 1

SUMMARY OF ORGANIC CONTAMINANTS IN GROUND WATER ^(c)

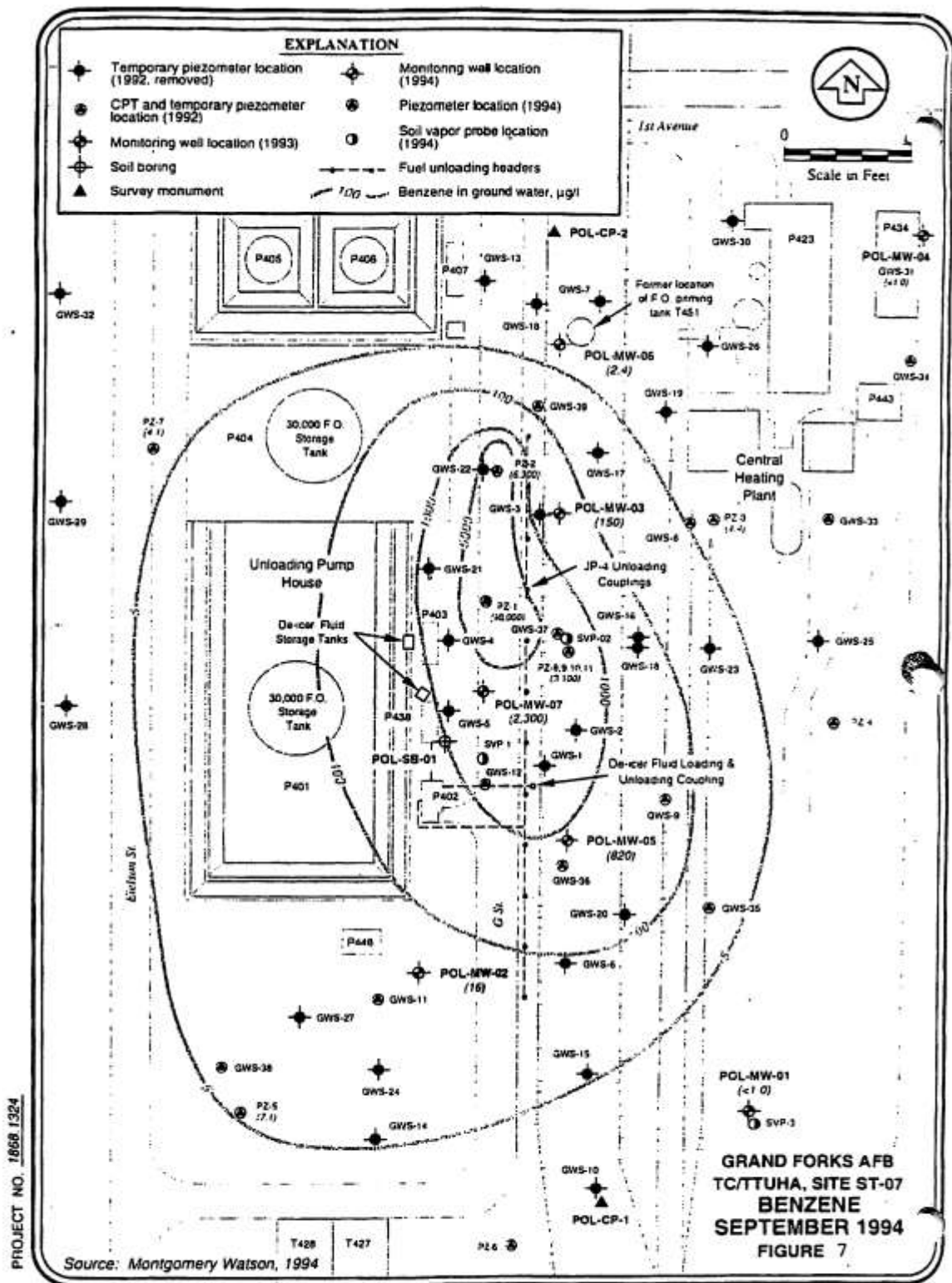
Monitoring Location	Date Sampled	Benzene (µg/l)	Toluene (µg/l)	Ethylbenzene (µg/l)	m, p-xylenes (µg/l)	o-xylene (µg/l)	1,2,4-Trimethylbenzene ^(a) (µg/l)	Napthalene (µg/l)	TPH ^(d) (mg/l)	Comments
POL-MW-01	9/26/94	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0		
POL-MW-02	9/26/94	16	0.092	14	8.7	0.20	2.1	<1.0		
POL-MW-03	9/26/94	150	0.23	47	45	1.5	5.2	<2.5	1.4	
POL-MW-04	9/27/94	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0		
POL-MW-05	9/26/94	820	1,600	110	2,600	1,500	360	19		
POL-MW-06	9/26/94	2.4	1.2	220	36	2.0	27	2.4		
POL-MW-07	9/26/94	710	2,200	480	1,800	750	360	<50	3.7	
POL-MW-07 Duplicate	9/26/94	2,300	3,900	620	3,200	1,500	510	<50		
PZ-1	9/27/94	10,000	28,000	2,900	7,400	3,300	870	<500		Hydrocarbon sheen Observed ^(b)
PZ-2	9/27/94	6,900	14,000	2,000	4,900	2,100	610	<250		Hydrocarbon sheen Observed ^(b)
PZ-3	9/28/94	4.4	71	1.8	8.9	4.8	1.7	0.29		
PZ-5	9/28/94	7.1	170	3.8	10	5.2	2.1	<2.5		
PZ-7	9/28/94	4.1	420	1.9	4.6	2.1	1.2	<5.0		
PZ-9	9/28/94	3,100	370	1,500	6,900	3,400	900	25		Hydrocarbon sheen Observed ^(b)

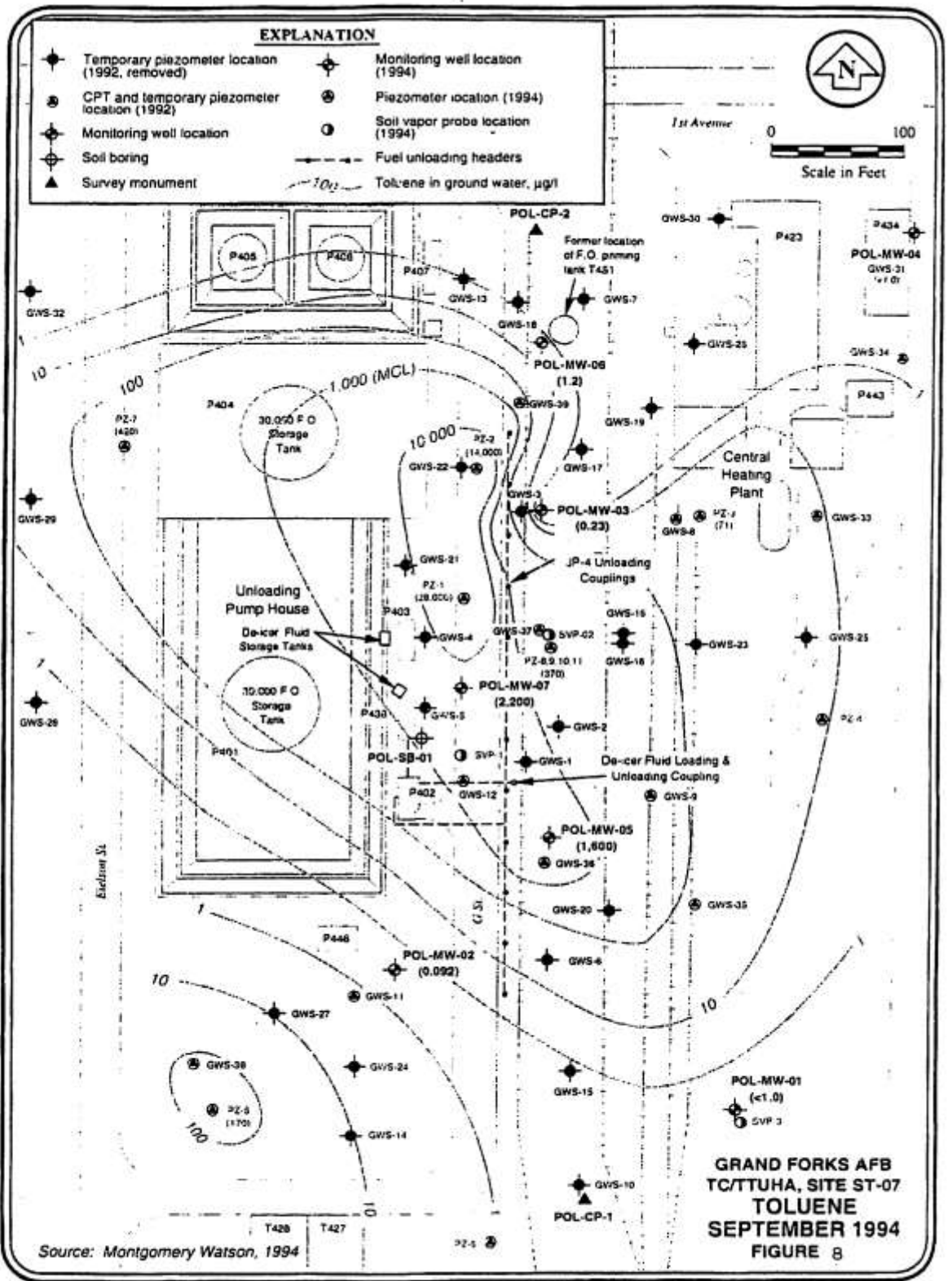
(a) 1,2,4-Trimethylbenzene was analyzed as a tracer compound.

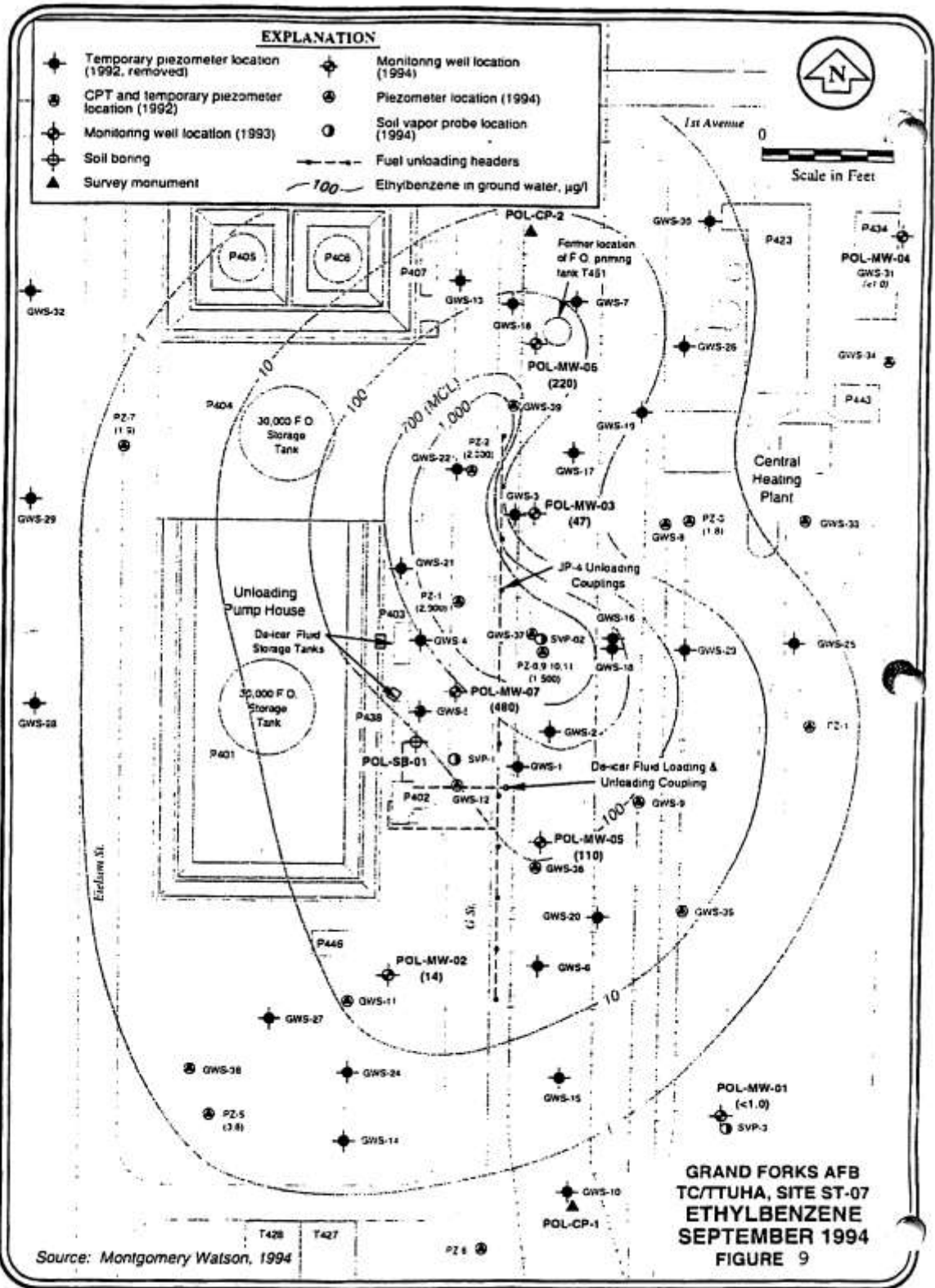
(b) Free product was observed as a coating on the water level indicator. Product thickness could not be measured in the piezometers because they were too small to accommodate the interface probe. The quantity of free product is unknown; however, it appears to be insufficient to accumulate in adjacent monitoring wells.

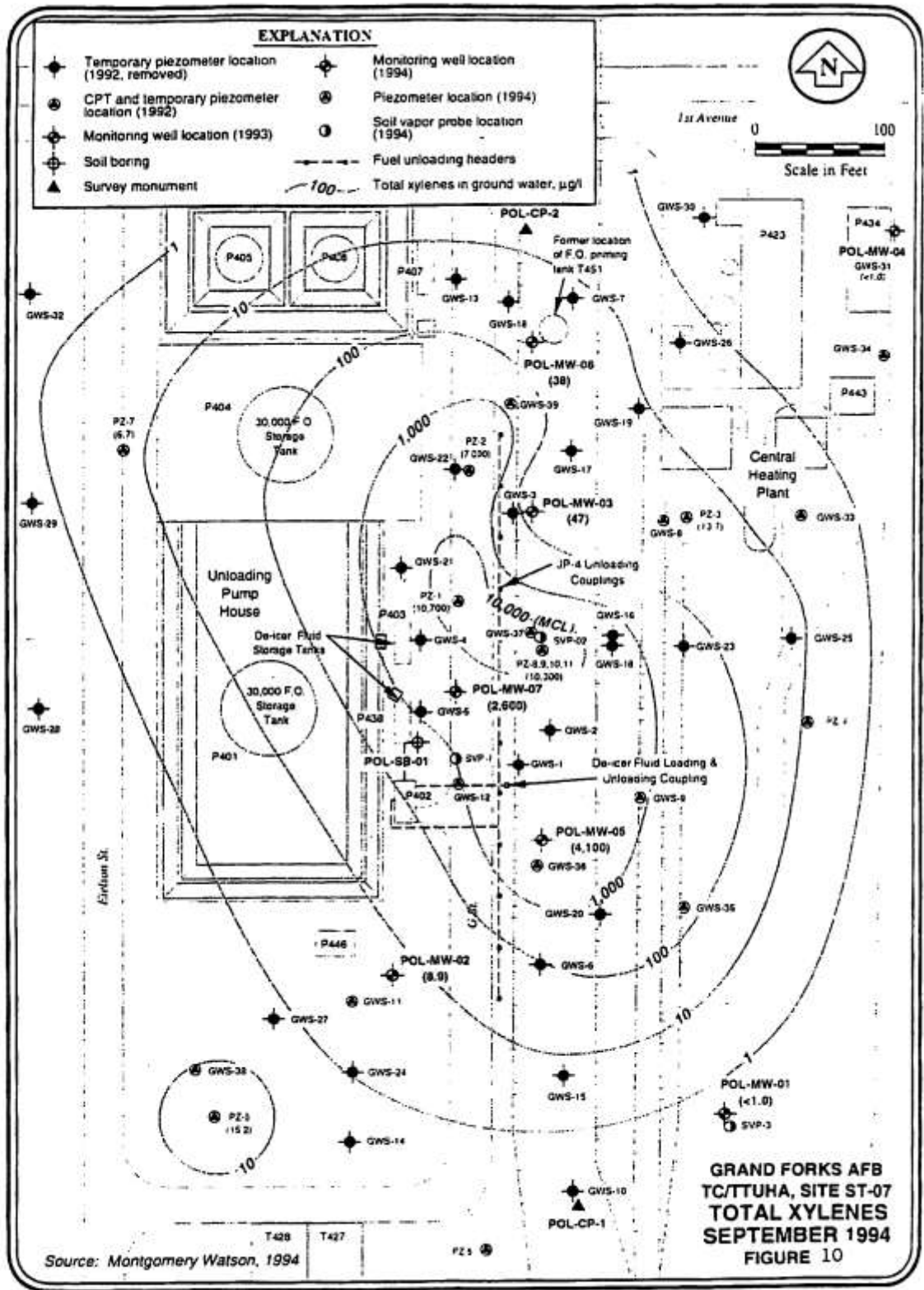
(c) MCLs (µg/L): Benzene (5); Toluene (1000); Ethylbenzene (700); Xylenes (10,000); 1,2,4 - Trimethylbenzene (NA); Napthalene (NA); TPH (NA). "NA" (not applicable) means that the chemical does not have an MCL.

(d) TPH - Total Petroleum Hydrocarbons









PROJECT NO. 1868.1324

Table 2
SUMMARY OF ORGANIC CONTAMINANTS IN SOIL SAMPLES

Sampling Location/Depth (ft bgs)	Date Sampled	Benzene (mg/kg)	Toluene (mg/kg)	Ethylbenzene (mg/kg)	Total Xylenes (mg/kg)	Napthalene (mg/kg)	TEPH (mg/kg)	TVPH (mg/kg)
POL-MW-05 5.0 - 5.5	9/20/94	<0.31	<0.31	<0.31	1.7	<0.31	<12	110
POL-MW-05 5.5 - 7.0	9/20/94	<1.5	<1.5	8.2	29	<1.5	63	350
POL-MW-06 4.5 - 5.0	9/20/94	<0.0059	<0.0059	<0.0059	<0.0059	<0.0059	<12	<1.2
POL-MW-06 6.5 - 7.0	9/20/94	<0.34	<0.34	0.58	2.3	<0.34	20	570
POL-MW-07 4.5 - 5.0	9/21/94	<0.0057	<0.0057	<0.0057	<0.0057	<0.0057	<11	<1.1
POL-MW-07 4.5 - 5.0 Duplicate	9/21/94	<0.0057	<0.0057	<0.0057	<0.0057	<0.0057	<11	<1.1
POL-MW-07 5.0 - 5.5	9/21/94	<140	880	370	1,500	<140	3,200	14,000

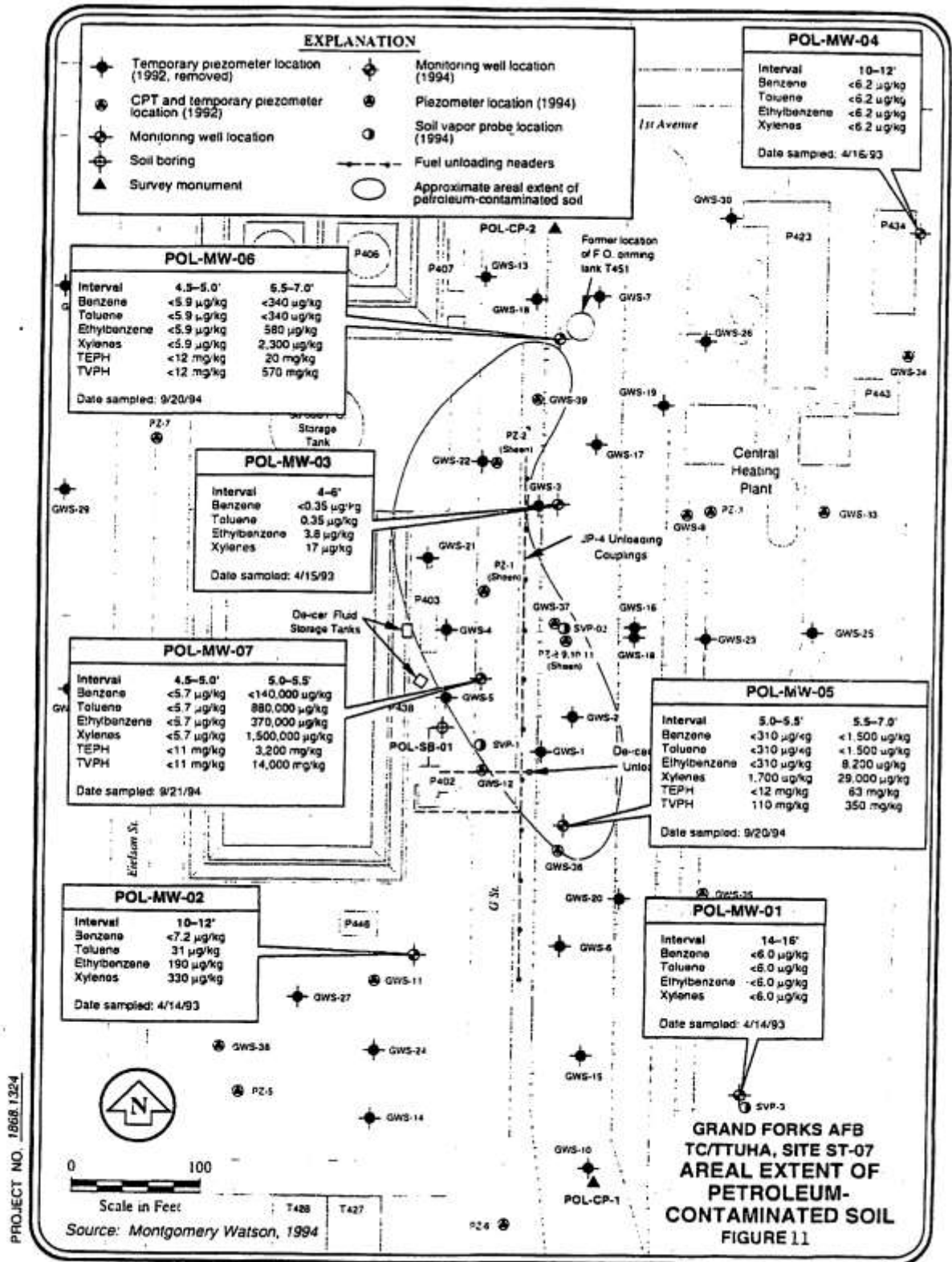


TABLE 3
RESULTS OF BIOPLUME MODELING SCENARIOS

Simulation Time	With Biodegradation		Without Biodegradation	
	Dissolved Mass Remaining (lb)	Maximum Benzene Concentration at Site ST-07 ($\mu\text{g/l}$)	Dissolved Mass Remaining (lb)	Maximum Benzene Concentration at Site ST-07 ($\mu\text{g/l}$)
5 years	30	7,600	66	16,000
10 years	20	5,800	73	18,000
20 years	15	5,000	96	21,000

Table 4
RESULTS OF LONG TERM MONITORING AT TC/TTUHA

LOCATION	DATE	ANALYTE ($\mu\text{g/L}$)				
		BENZENE	TOLUENE	ETHYLBENZENE	<i>m,p</i> -XYLENE	<i>o</i> -XYLENE
MW-01	9/94	ND ¹	ND	ND	ND	ND
	6/95	ND	ND	ND	ND	ND
MW-02	9/94	16	0.092	14	8.7	0.20
	6/95	1.52	ND	2.26	ND	1.37
MW-03	9/94	150	0.23	47	45	1.5
	6/95	620	ND	254	283	ND
MW-04	9/94	ND	ND	ND	ND	ND
	6/95	ND	ND	ND	ND	ND
MW-05	9/94	820	1600	110	2600	1500
	6/95	590	ND	414	1000	271
MW-06	9/94	2.4	1.2	220	36	2.0
	6/95	ND	ND	79.6	12.2	ND
MW-07	9/94	2300	2200	480	1800	750
	6/95	2380	2290	705	1890	491

¹ ND - Not Detected

SWMU-11

POL Tank Containment Systems

Closure Documentation

DRAFT

Closure Documentation

January 1997 meeting between NDDH and GFAB agreed to SWMU-11 closure.

DRAFT

SWMU-12

Abandoned Fuel Lines

Closure Documentation

DRAFT

Closure Documentation

January 1997 meeting between NDDH and GFAFB agreed to SWMU-12 closure.

DRAFT

SWMUs-13 and 14

Refueling Ramps and PADS and Hydrant Fuel Supply System

Closure Documentation

DRAFT

GRAND FORKS AIR FORCE BASE
Grand Forks AFB, North Dakota
March 14, 2007

Facility/Unit Type:	United States Air Force Base Hydrant Fuel System and Aircraft Parking Ramp (Site ST-08 / SWMU 13 and 14)
Contaminants:	Benzene, Total Petroleum hydrocarbons
Media:	Soil and groundwater
Remedy:	Monitored Natural Attenuation (MNA) through annual groundwater monitoring at ten wells throughout the site

FACILITY DESCRIPTION

ST-08 is an aircraft parking ramp and hydrant refueling supply system that supports a U.S. Air Force (USAF) refueling mission. Infra-structure around the site supports flight-line activities. Environmental Restoration Program (ERP) Site ST-08 is comprised of Solid Waste Management Units (SWMU) 13 (Refueling Ramps and Pads) referred to as the C ramp, and 14 (Type II Hydrant Fuel Supply System) investigated in 1999 under the Environmental Restoration Account (ERA) remedial investigation/feasibility study (RI/FS) program for the USAF and a Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI)-Corrective Measures Study (CMS) under the North Dakota Department of Health, which is the lead regulatory agency for cleanup of contaminated areas in North Dakota.

SWMU 13 is a large concrete apron (2,400 feet by 800 feet) located west of buildings 601, 661 and 670; and east of the runway in the central portion of the Base. The apron was installed in 1957 and is still in use today. Aircraft parked on the apron were serviced and refueled from tanker trucks or from the fuel hydrant system (SWMU 14) located beneath the C-ramp and west of the taxiway where support buildings are located.

SWMU 13 - C Ramp Apron

Prior to 1988, spills resulting from refueling activities were typically hosed off the concrete ramp onto the surrounding soil. Two substantial fuel releases in this area were documented. The first documented release occurred prior to 1974, when a fuel storage tank, located immediately adjacent to a pump house, overfilled for several

minutes before the system was shut off. An estimated 1,200 to 3,000 gallons of fuel were released. The second was associated with the burning of a B-52 bomber on January 27, 1983. An undetermined amount of fuel burned before the fire was extinguished, and the remaining fuel was hosed off the ramp.

During May and June 1995, a confirmation sampling project was performed by Parsons Engineering Science, Inc. (Parsons, 1995) to determine the presence or absence of contamination in soil and groundwater around the perimeter of the C ramp. Soil samples were collected from the probe holes for field headspace screening analysis; field immunoassay testing for total petroleum hydrocarbon (TPH) - diesel range organics (DRO) and polyaromatic hydrocarbons (PAHs); and laboratory analysis for TPH-DRO, PAHs, and benzene, toluene, ethylbenzene, and total xylenes (BTEX). Groundwater samples were collected from ten probe holes for immunoassay testing and laboratory analysis for TPH-DRO, PAHs, and BTEX.

Results from the soil and groundwater immunoassay testing and laboratory analyses indicated that soil and groundwater had been impacted by releases of petroleum hydrocarbons around the perimeter of the C ramp.

SWMU 14 - Charlie Ramp Hydrant Fuel System

This fuel hydrant system consists of an underground piping system that previously carried jet fuel from Building 501 through two pump houses (Buildings 611 and 612) to the

C ramp. The pump houses are located on the west side of the C ramp, west of the taxiway, and are approximately 1,200 feet apart. These pump houses delivered fuel through eight lateral lines to 11 hydrants located on the C ramp. An additional fuel distribution pipeline was installed under the west edge of the C ramp in the late 1980s. The new underground pipeline distributes JP-8 jet fuel from the pump house at Building 651 to distribution hydrants located on the west side of the C ramp.

The Building 612 pump house and seven of the eight lateral fueling lines associated with the original fuel distribution system were abandoned sometime between 1991 and 1995. The buildings and underground storage tanks (USTs) associated with Building 612 were removed in November 2000. Building 611 was demolished and associated tanks were removed in 2005.

In the fall of 1996, FEC conducted a direct push technology (DPT) investigation, which is commonly referred to as a GeoProbe® investigation, at both buildings to determine the lateral and vertical extent of soil and groundwater contamination potentially associated with the former JP-4 jet fuel recovery USTs. Soil and groundwater samples were collected from 21 probe holes advanced around Building 611 and from 29 probe holes advanced around former Building 612.

RCRA Facility Investigation/Corrective Measures Study

The RCRA Corrective Action program oversees the cleanup of existing contamination and any future contamination at active facilities. In its ongoing effort to improve the corrective action program, EPA, with the assistance of interested stakeholders, identified several improvements to increase the efficiency and cost-effectiveness of facility cleanups.

One of the improvements is "results-based" cleanup guidance, as outlined under the RCRA Cleanup Reforms announcement (EPA530-F-99-018, July 1999 available at: <http://www.epa.gov/correctiveaction/reforms/rcfoms1.pdf>). Results-based corrective action encourages technical and administrative innovation to achieve environmentally protective cleanups on a facility-specific basis.

Results-based approaches emphasize outcomes, or results, in cleaning up actual releases, rather than the process used to achieve those results. The benefits of a results-based corrective action are:

- Improved focus on the end goals of corrective action and intermediate milestones, such as environmental indicators, rather than on unnecessary adherence to a predetermined administrative process
- Generally, more rapid achievement of results
- Resource savings to both owner/operator and implementing agency

Additional information about results-based corrective action approach is included in Attachment A.

A RFI was conducted from fall 1999 to spring 2001 to complete characterization of the entire Charlie Ramp area of the concrete apron and fuel hydrant system. Several investigative techniques were employed including DPT soil and groundwater sampling, groundwater monitoring well installations, aquifer testing, and semi-annual groundwater sampling. Analytical results from the DPT work indicated that the highest levels of fuel contamination were found near fuel hydrant system lines, existing and abandoned valve vaults, and pipe junction vaults. Three areas of concern were identified near fuel hydrant structures at the Charlie Ramp. Two of these areas were selected to represent the characteristics of the contamination at the Charlie Ramp, Installation Restoration Program (IRP) Site ST-08.

The two areas were selected for semi-annual monitoring based on the presence of free petroleum product found during phase I of the RFI/CMS. These areas are identified as Areas 1 and 2 at IRP Site ST-08. Area 1 is located on the west side of SWMU 13 (the C Ramp) and adjacent to an abandoned fuel hydrant line, lateral-B, associated with SWMU 14. Area 2 is located on the west side of the taxiway adjacent to an abandoned fuel hydrant line junction box near lateral-D, also associated with SWMU 14. Areas 1 and 2 are illustrated on Figure 2-1 and 2-2 (Foothill Engineering Company, LLC [FEC] 2002). Groundwater monitoring wells were installed in Areas 1 and 2 and were sampled semi-annually to evaluate fate, transport, and remediation strategies.

Total BTEX concentrations in groundwater have generally decreased over the monitoring period (May 2000 to November 2005) and benzene has been the only constituent over the maximum concentration level (MCL).

Groundwater concentrations of benzene have fluctuated at the site and with highest readings in May 2001 and November 2004. The lowest readings were observed in November 2005 at 35 parts per billion (ppb).

TPH compounds in groundwater have generally decreased to concentrations below the North Dakota Department of Health (NDDH) action level.

EXPOSURE PATHWAYS

The human exposure pathways via soil and groundwater are ingestion, inhalation, and dermal contact. Human exposure potential includes occasional construction and maintenance personnel performing excavations at the site.

Ramp personnel may be exposed to contaminants migrating as gas into buildings if contaminant plumes migrate. Because site access is currently restricted and near-term residential use of the site is not probable, only exposure for the on-site worker may pose an unacceptable health risk. The nearest residential-use area is over one mile away. Institutional controls established for the site are sufficient to control the potential for exposure.

Risk to wildlife is considered very low because the area is industrial without sufficient habitat and activities discourage wildlife from inhabiting the area. No endangered species or sensitive environmental concerns are present and wetland habitat is not a concern given the distance of such habitat from the site. The RI/FS did not identify a complete exposure pathway to an ecological receptor.

Table 1 summarizes the maximum concentrations for contamination detected at Site ST-08 and the cleanup goals for the contaminants of concern (COCs).

**TABLE 1
CONTAMINATION DETECTED AND CLEANUP GOALS**

Media	Estimated Volume	Contaminant	Maximum Concentration	Action Level	Cleanup Goal ¹	Point of Compliance
Soil	Various depths	TPH	7,540 ppm	100 ppm ²	100 ppm	Not given
Groundwater	Not given	TPH	17,930 ppb	500 ppb ³	500 ppb	Not given
		benzene	3,100 ppb	5 ppb ⁴	5 ppb	

1 - The Cleanup Goal has been established to be equal to the Action Level.

2 - The Cleanup Goal for TPH in soil is consistent with NDDH guidance for remediation of petroleum spills, "Guidelines for Cleanup Action Levels for Gasoline and Other Petroleum Hydrocarbons," NDDH, Division of Waste Management - Underground Storage Tank Program, in accordance with North Dakota Underground Storage Tank (UST) Rules, Chapter 33-24-08 of the North Dakota Administrative Code (NDAC) Article 33-24.

3 - There is no MCL for TPH in groundwater, but the remedial action is consistent with NDDH guidelines for TPH cleanup action levels, "Guidelines for Cleanup Action Levels for Gasoline and Other Petroleum Hydrocarbons," NDDH, Division of Waste Management - Underground Storage Tank Program.

4 - MCL (Title 40, Code of Federal Regulations [CFR], Part 141, Subpart G).

PROPOSED REMEDY

The corrective measures identified in the CMS for Site ST-08 included: no action, MNA, and bioventing with MNA. Institutional controls were considered as part of each alternative during the remedial activities. However, institutional controls were not considered part of the permanent remedy because land use will be unrestricted upon completion of remedial efforts. The proposed remedy was selected after evaluating the feasibility and effectiveness of the proposed alternatives in meeting the remedial objectives for the site, including reduction of the potential for acute and chronic human health risks. Table 2 summarizes the comparison of alternatives.

The proposed remedial action for Site ST-08 is MNA or intrinsic bioremediation. Natural attenuation is achieved when naturally occurring in-situ processes transform contaminants to harmless constituents without requiring engineering actions and controls. Natural attenuation is non-intrusive and does not disrupt existing facilities or mission activities during remediation. Contaminants are degraded to simpler and less toxic products by natural processes. Additionally, because the process is in-situ, immediate risk of exposure to contaminants is avoided.

Natural attenuation is the preferred alternative in the Air Force Center for Environmental Excellence (AFCEE) remediation matrix. The AFCEE matrix ranks technologies and processes to be considered for implementation at Air Force sites with common contaminants, such as petroleum hydrocarbons. The matrix indicates that natural attenuation should always be considered as a remedy first and selected based on defensible risk assessment. Natural attenuation, as a remedy, is generally less expensive than conventional ex-situ remediation techniques.

Petroleum hydrocarbons have been shown to be naturally biodegradable at numerous sites throughout the world including sites at GFAFB. The physical aquifer characteristics at ST-08 of low permeability contributing to non-destructive adsorption and dispersion, and the aquifer geochemistry contributing to destructive microbial processes of aerobic biodegradation, denitrification, iron reduction, manganese

reduction, and sulfanogenesis have been demonstrated to be occurring at sufficient capacity to transform contaminants to harmless compounds. This will also result in mobility control of the contaminants. This MNA approach is scientifically defensible based upon contaminant sources, pathways, and potential receptors.

The shallow groundwater flows at an estimated 1.5 to 5 feet per year but does not flow to surface waters through seeps or springs. The tightness of the clay soils present at this site act as a natural control to slow contaminant migration. The contaminated shallow groundwater at this site is not used at the Base or in the surrounding areas. Any contaminated soil in the limited vadose zone (the dry portion of the soil profile) is expected to be remediated with the groundwater. The vadose zone at Area 1 is measured to be less than two feet from the ground surface to the top of the groundwater.

ST-08 is located at the flight line and surrounding field of the Base with little risk to human health or wildlife. Receptors may include incidental visits by birds and range animals such as rabbits and gophers. This wildlife is discouraged from using this area due to man-made runways and parking areas, security patrols, vehicle traffic including aircraft and grounds maintenance. There is little cover for wildlife. Primary health risks are to human populations working in disturbed soil at the site because contamination is approximately 5 feet below the ground surface.

The shallow groundwater at the Base and surrounding areas naturally has high dissolved solids, making the water unsuitable for consumption without treatment. Also, abundant clean drinking water supplies are available in the local community, so it is unrealistic to assume that anyone would utilize this shallow groundwater. It is believed that the natural attenuation process will reduce any petroleum contamination to concentration below action levels prior to reaching receptors due to factors mentioned above. The occasional worker that will be involved in excavation at the site will be protected by institutional controls already in place. Workers will be notified through the underground utility notification system that soil and groundwater contamination will be

encountered in the area. Precautions can then be taken by workers to avoid exposure.

Selection of natural attenuation will be accompanied by sampling and modeling to quantify contaminant mass and predict natural attenuation rates. A long-term monitoring program will be implemented to monitor natural attenuation model predictions and ensure no migration of contaminants. Current institutional controls include restricted access to and use of the site due to flight-line activities at this site; however, no land use restrictions are expected of this site regarding future use. The estimated time for remediation to occur at this site is approximately 15 years but will continue until clean or the risk posed is acceptable for future industrial use.

The proposed remedy of MNA will be accomplished as follows:

- Annual groundwater monitoring will be conducted in Areas 1 and 2 of SWMUs 13 and 14. Up to 10 groundwater monitoring wells will be sampled as appropriate.
- Groundwater samples collected during the annual monitoring will be analyzed for COCs and natural attenuation parameters.
- A report detailing the results of the monitoring and evaluating the natural attenuation potential of the groundwater system at the site will be developed following each annual sampling event.

KEY WORDS:

soil, groundwater; MNA; monitored natural attenuation; institutional controls; dermal contact, inhalation, ingestion; VOCs, benzene; BTEX; TPH; PAH; containment, monitoring

- After several monitoring events, a site model will be developed. Recommendations will be presented in each annual report concerning the performance of the selected remedy and suggest potential changes to enhance remediation efforts
- MNA will continue until concentrations of COCs have been reduced below established regulatory levels shown to be protective of human health and the environment
- Results of the RFI/CMS estimate remediation time to be approximately 15 years
- MNA will no longer be required once contamination levels are reduced below cleanup levels

The total cost, including operation and maintenance costs, is approximately \$1,100,000.

INNOVATIVE TECHNOLOGIES CONSIDERED

None.

PUBLIC PARTICIPATION

The public comment period is 60 calendar days.

NEXT STEPS

The NDDH will initiate the permit modification process for the Grand Forks AFB's Corrective Action Permit after selection of a remedy from the CMS.

CONTACT:

Curtis Erickson
North Dakota Department of Health
918 East Divide Avenue – 3rd Floor
Bismarck, ND 58501-1947
(701) 328-5166

**TABLE 2
COMPARISON OF ALTERNATIVES**

Criteria*	No Action	MNA	Bioventing	
General Standards	1	Minimal human health risks are identified at the site, so No Action is considered protective.	Minimal human health risks are identified at the site, so MNA is considered protective. More sampling is included than No Action, so MNA is considered more protective.	Minimal human health risks are identified at the site, so bioventing is considered protective. However, bioventing can introduce contaminants to the atmosphere and increase potential exposure during operation.
	2	ARARs are anticipated to be met under No Action.	ARARs are anticipated to be met using MNA.	ARARs are anticipated to be met using bioventing.
	3	No Action achieves long-term effectiveness based on preliminary modeling. However, no provisions are included in No Action to refine the model to better predict degradation rates.	MNA achieves long-term effectiveness, and monitoring will better predict or improve confidence in the modeled rates of contaminant degradation.	Bioventing achieves long-term effectiveness, but plume migration is possible from the introduction of air into the subsurface.
	4	No Action will eventually reduce contamination through natural attenuation.	MNA will eventually reduce contamination through natural attenuation. Monitoring of the contamination will allow refinement of the modeling to better predict rates of contaminant degradation.	Bioventing will accelerate contaminant reduction through natural attenuation. However, plume migration is possible from the introduction of air into the subsurface.
Selection Decision Factors	5	No Action based on present land use presents no known current risks.	MNA presents limited short-term risks for worker exposure during monitoring activities.	Bioventing presents limited short-term risks for worker exposure during system construction and operation. Implementation of a health and safety plan would mitigate these risks.
	6	Easily implemented.	Easily implemented.	Challenges include the low permeability of soils, logistics because of proximity to flightline operations, and permitting.
	7	\$0.64M	\$1.1M	\$2.1M
	8	NDDH does not believe No Action provides adequate protection.	NDDH agrees to MNA as the selected remedy.	NDDH believes bioventing will not achieve the remedial action objectives economically.
	9	Limited public interest, but the public has indicated concern over costs of previous environmental activities at the Base.		

* - Criteria include:

- 1 Overall Protection of Human Health and the Environment
- 2 Compliance with Applicable or Relevant and Appropriate Requirements
- 3 Long-Term Effectiveness and Performance
- 4 Reduction of Toxicity, Mobility, and Volume
- 5 Short-Term Effectiveness
- 6 Implementability
- 7 Cost
- 8 State Acceptance
- 9 Public Acceptance

ATTACHMENT A RESULTS-BASED CORRECTIVE ACTION APPROACH

Throughout the years of implementing the Corrective Action program and other cleanup programs (for example, the Superfund program), a results-based approach has been developed that project managers and owner/operators may use to more efficiently identify releases and risks and to accelerate facility cleanup. A successful RCRA program allows flexible program implementation that incorporates many different technical solutions and administrative approaches to site management. Approaches that focus owner/operators on program goals and appropriately reduce the process towards attaining those goals are termed "results-based" and are the primary focus of the effort to improve the corrective action program.

One of the improvements is "results-based" cleanup guidance, as outlined under the RCRA Cleanup Reforms announcement (EPA530-F-99-018, July 1999 available at: <http://www.epa.gov/correctiveaction/reforms/reforms1.pdf>). Greater use of results-based corrective action approaches has been the U.S. Environmental Protection Agency's (EPA's) stated policy since the 1996 Advanced Notice of Proposed Rulemaking (ANPR), Corrective Action for Solid Waste Management Units at Hazardous Waste Management Facilities (61FR19432). Results-based corrective action encourages technical and administrative innovation to achieve environmentally protective cleanups on a facility-specific basis.

Results-based approaches emphasize outcomes, or results, in cleaning up actual releases, rather than the process used to achieve those results. Results-based approaches involve setting goals and, where appropriate, allowing owner/operators to move towards those goals without the implementing agency unnecessarily dictating how owners or operators will attain the goals. EPA continues to encourage program implementers and facility owner/operators to focus on the desired result of cleanup rather than a mechanistic cleanup process. The benefits of a results-based corrective action are:

- Improved focus on the end goals of corrective action and intermediate milestones, such as environmental indicators, rather than on unnecessary adherence to a predetermined administrative process
- Generally, more rapid achievement of results
- Resource savings to both owner/operator and implementing agency

Additionally, the Superfund program began developing presumptive remedy guidance in 1991 using past experience to streamline cleanups. Presumptive remedies are preferred technologies for common categories of sites, based on historical patterns of remedy selection and EPA's scientific and engineering evaluation of performance data on technology implementation. EPA expects project managers to use presumptive remedies at appropriate RCRA facilities to help ensure consistency in remedy selection and implementation and to reduce the cost and time required to investigate and remediate similar types of sites. In general, even though EPA's presumptive remedy guidance documents were developed for CERCLA sites, project managers should use them at appropriate RCRA corrective action facilities to focus investigations and simplify the evaluation of remedial alternatives and remedy selection processes.

The following is a list of some oversight activities that have been adapted to facilities to decrease the level of oversight as deemed appropriate. These include, but are not limited to:

- Eliminating duplicative state/federal reviews of documents
- Eliminating interim deliverables while maintaining accountability of the owner/operator to produce a measurable end product
- Time-limited review where agency approval is not required for the owner/operator to proceed
- Increasing the use of meetings, briefings, and other communication methods to identify and resolve issues early on rather than using formal documentation methods

- Limiting the number of facility visits for routine field activities when the owner/operator demonstrates competence in achieving remedial results, including public involvement
- Establish performance standards that define clear and attainable results
- Using briefings, conversations, and progress reports from the owner/operator to replace some of the formal interim deliverables while still making this information publicly available where appropriate
- Encouraging communication among the project manager, owner/operator and the community; for example, make up-to-date facility information available at publicly accessible locations. Public participation remains a key component of the corrective action process

North Dakota is a leading state in developing and implementing these recommendations of EPA. In fact, North Dakota has been using this concept prior to EPA's guidance issuance. Our progress in achieving the environmental indicators at contaminated sites under control is a testament to the working relationship North Dakota shares with its facilities under corrective action and a results-based approach.

ADDENDUM I
STATEMENT OF BASIS - REMEDY UPDATE
IRP SITE ST-08 (SWMUs 13 AND 14)
REFUELING RAMPS AND PADS/HYDRANT FUEL SUPPLY SYSTEM
NDDH PERMIT HW-020

INTRODUCTION

This addendum updates the Statement of Basis (SOB) dated March 14, 2007, for NDDH permit HW-020 at Installation Restoration Program (IRP) Site ST-08 (SWMUs 13 and 14). It also provides background information and justification for the updated remedy.

UPDATED REMEDY

The updated remedy for Site ST-08 is natural attenuation with no further long-term monitoring (LTM) activities. Approval for discontinuing further LTM activities was received after discussion and agreement with the North Dakota Department of Health (NDDH) on April 25, 2011. The reasons for updating the remedy are presented below and in the *Final 2010 Annual Long-Term Monitoring Program Report for Solid Waste Management Units (SWMUs) 13 and 14, Installation Restoration Program (IRP) Site ST-08*.

BACKGROUND

LTM was conducted at site ST-08 for 10 years (2000 through 2010), and results show that natural attenuation is working at this site. In May 2000, LTM activities began at Site ST-08 with semiannual sampling events occurring in 2000 and 2001. Annual sampling was conducted from October 2003 through October 2010. During this time period, the maximum measured concentrations of benzene in groundwater dropped from 3,100 parts per billion (ppb) to 920 ppb, and the maximum total petroleum hydrocarbon (TPH) concentration decreased from 17,930 ppb to 3,100 ppb. During the 10-year monitoring period, interim changes to optimize the monitoring program were allowed by NDDH as a result of the decrease in concentrations and extent. In 2007, the number of monitoring wells sampled as part of LTM activities was decreased from the initial 10 monitoring wells to 3 wells because the monitoring showed groundwater had achieved cleanup goals in those 7 wells. Starting in June 2009, sampling for monitored natural attenuation parameters was not performed due to the repeated demonstration that Site ST-08 contains adequate assimilative capacity for natural attenuation to occur continually.

Following the 2010 LTM activities, the recommendation to suspend LTM was proposed by the Air Force and approved by NDDH. The general decreasing trend of concentrations demonstrates natural attenuation is working, and the documented assimilative capacity (AC) indicates natural attenuation will continue to improve groundwater quality.

JUSTIFICATION FOR UPDATED REMEDY

Approval of the updated remedy is based upon the following conclusions, derived since the inception of LTM activities through 2010:

1. The extent and concentration of BTEX and TPH compounds have significantly decreased since the inception of monitoring activities.

At the inception of LTM activities, three wells (ST08-MW01, ST08-MW03, and ST08-MW04) contained benzene and TPH compound concentrations greater than action levels. TPH compounds have been reduced below the NDDH action level of 500 ppb in ST08-MW03 and ST08-MW04 since 2005 and 2001, respectively. Two monitoring wells (ST08-MW01 and ST08-MW03) still exhibit benzene and/or TPH compound concentrations greater than action levels, which represents a relatively small impact area of approximately 8,500 square feet (0.2 acre). Monitoring well ST08-MW01 is the only well with both benzene and TPH compound concentrations greater than action levels. Monitoring well ST08-MW04 has not exceeded its TPH compound maximum contaminant level of 5 ppb since 2003.

The lowest benzene concentrations in ST08-MW01 were observed in 2006 and 2007 at concentrations less than 40 ppb. In 2010, benzene was detected at 920 ppb in ST08-MW01. Reasons for the recent increase of benzene in ST08-MW01 are not clear but could be attributed to several factors, including fluctuations in seasonal groundwater levels or an increase in groundwater recharge from the surface, as well as changes in the amount of runoff from the site into the shallow aquifer. The lowest benzene concentration in ST08-MW03 (5.4 ppb) was observed in 2010, which is reduced from its maximum concentration of 167.5 ppb reported in October 2000.

2. The AC of the soil within the shallow groundwater unit greatly exceeds contaminant concentrations.

The AC of the shallow groundwater unit was measured each year from May 2000 to June 2009. The average AC during this timeframe (greater than 76,000 ppb) was compared the maximum concentration of BTEX compounds (1,078 ppb) for the same timeframe. The average AC during this timeframe is more than 700 times greater than the maximum concentration; therefore biodegradation is expected to be sufficient for reducing the concentration of BTEX and TPH compounds.

3. Significant shallow groundwater migration away from the source area is not anticipated.

The shallow groundwater aquifer is typically located within the native clay and flows at an estimated 1.5 to 5 feet per year. Because of the low permeability and discontinuous fractures within the clayey soil, actual velocity may be even slower.

4. Unacceptable human health risks from the shallow groundwater are not present.

The shallow groundwater aquifer beneath the site is not used and is not expected to be used in the future because of low potential yields and poor water quality. Additionally, there are no plans to construct a structure or change the current land use that may be of concern from an indoor air perspective. However, if these land use plans change, additional evaluation of concentrations and risk scenarios will be required.



TIMOTHY E. BUSH, Colonel, USAF
Commander, 319th Air Base Wing

Date: 6 July 2012

SWMU-15

Waste Oil Accumulation Tank

Closure Documentation

DRAFT

Closure Documentation

January 1997 meeting between NDDH and GFAFB agreed to SWMU-15 closure.

DRAFT

SWMU-16

Bowser-Northeast of Building 602

Closure Documentation

DRAFT

Closure Documentation

January 1997 meeting between NDDH and GFAFB agreed to SWMU-16 closure.

DRAFT

SWMU-17

Pole Yard Storage Area

Closure Documentation

DRAFT



**NORTH DAKOTA DEPARTMENT OF HEALTH
Environmental Health Section**

Location:
1200 Missouri Avenue
Bismarck, ND 58504-5264

Fax #:
701-328-5200

Mailing Address:
P.O. Box 5520
Bismarck, ND 58506-5520

REF FILE: Grand Forks Air Force Base (HW-020)

January 3, 2001

WAYNE KOOP
319 CES/CEV
525 SIXTH AVE
GRAND FORKS AFB ND 58205-6434

Dear Mr. Koop:


This letter is written regarding submittal of the Final RFA Report for the Pole Yard, SWMU 17, dated December 2000.

The pole yard storage area is listed as a solid waste management unit in the Corrective Action Module of the Base's state-issued hazardous waste permit. This requires the Base, at a minimum, to investigate this SWMU. Based on the results of the investigation a corrective measures study or implementation of corrective measures may be required. These actions are required under the Corrective Action Module of the permit.

The Division has reviewed the second investigation (assessment) submitted for this site. Based on this assessment, the Division concurs that no further corrective action is required at this site. The Pole Yard, SWMU 17, will be removed from the "active" list of solid waste management units identified in the Corrective Action Module of the permit.

If you have any further questions, please contact Mr. Robert Disney of this office.

Sincerely,


Curtis L. Erickson, Manager
Hazardous Waste Program
Division of Waste Management

CLE:RD:lb

Environmental Health
Section Chief's Office
701-328-5150

Environmental
Engineering
701-328-5188

Municipal
Facilities
701-328-5211

Waste
Management
701-328-5166

Water
Quality
701-328-5210

Printed on recycled paper.

SWMU-18

Scrap Storage Area

Closure Documentation

DRAFT

Closure Documentation

January 1997 meeting between NDDH and GFAFB agreed to SWMU-18 closure.

DRAFT

SWMU-19

Underground Waste Storage Tanks (19a-n)

Closure Documentation

DRAFT

Decision Document
Underground Storage Tanks
Solid Waste Management Unit 19



1.0 Site and Location

Grand Forks Air Force Base, North Dakota

2.0 Statement Of Basis

The decision described herein concerns the selected remedy (SR) at 14 Underground Storage Tanks (UST), identified as Solid Waste Management Units (SWMU) 19 a-n and located at various locations throughout the installation. It is based on an evaluation of the results received from corrective action performed under the United States Air Force Installation Restoration Program (IRP). Documented studies include Facility Assessments 1990, 1992; Facility Investigation 1997; Corrective Measures Studies 1994 -1998 and Corrective Measure Implementation 1994-1999.

3.0 Remedy Selection

A remedy was selected depending on the presence of contamination, its concentration, practical ability of remediation and risk posed. The UST were investigated and classified one of five ways: 1. No contamination present. 2. Contamination present but below regulated levels. 3. Contamination present above regulated levels but below risk based levels. 4. Contamination present above regulated levels and above risk based levels but technically impractical to remove. 5. Contamination present above regulated and risk-based levels and accessible.

4.0 Declaration Of Consistency With CERCLA And NCP

This document presents the selected remedy for these sites developed in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended by the Superfund Amendments and Reauthorization Act (SARA) of 1986, National Contingency Plan (NCP), and the Resource Conservation and Recovery Act (RCRA) of 1976, as amended.

5.0 Facility

5.1 Grand Forks, ND, is located on the North Dakota-Minnesota border at the junction of the Red Lake River and the Red River of the North, 75 miles north of Fargo, ND, and 145 miles south of Winnipeg, Manitoba, Canada. Grand Forks AFB is located on US Highway 2, approximately 15 miles west of Grand Forks and 10 miles west of the Mark Andrews International Airport.

5.2 Grand Forks AFB is situated in a sub humid climate characterized by a wide temperature range, variable precipitation, and rigorous winters. Records from 1900 to 1940 indicate the coldest recorded temperature was -43 degrees Fahrenheit (°F) and the warmest was 109°F.

5.3 The average annual daily maximum temperature is about 50°F with highest temperatures occurring during July and August. The average annual daily minimum temperature is about 28°F with the lowest temperatures occurring during January. The annual average daily temperature is 39°F.

5.4 The average monthly rainfall precipitation ranges from greater than 3.0 inches during June to less than 0.5 inches during February. The average annual rainfall precipitation is about 18.5 inches, three-fourths of which occurs from May to September. Snowfall averages slightly less than three feet each year. The prevailing wind direction is from the northwest.

6.0 Physiography and Land Use

6.1 Grand Forks AFB lies within the Agassiz Lake Plain District of the Western Ground Drift section of the Central Lowland Physiographic Province. The Western Ground Drift section is a lowland prairie upon a gently rolling glacial ground moraine. Ridges of end moraine and flat outwash plains occasionally interrupt it. Strandline deposits associated with Glacial Lake Agassiz form low, narrow linear ridges with a northwesterly trend. The average elevation above sea level is about 890 feet with a maximum local relief of about 25 feet.

6.2 Grand Forks AFB is also located in the Red River Valley topographic area, which corresponds to the Agassiz Lake Plain physiographic division. Geologic processes include the movement of groundwater through underlying rock strata, differential erosion, modification by glaciers, and recent wind and stream forming events. Prior to glaciation, the river became incised until it reached Precambrian rock, and then shifted its course westward as it eroded away Cretaceous shale and sand, thereby forming the Pembina Escarpment. When glaciers deposited a layer of till over the area, the river erosion temporarily ceased. Lake Agassiz sediment now covers the Red River Valley. The modern Red River of the North flows on this lake plain. The Pembina Escarpment was probably altered by glacial processes but exists today as the western extent of Glacial Lake Agassiz sediments, about 10 miles west of Grand Forks AFB. The present location of the Red River of the North is 20 miles east of Grand Forks AFB, representing the North Dakota-Minnesota state line.

6.3 Land use in Grand Forks County consists primarily of cultivated crops with remaining land used for pasture and hay, urban development, recreation and wildlife habitat. Principal crops are spring wheat, barley, sunflowers, potatoes and sugar beets. Turtle River State Park, located about five miles west of the Base, is the only major recreational area in Grand Forks County. Several watershed protection dams are

being developed for recreational activities. Wildlife habitat is very limited in the County. Kelly Slough National Wildlife Refuge and the adjacent National Waterfowl Production Area are managed for wetland wildlife and migratory waterfowl, but they also include a significant acreage of open land wildlife habitat in the county.

7.0 Geology

7.1 Geologic data was collected from previous investigations at Grand Forks AFB. During investigations, soil borings were logged to distinguish between in situ soils (till and lacustrine sediments), disturbed soil (reworked till/lacustrine), and Emerado sand (Emerado Aquifer).

7.2 Beneath the glacial drift of Grand Forks County, up to 2050 feet of westward-dipping sedimentary rocks of Paleozoic and Mesozoic age overlie igneous and metamorphic rocks of Precambrian age. Paleozoic and Mesozoic sedimentary rocks thin to the east and are absent in the southeast part of the country. All of the Paleozoic and Mesozoic rocks, except for the basal Cretaceous rocks, are of marine origin. The basal Cretaceous rocks are most likely a mixture of terrestrial and marine beds. Most of the bedrock topography was formed during the late Tertiary and early Quaternary time. (Hansen and Kume, 1970)

7.3 The surface fill material across Grand Forks AFB consists of brown coarse sand, gravel, and silty clay. The thickness of the fill ranges from 2 to 6 feet. The fill is underlain by 15 to 40 feet of brown and gray mottled silty lacustrine clay containing decayed vegetation. A gray clay stratigraphic unit with gravel and occasional cobbles occurs beneath the brown and gray silty clay. This unit varies in thickness and is a glacial till. Beneath this unit, a second lacustrine unit occurs as a gray silty clay layer that is approximately 16 to 32 feet thick. This lacustrine unit is underlain by a gray sand unit followed by undifferentiated Pleistocene glacial drift sediments consisting of gray silty to sandy clay with gravel. The total thickness of glacial sediments overlying bedrock is approximately 200 to 250 feet at Grand Forks AFB (IT Corporation, 1991).

8.0 Hydrogeology

8.1 The Precambrian rocks beneath Grand Forks County contain small amounts of water in joints or fractures and are not thought to be capable of producing sustainable quantities of water. The Paleozoic and Mesozoic sedimentary rocks contain at least three aquifers. The Paleozoic rocks containing aquifers are of Ordovician age, and have been subdivided by the North Dakota Geological Survey into two units, the Winnipeg Group and the overlying Red River Formation. The Mesozoic rocks are of Cretaceous age and include the Dakota Group and the Pierre Formation (IT Corporation, 1991).

8.2 Five major aquifers are contained in the glacial drift sediments overlying bedrock. They are the Elk Valley, Inkster, Emerado, Grand Forks, and Thompson aquifers. The

Emerado, Grand Forks, and Thompson aquifers are generally small, poorly defined water-bearing zones in the glacial drift. The water in these aquifers is too highly mineralized for most uses, and ground water wells in the aquifers recharge slowly. In addition to these aquifers, minor glacial drift aquifers either contain small storage volumes of water or have low permeability. The Emerado aquifer has an aerial extent of approximately 15 miles and underlies most of Grand Forks AFB. The city of Emerado directly overlies the central portion of the Emerado aquifer. A well drilled in Emerado penetrated 30 feet of water-bearing "quicksand" between the depths of 50 to 80 feet Below Ground Surface (BGS). The principal soil classification (according to the Unified Soil Classification System) of the Emerado aquifer is medium to coarse-grained poorly sorted sand with abundant gravel and little intermixed silt and clay. Generally, the aquifer interfingers with glacial till which confines it above and below under pressure. The aquifer is separated from the bedrock by more than 60 feet of glacial till in most places. Test hole data indicate that there is a hydrostatic head of more than 70 feet above the top of the aquifer. The water quality of the Emerado aquifer is generally poor, probably due to upward leakage of poor quality water from bedrock aquifers, and is not considered satisfactory for municipal use. Data obtained from water samples collected from the aquifer in 1962 indicated concentrations of dissolved solids, chloride, and sulfate content above the recommended maximums set by the US Public Health Service in 1962. Current water quality data measured against current water quality standards are not available. In 1968, several wells were constructed in the Elk Valley aquifer and the water is piped 8 miles to Emerado for municipal use.

8.3 Groundwater levels were measured throughout the base at various sampling locations from previous investigations. Groundwater depths vary based on the time of year and precipitation amounts but normally are encountered at depths 3 to 15 feet below the ground surface. The shallow groundwater is unconfined and has an estimated hydraulic conductivity of 6×10^{-4} centimeters per second (cm/sec) to 1.1×10^{-8} cm/sec.

8.4 Grand Forks AFB is situated in the drainage basin of the Red River of the North. The major tributary of this river in the vicinity of Grand Forks AFB is the Turtle River, which flows to the northeast. Based on the topography of Grand Forks AFB and surface water flow in the area, it is presumed that ground water flow is in a northeast direction.

8.5 During previous investigations at Grand Forks AFB, ground water was encountered at depths ranging from approximately 3 feet to 15 feet BGS across Grand Forks AFB. According to these measurements, ground water flow direction is variable across Grand Forks AFB. Observations made during previous soil sampling activities suggest that ground water flow is preferential along fractures in the clay sediments, which do not appear to be interconnected. Gypsum mineralization was observed along fractures at depths below the ground water table. Previous experience at Grand Forks AFB has shown that at locations where petroleum hydrocarbon compounds had

impacted soils away from source areas, contamination was concentrated along the fractures. Based on these observations, it appears that ground water flow is mostly confined to the discontinuous fractures observed in the soils. Significant migration of ground-water contaminants away from source areas is generally minimal.

9.0 Surface Hydrology

Natural surface water features on Grand Forks AFB are limited to a small stretch of the Turtle River that flows across the northwestern portion of the Base. In general, surface water runoff from the maintenance apron (east of the runway) is routed north through the west drainage ditch to the Turtle River. The remaining surface water flows through north and south drainage ditches that flow into the Kelly Slough. Kelly Slough is a wide marshy area with a poorly defined stream channel. Vegetation at Kelly Slough is characterized by salt grass marshes. The slough is interpreted as a discharge area for the Emerado Aquifer. Kelly Slough is designated as a National Wildlife Refuge. The slough flows northeast into the Red River.

10.0 Background

10.1 A RCRA Facility Assessment (RFA) was conducted for Grand Forks AFB by the Environmental Protection Agency (EPA) in April 1990. The RFA identified four SWMU at the base and recommended further action at three of the identified Solid Waste Management Units.

10.2 Comparison of the Grand Forks AFB RFA Report with those performed at other Air Force Bases indicated that the number and type of SWMU normally associated with an Air Force Base were not identified. Based upon this comparison, the Environmental Protection Agency (EPA) elected to perform a second RFA for Grand Forks AFB in 1993 to ensure that all SWMU were identified and that the potential for release of hazardous constituents to the environment from these SWMU were evaluated.

10.3 The second RFA performed at Grand Forks AFB identified a total of 32 SWMU. Of these 32, 20 required further action, one being UST. The UST were added to the Grand Forks IRP Program as SWMU 19 in 1993. There are 14 UST included in this SWMU, all located underground.

10.4 The 14 UST are located throughout Grand Forks AFB and are noted in the accompanying figures. The UST manage waste oil, waste hydraulic oil, or petroleum products removed in Oil Water Separators (OWS). The buildings house various industrial operations to support current and past missions. The exact constituents in the UST vary from site to site, however the wastes generally consisted of oil and fuel. Prior to the mid 1980's, wastes such as cleaning solvents and acids may have also been discharged to the UST.

10.5 The UST were investigated under the Grand Forks Air Force Base Installation Restoration Program (IRP) in 1995. There are no historical records of releases from UST. These sites were included as SWMU because of the potential to contaminate soil and/or groundwater.

10.6 During the RFI, borings were advanced and soil samples were collected for immunoassay testing, chemical analysis, headspace screening, and lithologic data. Groundwater samples were collected for immunoassay testing for benzene, Polycyclic Aromatic Hydrocarbons (PAH) and TPH. Laboratory analysis of groundwater consisted of Benzene, Toluene, Ethylbenzene and Xylene (BTEX), TPH, and PAH. Visible signs of stressed or stained vegetation were also noted where applicable.

10.7 Soil and Groundwater samples were taken at various locations around the UST. Total Petroleum Hydrocarbons (TPH) were detected in some locations above action levels. The action levels used for this investigation are as follows.

Contaminated Media	Contaminant	Action Level
Groundwater	Benzene	5 parts per billion (PPB)
	Total Petroleum Hydrocarbons	500 PPB
Soil	Total Petroleum Hydrocarbons	100 parts per million (PPM)

10.8 During the Corrective Measures Implementation (CMI), samples were obtained and tested for metals, semi-volatile organic compounds (SVOC), and volatile organic compounds (VOC). These samples supplemented investigations conducted previously.

11.0 Public Relations

11.1 An Administrative Record (AR) is the legal record of the physical situation at an installation by which response actions are reviewed and defended. An AR must be established at each installation, which has conducted or is conducting IRP activities, and must be available to the public at or near the installation. The AR at Grand Forks AFB is available at the following location and is updated as needed by the base Remedial Project Manager.

319 CES/CEV
525 Tuskegee Airmen Blvd
Grand Forks AFB ND 58205-6434

11.2 An Information Repository (IR) is a project file on IRP activities at Air Force (AF) installations. The repository is to be established for all remedial action sites and for all sites where removal actions last longer than 120 days. It is located either on or

off base at a place convenient to the community and contains site information, investigatory reports, information about the sources and nature of the contaminants, and a schedule for cleanup operations. The IR is intended to address community relations' requirements and is a source of reading material for the public. Many of the documents are the same in the IR and the AR. In Jan 1993, GFAFB established an IR, which is maintained at the Grand Forks City Library, in the reference section, to insure public access. Following is the location of the IR.

Grand Forks Public Library
2100 Library Circle
Grand Forks, ND 58201

11.3 Restoration Advisory Board

11.3.1 A Technical Review Committee (TRC) later renamed a Restoration Advisory Board (RAB) was established at GFAFB Dec. 1991 to review and comment on Department of Defense actions and proposed actions with respect to releases or threatened releases of hazardous substances into the environment. The RAB was also established to ensure open communication and exchange of ideas with the general public about Grand Forks AFB IRP and CERCLA (1980), SARA (1986), and RCRA (1976).

11.3.2 All RAB members understand and agree that the primary purpose and function of the RAB is informational, specifically to foster community and interagency awareness and understanding of Grand Forks AFB IRP remedial actions related to the releases or threatened releases of hazardous substances at Grand Forks AFB.

11.3.3 The Grand Forks AFB community relation's plan, news releases, newsletters, and fact sheets are periodically distributed to the local media and RAB members to inform the public about past, present, and future IRP events.

12.0 Selected Remedy

One remedy was selected for remediation of the contaminated media at the UST.

Contaminated soil is to be excavated and land treated at a permitted site until a level of 10 parts per million total petroleum hydrocarbons has been reached at which time the soil is considered clean and reusable.

13.0 Evaluation of Selected Remedy

13.1 An analysis of the remedy was conducted to evaluate the remedy with respect to its relative performance in meeting nine criteria. These evaluation criteria are divided into three categories and have been developed by the EPA to address the technical and

policy considerations that have proven important for selecting remedies. The nine criteria are found in [40 CFR 300.430(f)(1)(i)].

13.2 Threshold Criteria

1. Overall protection of human health and the environment
2. Compliance with Applicable or Relevant and Appropriate Requirements (ARAR)

Primary Balancing Criteria

3. Long-term effectiveness and permanence.
4. Reduction of toxicity, mobility, or volume (TMV)
5. Short term effectiveness
6. Implementability
7. Cost

Modifying Criteria

8. State Acceptance
9. Community Acceptance

13.3 Criterion 1: Overall Protection of Human Health and the Environment

a. Protectiveness is the primary requirement that remedial actions must meet under CERCLA. A remedy is protective if it adequately eliminates, reduces, or controls all current and potential risks posed through each pathway at the site.

b. Remedy 1 - Excavation of the contaminated soil will remove the contamination from the immediate vicinity of the industrial area to an isolated treatment site. Remediation at the land treatment site will immediately begin to reduce and eliminate current risks posed by the contaminated soil and prevents further contamination of ground water. The potential for human exposure to contamination at the UST is eliminated.

13.4 Criterion 2: Compliance with ARAR

a. Compliance with ARAR is one of the statutory requirements of remedy selection. Applicable requirements are cleanup standards, criteria or limitations promulgated under federal or state law that specifically address a hazardous substance, pollutant, contaminant, remedial action, location or other circumstance at a site. Relevant and appropriate requirements address problems or situations sufficiently similar to those encountered at the site and that their use is well suited to the environmental and technical factors at a particular site. The primary ARAR at the UST include site-specific contaminant levels, RCRA UST Regulations, Land Treatment of Petroleum Contaminated Soil Guideline, MCL and potentially the National Pollutant Discharge Elimination System (NPDES) under the Clean Water Act.

b. Remedy 1 - This remedy seeks a cleanup level of ten parts per million total petroleum hydrocarbons. Other contaminants will be reviewed on a case-by-case basis for determining corrective measures to be implemented. Land treatment according to these guidelines, will reduce the contamination to below MCL. Proper management of the contaminated soil will prevent discharges in violation of the NPDES.

13.5 Criterion 3: Long Term Effectiveness and Permanence

a. This criterion reflects CERCLA emphasis on implementing remedies that will ensure protection of human health and the environment in the long term. The assessment of remedies against this criterion evaluates the residual risks at a site after completion of a remedial action.

b. Remedy 1 - This remedy will achieve long-term effectiveness and permanence through remediation of contaminated media to a "clean" condition. Upon completion, the residual risks will be less than industrial screening levels.

13.6 Criterion 4: Reduction of Toxicity, Mobility, and Volume (TMV)

a. This criterion addresses the statutory preference for remedies that employ treatment as a principal element. The assessment against this criterion evaluates the anticipated performance of the specific treatment technologies a remedy may employ.

b. Remedy 1 - Treatment of the contaminants in a permitted land treatment site through the activity of resident microorganisms in the soil has been shown effective in reducing the TMV. Petroleum hydrocarbons serve as food for the microorganisms. An increase in microbiological activity and numbers of organisms confirms the activity taking place. Analysis of contaminant concentrations will be reduced in response to microbe activity.

13.7 Criterion 5: Short Term Effectiveness

a. This criterion addresses short-term impacts of the remedy. The assessment against this criterion examines the effectiveness of remedies in protecting human health and the environment during the construction and implementation of a remedy.

b. Remedy 1 - This remedy will create short-term exposure pathways during the excavation and land farming activity, during repair of UST and during well installation and sampling events.

13.8 Criterion 6: Implementability

a. The assessment against this criterion evaluates the technical and administrative feasibility of the remedy and the availability of the goods and services needed to implement them.

b. Remedy 1 - This remedy is technically low in goods and services needed for implementation and are readily available. Administrative functions are minimal once a permitted land treatment site is established.

13.9 Criterion 7: Cost

a. Cost encompasses all engineering, construction, and operation and maintenance costs incurred over the life of the project. The assessment against this criterion is based on the present worth of these costs for each alternative.

b. Remedy 1 - The cost for this remedy varies according to the amount of soil and the concentration of contamination at each oil/water separator location. The range will be approximately \$5-75,000. These costs included replacing the UST if necessary. The total cost for all UST corrective action is approximately \$550,000. Grand Forks AFB expedited corrective measures by removing and treating contaminated soil during the investigation phase. This procedure saved Grand Forks AFB time and money in the remediation process by removing contamination when discovered rather than returning to the site at later time.

13.10 Criterion 8: State Acceptance

a. This criterion, which is an ongoing concern throughout the corrective action process, reflects the statutory requirement to provide for substantial and meaningful State involvement.

b. Remedy 1 - North Dakota Department of Health (NDDH) recognizes this remedy as an acceptable form of remedial action.

13.11 Criterion 9: Community Acceptance

a. This criterion reflects the community's apparent preferences or concerns about remedies.

b. The RAB, and IR have been the avenues by which the base has informed the community of IRP and RCRA Corrective Action activities. RAB meetings are held twice each year to update members on corrective action activity. RAB meetings, and the IR have provided an opportunity for public comment/involvement in this and other base IRP activities. A 30-day notice of a 45-day public comment period regarding the permit to be issued and incorporating this selected remedy will be given.

c. With the exception of some University academic interest, there has been little public interest in this activity based on the questions/comments posed by community members.

d. Remedy 1 - The RAB members have been favorable toward this remedy.

14.0 Corrective Measures Implemented

Contamination was remediated during the investigation phase at sites 19-a, 19-b and 19-h. During the investigation, the sites were excavated and the UST were removed. Grand Forks AFB expedited corrective measures for some sites by removing and treating contaminated soil during the investigation phase. This procedure saved Grand Forks AFB time and money in the remediation process by removing contamination when discovered rather than returning to the site at later time. All contaminated soils were removed at these sites and hauled to a permitted Land Treatment Facility.

15.0 Corrective Measures Partially Implemented

There is one site (19-g) where contamination remains but is not practicable to remediate. Some contamination was removed and remediated at this location but some of the contamination was not accessible due to overlying buildings, roads, utilities and other structures. This contamination will be monitored for risk posed to human health and the environment as appropriate. The potential for human health exposure and the potential for environmental impact exists at this site. If, in the future, construction in the area exposes any remaining contaminated soil it will be remediated in an appropriate manner.

16.0 No Corrective Measures Required

During the RCRA Facility Investigation, sampling at SWMU 19-c, 19-d, 19-j, and 19-k revealed no contamination. At three sites: 19-e, 19-f and 19-l, contamination was detected below regulatory levels. None of these sites required further corrective action. At three locations, 19-l, 19-m and 19-n, and during two investigations, the UST could not be located. No further corrective action is required.

17.0 Status of SWMU

The table below gives past and present information about the UST.

Building & SWMU (#)	Installation Date	Capacity (Gallons)	Construction Material/ Contents	Status & Date of Corrective Action	Contamination
306 (19-a)	1958	2000	Steel/ Used Motor Oil	Removed 1994	Below Regulated Levels
415 (19-b)	Unknown	500	Steel/ Used Motor Oil	Removed 1994	Below Regulated Levels
200 (19-c)	1969/1995	560/600	Steel and Fiberglass/ Used Motor Oil	Replaced 1994 Removed 2000	None
556 (19-d)	1989	1000	Fiberglass/ Hydraulic Fluid	Emergency Spill Tank; In service	None
605 (19-e)	1987	1500	Steel/ OWS Recovery	Investigated 1998; In Service	Below Regulated Levels
649 (19-f)	1987	9000	Steel/ OWS Recovery	Investigated 1998; In Service	Below Regulated Levels
661 (19-g)	1987	550	Steel/ OWS Recovery	In Service	Remains
663 (19-h)	1988	1000	Fiberglass/ OWS Recovery	Removed 1998	Removed
761 (19-i)	1989	550	Steel/ OWS Recovery	Removed 1998	Below Regulated Levels
737 (19-j)	1982	2000	Steel/ OWS Recovery	In Service	None
610 (19-k)	Unknown	3000	Steel/ Unknown	Out of Service 1991	None
817 (19-l)	NA	NA	NA	Not Located	Unknown
822 (19m)	NA	NA	NA	Not Located	Unknown
823 (19-n)	NA	NA	NA	Not Located	Unknown

18.0 Conclusion

18.1 The selected remedy for the contaminated UST, where practical, was removal and treatment of the contaminated soil. This action includes repair of leaking UST and removal of those no longer needed. Removal and treatment of contaminated soils will be protective of human health and the environment by eliminating the contaminants of concern, thus eliminating human exposure and preventing the migration of contaminants.

18.2 At those contaminated sites which were technically impracticable to remediate due to existing structures, monitoring will be conducted for unacceptable risks to human health and the environment as appropriate. This will continue until contaminants have been eliminated through natural attenuation or feasible access to the contamination is possible at which time appropriate corrective measures will be reviewed.

18.3 In summary, all contamination at the UST designated as SWMU 19 that was technically feasible to remove has been removed and treated to reduce the contamination to below regulatory and risk based levels. The site where contamination remains will be monitored for unacceptable risks to human health and the environment. If access to these contaminated soils becomes available further corrective measures will be reviewed and implemented if necessary. No Further Action is required at this SWMU at this time.


MARY C. GILTNER, GM-13, DAF
Deputy Civil Engineer

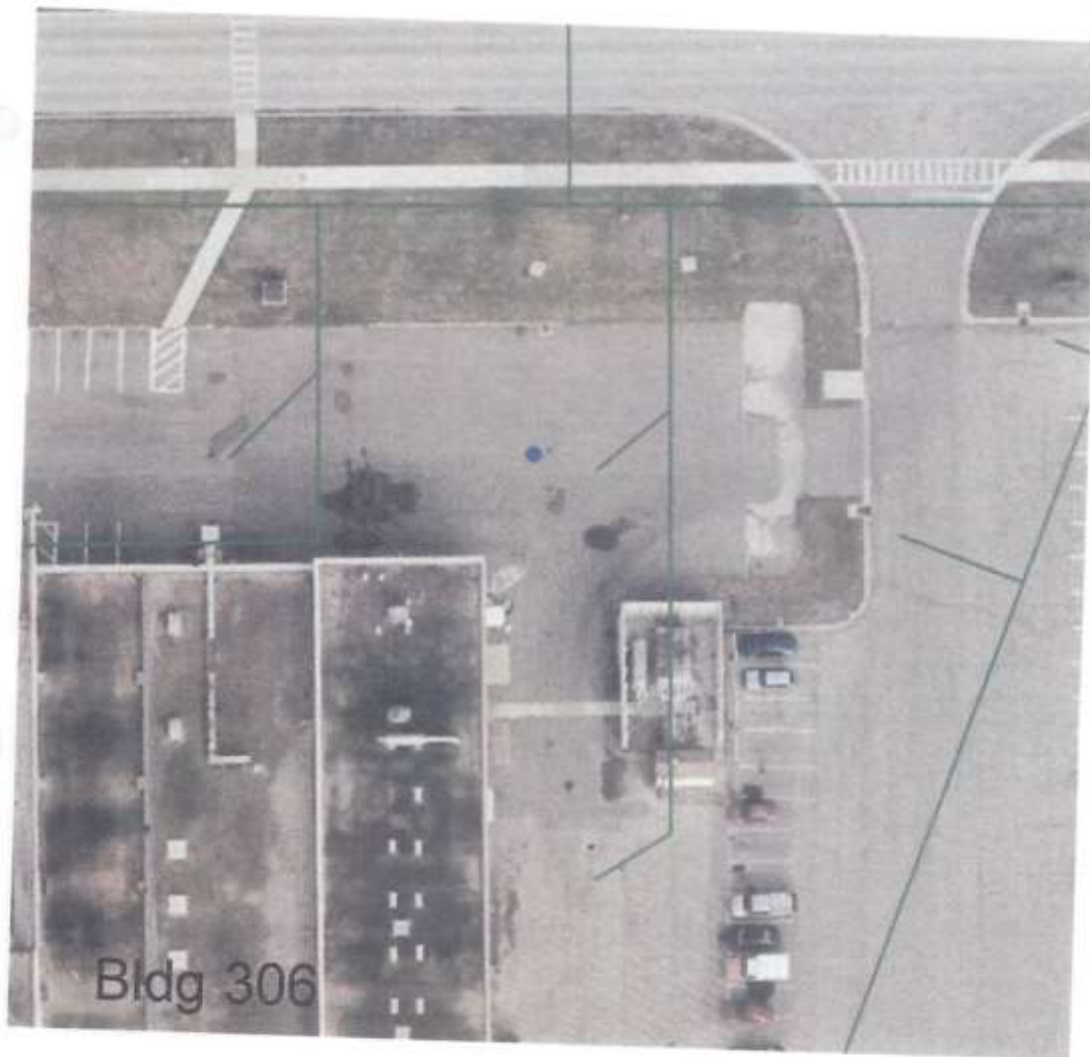


SWMU 19

Underground Storage Tanks

Figure 1





SWMU 19-A
NE corner of Bldg 306
Scale = 1:600

General Legend

- SMWU Location

Utility Lines:

- Abandoned Sanitary
- Active Sanitary
- Abandoned Storm
- Active Storm



SWMU 19-B
NW corner Bldg 415
Scale = 1:600

General Legend

- SWMU Location

Utility Lines

- Abandoned Sanitary
- Active Sanitary
- Abandoned Storm
- Active Storm



SWMU 19-C
West of Bldg. 201
Scale = 1:1000

General Legend

● SMWU Location

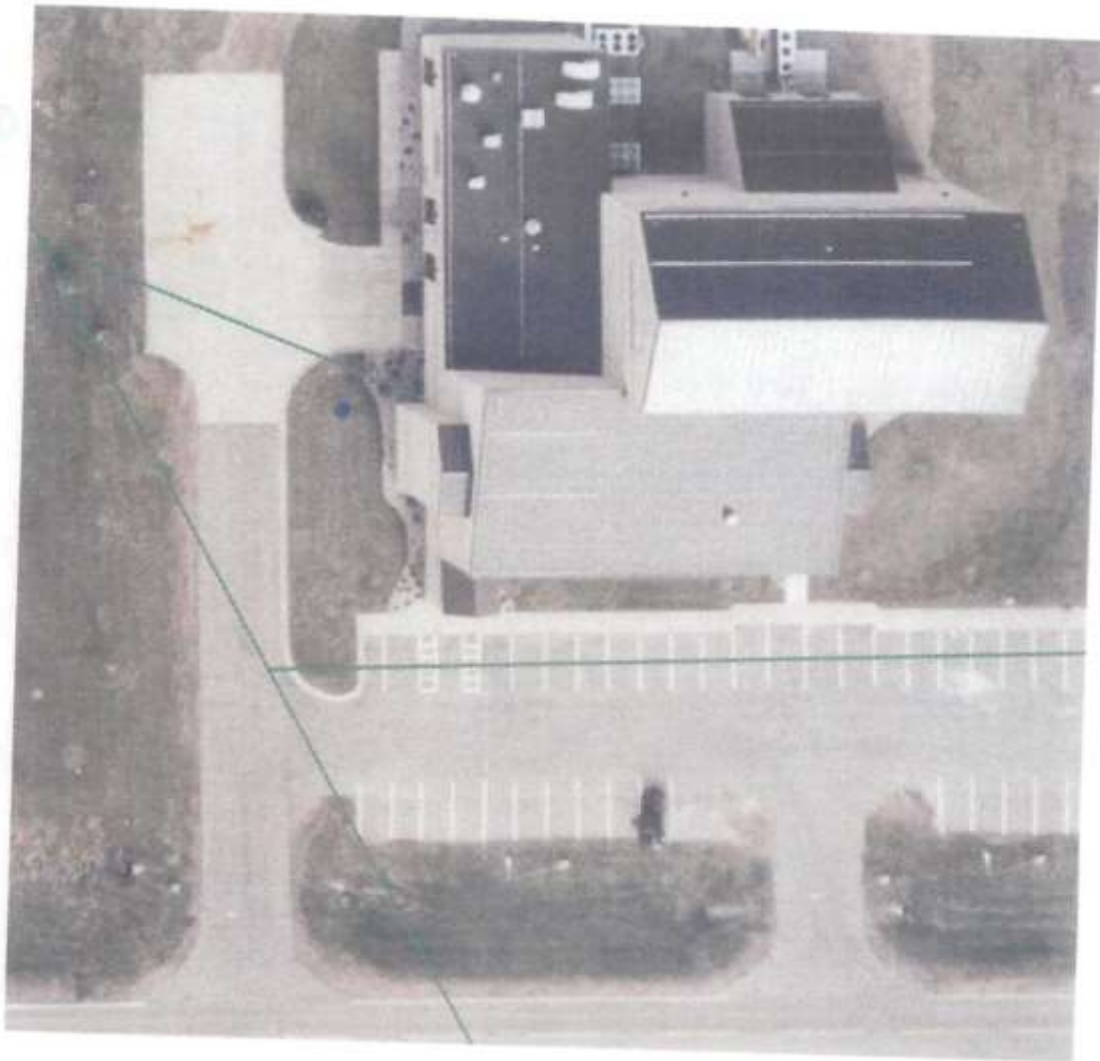
Utility Lines

— Abandoned Sanitary

— Active Sanitary

— Abandoned Storm

— Active Storm



SWMU 19-D
West of Bldg. 556
Scale = 1:600

General Legend

● SMWU Location

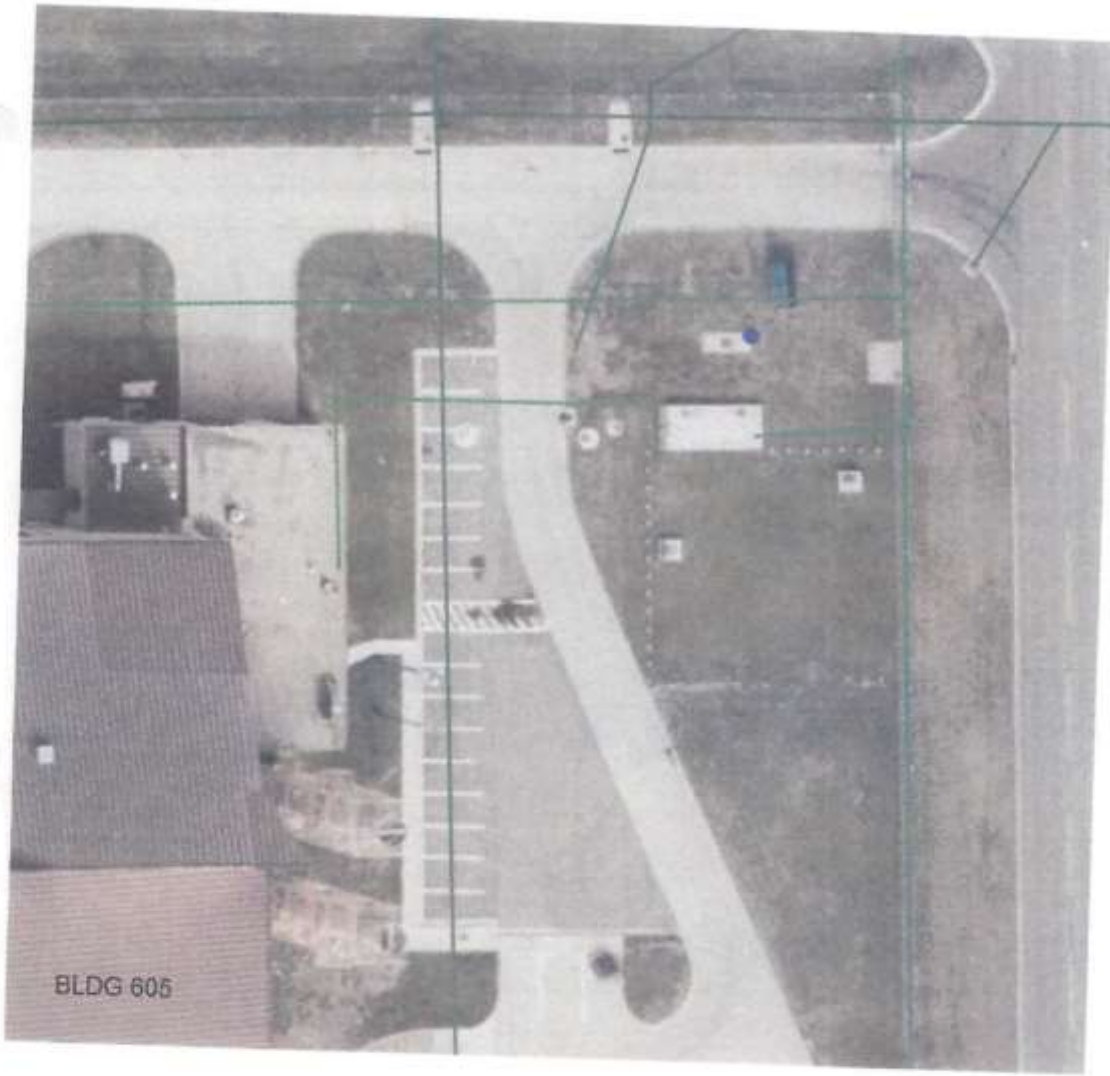
Utility Lines

— Abandoned Sanitary

— Active Sanitary

— Abandoned Storm

— Active Storm



SWMU 19-E
NE corner of Bldg 605
Scale = 1:600

General Legend

● SMWU Location

Utility Lines

— Abandoned Sanitary

— Active Sanitary

— Abandoned Storm

— Active Storm



SWMU 19-F
NE corner Bldg. 649
Scale = 1:600

General Legend

- SWMU Location

Utility Lines

- Abandoned Sanitary
- Active Sanitary
- Abandoned Storm
- Active Storm



SWMU 19-G
East Bldg 661
Scale = 1:600

General Legend

● SMWU Location

Utility Lines

— Abandoned Sanitary

— Active Sanitary

— Abandoned Storm

— Active Storm



SWMU 19-H
3E Bldg 621
Scale = 1:600

General Legend

● SMWU Location

Utility Lines

— Abandoned Sanitary

— Active Sanitary

— Abandoned Storm

— Active Storm



SWMU 19-1
SE corner Bldg 761
Scale = 1:600

General Legend

- SMWU Location

Utility Lines

- Abandoned Sanitary
- Active Sanitary
- Abandoned Storm
- Active Storm



SWMU 19-J
South of Bldg 737
Scale = 1:600

General Legend

- SMWU Location
- Utility Lines:
 - Abandoned Sanitary
 - Active Sanitary
 - Abandoned Storm
 - Active Storm



SWMU 19-K
East of Bldg. 610
Scale = 1:600

General Legend

- SMWU Location

Utility Lines

- Abandoned Sanitary
- Active Sanitary
- Abandoned Storm
- Active Storm



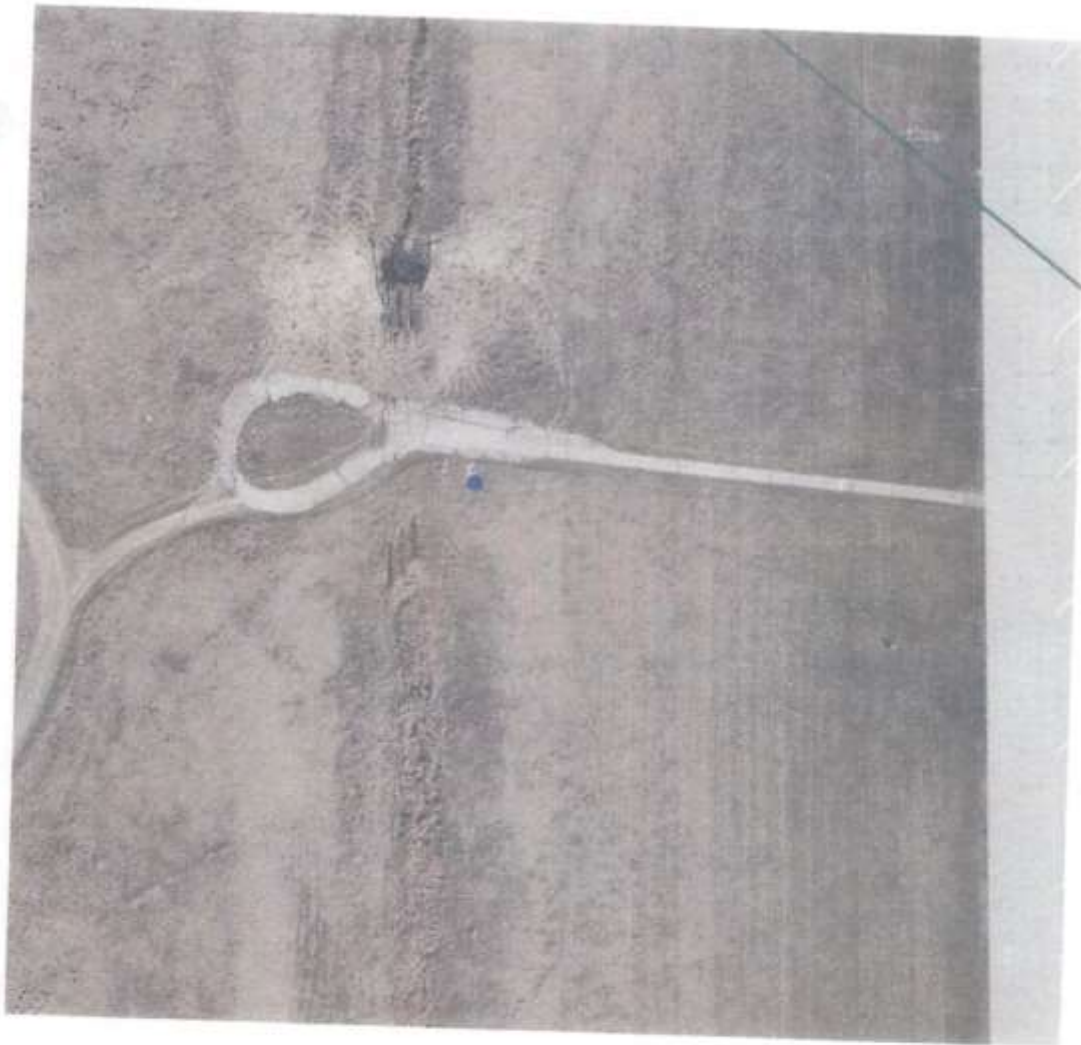
SWMU 19-L
SE Fire Training Area
Scale = 1:3500

General Legend

- SWMU Location

Utility Lines

- Abandoned Sanitary
- Active Sanitary
- Abandoned Storm
- Active Storm



SWMU 19-M
West of center runway
Scale = 1:1500

General Legend

● SMWU Location

Utility Lines

— Abandoned Sanitary

— Active Sanitary

— Abandoned Storm

— Active Storm



SWMU 19-N
E corner runway
Scale = 1:2500

General Legend

● SWMU Location

Utility Lines

— Abandoned Sanitary

— Active Sanitary

— Abandoned Storm

— Active Storm

SWMU-20

Former Helicopter Wash Area

Closure Documentation

DRAFT

Closure Documentation

January 1997 meeting between NDDH and GFAFB agreed to SWMU-20 closure.

DRAFT

AOC A

Former Building 539

Closure Documentation

DRAFT

GRAND FORKS AIR FORCE BASE
Grand Forks AFB, North Dakota
March 14, 2007

Facility/Unit Type:	United States Air Force Base Former Building 539(Area of Concern (AOC) 539)
Contaminants:	Trichloroethene (TCE), benzene, total petroleum hydrocarbons (TPH)
Media:	Soil and groundwater
Remedy:	Phytoremediation and Monitored Natural Attenuation (MNA) through annual groundwater monitoring at eleven wells throughout the site

INTRODUCTION

The Grand Forks Air Force Base (AFB) Corrective Action Program is conducted under the authority of Sections 3004(u), 3004(v), 3005(c)(3), 3008(h), 3013, 6001, and 7003 of the Resource Conservation and Recovery Act (RCRA)(42 U.S.C. 6901 et seq.) as amended by the Hazardous and Solid Waste Amendments of 1984 (HSWA) (Pub. L. No. 98-616, 98 Stat. 3221) and the Federal Facility Compliance Act of 1992 (Pub. L. 102-386, 106 Stat. 1505). North Dakota has been delegated authority under the RCRA Corrective Action Program by the U.S. Environmental Protection Agency (USEPA) and has program responsibility for this action by virtue of that delegation.

The objective of a RCRA corrective action program is to evaluate the nature and extent of the release of contaminants; to evaluate site characteristics, including identification of solid waste management units, geophysical information, areas and populations threatened by the release, and actual and potential threats to human health and the environment; and to identify, develop, and implement an appropriate corrective measure or measures to protect human health and the environment.

This Statement of Basis is part of the corrective action process and is a requirement of the RCRA Corrective Action Permit, issued to Grand Forks AFB by the North Dakota Department of Health (NDDH). The purpose of the Statement of Basis is multi-fold: 1) identify remedies evaluated; 2) identify the proposed remedy and rationale for its selection; 3) provide information on how the public can become involved in the selection process; and 4) solicit public review and comment on the proposed remedy. This Statement of Basis

summarizes information obtained during investigations and remedial actions conducted at former Building 539 (Area of Concern [AOC] 539).

FACILITY DESCRIPTION

AOC 539 is a former jet engine test facility (Building 539) that supported a U.S. Air Force (USAF) mission from the late 1950s through 1992. Presently, AOC 539 is undeveloped although a full-scale phytoremediation pilot test (FSPPT) comprising several hundred poplar and Russian olive trees is in place at the site to remediate site contamination.

In 1995, a petroleum odor was detected in soils while foundation footings were removed during demolition of Building 539. Soil samples from the site were analyzed and were found to contain a variety of organic compounds that were commonly used at the former building location, including jet propulsion fuel, type 4 (JP-4), hydraulic fluid, engine oil, and solvents such as trichloroethene (TCE) and methyl ethyl ketone (MEK).

The Air Force Base notified the North Dakota Department of Health (NDDH), which is the lead regulatory agency for cleanup of contaminated areas in North Dakota, of this new area of concern (AOC) by memorandum dated 29 October 1996. Subsequent investigations were conducted under the Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) process.

RCRA Facility Investigation/Corrective Measures Study

The RCRA Corrective Action program oversees the cleanup of existing contamination and any future contamination at active facilities. In its ongoing effort to improve the corrective action program, EPA, with the assistance of interested stakeholders, identified several improvements to increase the efficiency and cost-effectiveness of facility cleanups.

One of the improvements is "results-based" cleanup guidance, as outlined under the RCRA Cleanup Reforms announcement (EPA530-F-99-018, July 1999 available at: <http://www.epa.gov/correctiveaction/reforms/reforrms1.pdf>). Results-based corrective action encourages technical and administrative innovation to achieve environmentally protective cleanups on a facility-specific basis.

Results-based approaches emphasize outcomes, or results, in cleaning up actual releases, rather than the process used to achieve those results.

The benefits of a results-based corrective action are:

- Improved focus on the end goals of corrective action and intermediate milestones, such as environmental indicators, rather than on unnecessary adherence to a predetermined administrative process
- Generally, more rapid achievement of results
- Resource savings to both owner/operator and implementing agency

Additional information about results-based corrective action approach is included in Attachment A.

An RFI report was completed in June 1999. The investigation found several volatile organic compounds (VOC) and total petroleum hydrocarbons (TPH) to be above the maximum contaminant levels (MCLs) in groundwater as well as contamination in soil. The report concluded that the full extent of the contaminants had not been characterized and additional samples would be necessary.

Six monitoring wells were installed (GFB539-MW01 through -MW06) and sampled in August 2000. The Phase II RFI report documenting these data concluded that there was

enough data to determine the vertical and horizontal extent of contamination on the site.

Several alternatives were considered for this site, including excavation and disposal, *in situ* treatment, and monitored natural attenuation (MNA). Discussions with NDDH eliminated excavation and onsite disposal because it was cost prohibitive and required extensive permitting. *In situ* treatment, such as treatment using extraction or injection wells, was eliminated because of the clay soils causing slow migration of groundwater through the aquifer. MNA was retained as the optimal solution because natural attenuation processes had been observed at other sites at the Base. NDDH recommended the addition of phytoremediation to MNA to use trees providing hydraulic control of the aquifer to prevent migration of contamination from the site. Part of the pilot study was to assess the effectiveness of phytoremediation in the cold northern climate. Additionally, phytoremediation provides the benefits of bioremediation from the trees to augment existing natural attenuation processes.

Six additional monitoring wells were installed (GFB539-MW07 through -MW12) in September 2001 in preparation for installation of the FSPPT, which was proposed as a full-scale pilot program both for remediation of the site and to provide experience and data for use of phytoremediation in northern climates. Soil and groundwater samples from the well installations provided results consistent with the past use of the area and previous investigations. The analyses showed that TCE, other VOCs, and TPH were present in the soil and as well as in groundwater at concentrations exceeding MCLs in several but not all of the wells installed in 2001.

In May 2002, 433 bare root trees were planted at the site based on the available soil and groundwater data as part of the FSPPT for evapotranspiration (i.e., the process of plants taking up water, using it, and respiring it). The objective of the FSPPT was to establish hydraulic control of the contaminated shallow aquifer through evapotranspiration to confine and control migration of the contaminant plume. Natural attenuation of the contamination can then proceed. Grass was also planted at the site to provide soil stabilization as well as to intercept and evapotranspire precipitation minimizing recharge of the groundwater at the site.

The trees were planted in rows 12 feet apart with poplar and Russian olive trees spaced 6 feet apart within each row. These tree species and the spacing were selected to optimize rapid growth of the tree plot and to provide as much evapotranspiration as soon as possible. The Russian olive trees, which are more tolerant to salty soil and groundwater, were planted in areas of the site with higher salinity.

A mixture of a sandy topsoil and peat was added to the tree planting locations to improve the physical, chemical, and biological characteristics of the native soil. Fertilizer has been applied each year to optimize tree growth. A drip-irrigation system was installed to help establish and maximize growth of these trees and soil moisture sensors were installed to provide information to establish an irrigation schedule.

Annual groundwater monitoring at the FSPPT site (AOC 539) began in 2002. The heart of the contamination plume was identified at the former Building 539 location. Monitoring well GFB539-MW05 historically reports the highest TCE and gasoline range organic (GRO) concentrations and is located within the footprint of the former structure. Monitoring wells around the perimeter of the site historically fail to report contaminants above the laboratory reporting limits.

The highest concentration of TCE was reported in 2003 at 24,000 micrograms per liter ($\mu\text{g/L}$) in monitoring well GFB539-MW05. TCE concentrations have stabilized between approximately 13,000 and 17,000 $\mu\text{g/L}$ from 2004 through 2006 in the heart of the plume. A well set deeper in the aquifer, GFB539-MW06, which is co-located with GFB539-MW05, has reported TCE concentrations ranging from approximately 3 to 11 $\mu\text{g/L}$ indicating that the TCE is not migrating significantly downward into the aquifer.

TCE concentrations in three monitoring wells within the FSPPT surrounding the heart of the plume have remained stable from 2002 through 2006 at concentrations ranging from 720 to 3,800 $\mu\text{g/L}$. The monitoring wells outside of the FSPPT at the perimeter of the site fail to indicate TCE above the reporting limit. These data indicate that the plume is not migrating significantly if at all.

Evidence of natural attenuation of TCE is indicated by degradation byproducts in the groundwater, such as cis-1,2-dichloroethene (DCE), trans-1,2-DCE, 1,1-DCE, and vinyl chloride. Eventually, these degradation byproducts will be intrinsically remediated as well as the TCE.

Petroleum has also been reported in the contamination plume from activities at former Building 539. The GRO concentration follows the same pattern as the TCE contamination where the highest concentration is found at GFB539-MW05. Concentrations have generally shown a decreasing trend from 19 milligrams per liter (mg/L) in 2002 down to approximately 10 mg/L in 2006. Benzene, a compound found in fuels, has only been found above the MCL of 5 $\mu\text{g/L}$ in the heart of the plume at monitoring well GFB539-MW05. Data since 2003 indicate that the concentration of benzene has shown a general decreasing trend from 1,200 $\mu\text{g/L}$ in 2003 to 910 $\mu\text{g/L}$ in 2006.

Concentration of natural attenuation parameters, such as dissolved oxygen, methane, nitrate, sulfate, ferrous iron, and manganese, collected from the groundwater at the site indicate that the assimilative capacity of the aquifer is sufficient to degrade petroleum contaminants in the groundwater. The petroleum contaminants in the groundwater can also be important for the continued intrinsic remediation of the TCE contamination.

These data and the historic trend of contaminant concentrations indicate that the TCE and petroleum contaminant plume is not migrating from the site and that the contamination appears to be naturally attenuating as anticipated.

The objective of the FSPPT is to provide hydraulic control of the aquifer to prevent migration of the contamination in groundwater so that the contaminants can be remediated through natural attenuation in conjunction with phytoremediation. During the period of annual groundwater monitoring beginning in 2002, no migration of contaminated groundwater has been documented. It is believed that the aquifer characteristics, including low hydraulic conductivity and low groundwater gradient, significantly contribute to the lack of migration of contamination through adsorption and dispersion. Additionally, hydraulic control through the maturing FSPPT, which was first indicated in

2006, will further minimize any potential migration and will allow natural attenuation of the groundwater contamination.

EXPOSURE PATHWAYS

The human exposure pathways via soil and groundwater are ingestion, inhalation, and dermal contact. Potential for human exposure includes occasional construction and maintenance personnel performing environmental monitoring and excavations at the site. Because site access on-Base is currently restricted and near-term residential use of the site is not probable, only exposure for the on-site worker may pose an unacceptable health risk. The nearest residential-use area is over one mile away. Institutional controls established for the site are sufficient to control the potential for exposure.

Risk to wildlife is considered very low because, although the site provides food and cover, the general area use is industrial and area activities discourage significant wildlife populations from inhabiting the general area. Also, the contamination is confined below ground surface. No endangered species or sensitive environmental concerns are present and wetland habitat is not a concern given the distance of such habitat from the site. The RFI did not identify a complete exposure pathway to an ecological receptor.

Table 1 summarizes the maximum concentrations for contamination detected at AOC 539 and the cleanup goals for the contaminants of concern (COCs).

PROPOSED REMEDY

The corrective measures identified in the CMS for AOC 539 included: no action and phytoremediation with MNA. Institutional controls were considered as part of each alternative during the remedial activities. However, institutional controls were not considered part of the permanent remedy because land use will be unrestricted upon completion of remedial efforts. The proposed remedy was selected after evaluating the feasibility and effectiveness of the proposed alternatives in meeting the remedial objectives for the site, including reduction of the potential for acute and chronic human health risks. Also, the proposed

remedy was selected to provide information about phytoremediation in northern climates. Table 2 summarizes the comparison of alternatives.

The proposed remedial action for AOC 539 is phytoremediation with MNA (intrinsic bioremediation). Phytoremediation provides hydraulic control of the shallow aquifer to prevent off-site migration of dissolved-phase contamination in the aquifer to allow natural attenuation processes to remediate the contamination. Phytoremediation also augments natural attenuation processes, such as through metabolism of the contaminants by the tree and by the tree roots and through evapotranspiration of the contaminated groundwater.

Natural attenuation is achieved when naturally occurring in-situ processes transform contaminants to harmless constituents without requiring engineering actions and controls. Contaminants are degraded to simpler and less harmful products by natural processes. Additionally, because the process is in-situ, immediate risk of exposure to contaminants is avoided.

Natural attenuation is non-intrusive and does not disrupt existing facilities or mission activities during remediation. Phytoremediation, which augments natural attenuation, differs from natural attenuation in that the FSPPT can disrupt mission activities by preventing development of the area until remediation is complete.

Natural attenuation is the preferred alternative in the Air Force Center for Environmental Excellence (AFCEE) remediation matrix. The AFCEE matrix ranks technologies and processes to be considered for implementation at Air Force sites with common contaminants, such as petroleum hydrocarbons. The matrix indicates that natural attenuation should always be considered as a remedy first and selected based on defensible risk assessment. Natural attenuation, as a remedy, is generally less expensive than conventional ex-situ remediation techniques.

Chlorinated solvents and petroleum hydrocarbons have been shown to naturally biodegrade at numerous sites throughout the world including sites at GFAPB. The physical aquifer characteristics at AOC 539 of low permeability

**TABLE 1
CONTAMINATION DETECTED AND CLEANUP GOALS**

Media	Estimated Volume	Contaminant	Maximum Concentration	Action Level	Cleanup Goal ¹
Soil	Various depths	TCE	20 ppm	0.053 ppm ²	0.053 ppm
		cis-1,2-DCE	2.9 ppm	43 ppm ²	43 ppm
		trans-1,2-DCE	0.015 ppm	69 ppm ²	69 ppm
		1,1-DCE	0.0006 ppm ³	120 ppm ²	120 ppm
		Vinyl chloride	ND	0.079 ppm ²	0.079 ppm
		TPH	4,820 ppm	100 ppm ⁴	100 ppm
		benzene	3.2 ppm	0.64 ppm ²	0.64 ppm
Groundwater	Not given	TCE	24,000 ppb	5 ppb ⁵	5 ppb
		cis-1,2-DCE	11,000 ppb	70 ppb ⁵	70 ppb
		trans-1,2-DCE	250 ppb	100 ppb ⁵	100 ppb
		1,1-DCE	35 ppb	7 ppb ⁵	7 ppb
		Vinyl chloride	1,200 ppb	2 ppb ⁵	2 ppb
		TPH	24,500 ppb	500 ppb ⁶	500 ppb
		benzene	1,200 ppb	5 ppb ⁵	5 ppb

1 – The Cleanup Goal has been established to be equal to the Action Level.

2 – USEPA Region IX Preliminary Remediation Goal (PRG). No NDDH action level or cleanup standard for soil is available for this compound.

3 – Estimated value

4 – The Cleanup Goal for TPH in soil is consistent with NDDH guidance for remediation of petroleum spills, "Guidelines for Cleanup Action Levels for Gasoline and Other Petroleum Hydrocarbons," NDDH, Division of Waste Management - Underground Storage Tank Program, in accordance with North Dakota Underground Storage Tank (UST) Rules, Chapter 33-24-08 of the North Dakota Administrative Code (NDAC) Article 33-24.

5 – MCL (Title 40, Code of Federal Regulations [CFR], Part 141, Subpart G).

6 – There is no MCL for TPH in groundwater, but the remedial action is consistent with NDDH guidelines for TPH cleanup action levels, "Guidelines for Cleanup Action Levels for Gasoline and Other Petroleum Hydrocarbons," NDDH, Division of Waste Management - Underground Storage Tank Program.

**TABLE 2
COMPARISON OF ALTERNATIVES**

Criteria*	No Action	Phytoremediation and MNA	
General Standards	1	Minimal human health risks are identified at the site, so the No Action alternative is considered protective by providing land use controls.	Minimal human health risks are identified at the site, so phytoremediation with MNA is considered protective by providing land use controls and moderating natural attenuation processes.
	2	ARARs are anticipated to be met under No Action.	ARARs are anticipated to be met using phytoremediation and MNA.
	3	No Action eventually achieves long-term effectiveness through natural attenuation processes based on preliminary modeling. However, no provisions are included under No Action to refine the model to better predict degradation rates or to confirm when risk-based criteria are met.	Phytoremediation with MNA achieves long-term effectiveness more rapidly than the No Action alternative and includes monitoring to determine the progression of natural attenuation and when risk-based criteria are met.
	4	No Action will eventually reduce contamination through natural attenuation.	Phytoremediation will accelerate contaminant reduction through moderated natural attenuation processes. Phytoremediation also provides hydraulic control of the contaminated shallow aquifer to reduce mobility and volume while natural attenuation processes reduce toxicity.
Selection Decision Factors	5	No Action based on present land use presents no known current risks.	Phytoremediation presents only limited short-term risks for worker safety and potential for exposure during system construction, operation, maintenance, and monitoring activities. Implementation of a health and safety plan will mitigate these risks.
	6	Easily implemented.	Easily implemented. Challenges include growth of the trees because of the severe winters and poor soil conditions.
	7	\$0	\$1.4M over 20 years
	8	NDDH does not believe No Action provides adequate protection.	NDDH agrees to phytoremediation with MNA as the selected remedy.
	9	Limited public interest has been expressed in remediation efforts at the site.	

* - Criteria include:

- 1 Overall Protection of Human Health and the Environment
- 2 Compliance with Applicable or Relevant and Appropriate Requirements
- 3 Long-Term Effectiveness and Performance
- 4 Reduction of Toxicity, Mobility, and Volume
- 5 Short-Term Effectiveness
- 6 Implementability
- 7 Cost
- 8 State Acceptance
- 9 Public Acceptance

with the additional hydraulic control provided by the FSPPT contribute to non-destructive adsorption and dispersion to minimize migration of contamination. The aquifer geochemistry and phytoremediation processes contributing to destructive microbial processes have been demonstrated to be occurring at the site at sufficient capacity to transform contaminants to harmless compounds. This phytoremediation with MNA approach is scientifically defensible based upon contaminant sources, pathways, and potential receptors.

There is no hydraulic connection between potentially contaminated groundwater and the surface waters. The shallow groundwater flows at an estimated 1.5 to 5 feet per year but does not flow to surface waters through seeps or springs. The tightness of the clay soils present at this site act as a natural control to slow contaminant migration supplemented by the hydraulic control provided by the FSPPT. The contaminated shallow groundwater at this site is not used at the Base or in the surrounding areas. Any contaminated soil in the limited vadose zone (the dry portion of the soil profile) is expected to be remediated with the groundwater. The vadose zone is measured to be less than approximately 5 feet from the ground surface to the top of the groundwater.

AOC 539 is located near the edge of the flight line and the surrounding support area of the Base with little risk to human health or wildlife. Receptors may include incidental visits by birds and range animals such as rabbits and gophers. This wildlife is discouraged from using this area due to vehicle traffic, parking areas, grounds maintenance, and security patrols in spite of the cover and food provided by the site. Primary health risks are to human populations monitoring the site or working in disturbed soil at the site, but exposure is limited because contamination is approximately 5 feet below the ground surface.

The shallow groundwater at the Base and surrounding areas has naturally high dissolved solids, making the water unsuitable for consumption without treatment. Also, abundant clean drinking water supplies are available in the local community, so it is unrealistic to assume that anyone would utilize this shallow groundwater. It is believed that the natural attenuation process will reduce any chlorinated solvent contamination and petroleum contamination to concentrations below action

levels prior to reaching receptors due to factors mentioned above. The occasional worker that will be involved in environmental monitoring or excavation at the site will be protected by institutional controls and safety practices already in place, including notification through the underground utility notification system that soil and groundwater contamination will be encountered in the area. Precautions can then be taken by workers to avoid exposure.

Selection of phytoremediation and MNA will be accompanied by sampling, trending analysis, and modeling as appropriate to quantify contaminant mass and predict natural attenuation rates. A long-term monitoring program will be implemented to establish trends in contaminant attenuation rates, to monitor natural attenuation model predictions, and to ensure no migration of contaminants. Current institutional controls include restricted use of groundwater and excavation controls; however, no land use restrictions are expected at this site regarding future use. The estimated time for remediation to occur at this site is approximately 20 years but will continue until clean or the risk posed is acceptable for future industrial use.

The proposed remedy of phytoremediation and MNA will be accomplished as follows:

- Maintenance of the FSPPT will be performed to maximize evapotranspiration and hydraulic control of the shallow aquifer
- Annual groundwater elevation monitoring will be conducted to verify hydraulic control of the shallow aquifer
- Annual groundwater monitoring will be conducted. Up to 11 groundwater monitoring wells will be sampled as appropriate
- Groundwater samples collected during the annual monitoring will be analyzed for COCs and natural attenuation parameters
- A report detailing the status of the FSPPT, the results of the sampling, and evaluating the natural attenuation potential of the groundwater system at the site will be developed following each annual sampling event
- After several monitoring events, trend analysis of the groundwater contamination and potentially a site model will be developed. Recommendations will be presented in each annual report concerning the performance of the selected remedy and

suggest potential changes to enhance remediation efforts

- Hydraulic control using the FSPPT and MNA will continue until concentrations of COCs have been reduced below established regulatory levels shown to be protective of human health and the environment
- Results of the RFI/CMS estimate remediation time to be approximately 20 years
- The FSPPT and MNA will no longer be required once contamination levels are reduced below cleanup levels

The total future cost, including operation and maintenance costs, is approximately \$1,400,000 (\$70K per year for 20 years).

INNOVATIVE TECHNOLOGIES CONSIDERED

Phytoremediation is considered an innovative technology, particularly in this northern climate.

PUBLIC PARTICIPATION

The public comment period for this SOB is 60 calendar days.

KEY WORDS:

soil, groundwater; phytoremediation; monitored natural attenuation; MNA; hydraulic control; institutional controls; land use controls; dermal contact, inhalation, ingestion; chlorinated solvents; halogenated solvents; VOCs, benzene; BTEX; TPH; containment, monitoring

The remedy proposed for selection at AOC 539, which is MNA with phytoremediation, has been in place for several years. All corrective actions at this site have been announced at Restoration Advisory Board meetings and no public comments have been received. The Information Repository for AOC 539 is available to the public at:

Grand Forks Public Library
2110 Library Cir, Grand Forks, ND 58201
(701) 772-8116
Hours: Monday-Thursday 9 am to 9 pm
Friday and Saturday 9 am to 5 pm
Sunday 1 pm to 5 pm

NEXT STEPS

The NDDH will initiate the permit modification process for the Grand Forks AFB's Corrective Action Permit after selection of a remedy from the CMS.

CONTACT:

Curtis Erickson
North Dakota Department of Health
Division of Waste Management
918 East Divide Avenue - 3rd Floor
Bismarck, ND 58501-1947
(701) 328-5166

ATTACHMENT A RESULTS-BASED CORRECTIVE ACTION APPROACH

Throughout the years of implementing the Corrective Action program and other cleanup programs (for example, the Superfund program), a results-based approach has been developed that project managers and owner/operators may use to more efficiently identify releases and risks and to accelerate facility cleanup. A successful RCRA program allows flexible program implementation that incorporates many different technical solutions and administrative approaches to site management. Approaches that focus owner/operators on program goals and appropriately reduce the process towards attaining those goals are termed "results-based" and are the primary focus of the effort to improve the corrective action program.

One of the improvements is "results-based" cleanup guidance, as outlined under the RCRA Cleanup Reforms announcement (EPA530-F-99-018, July 1999 available at: <http://www.epa.gov/correctiveaction/reforms/reforms1.pdf>). Greater use of results-based corrective action approaches has been the U.S. Environmental Protection Agency's (EPA's) stated policy since the 1996 Advanced Notice of Proposed Rulemaking (ANPR), Corrective Action for Solid Waste Management Units at Hazardous Waste Management Facilities (61CFR19432). Results-based corrective action encourages technical and administrative innovation to achieve environmentally protective cleanups on a facility-specific basis.

Results-based approaches emphasize outcomes, or results, in cleaning up actual releases, rather than the process used to achieve those results. Results-based approaches involve setting goals and, where appropriate, allowing owner/operators to move towards those goals without the implementing agency unnecessarily dictating how owners or operators will attain the goals. EPA continues to encourage program implementers and facility owner/operators to focus on the desired result of cleanup rather than a mechanistic cleanup process. The benefits of a results-based corrective action are:

- Improved focus on the end goals of corrective action and intermediate milestones, such as environmental indicators, rather than on unnecessary adherence to a predetermined administrative process
- Generally, more rapid achievement of results
- Resource savings to both owner/operator and implementing agency

Additionally, the Superfund program began developing presumptive remedy guidance in 1991 using past experience to streamline cleanups. Presumptive remedies are preferred technologies for common categories of sites, based on historical patterns of remedy selection and EPA's scientific and engineering evaluation of performance data on technology implementation. EPA expects project managers to use presumptive remedies at appropriate RCRA facilities to help ensure consistency in remedy selection and implementation and to reduce the cost and time required to investigate and remediate similar types of sites. In general, even though EPA's presumptive remedy guidance documents were developed for CERCLA sites, project managers should use them at appropriate RCRA corrective action facilities to focus investigations and simplify the evaluation of remedial alternatives and remedy selection processes.

The following is a list of some oversight activities that have been adapted to facilities to decrease the level of oversight as deemed appropriate. These include, but are not limited to:

- Eliminating duplicative state/federal reviews of documents
- Eliminating interim deliverables while maintaining accountability of the owner/operator to produce a measurable end product
- Time-limited review where agency approval is not required for the owner/operator to proceed
- Increasing the use of meetings, briefings, and other communication methods to identify and resolve issues early on rather than using formal documentation methods

- Limiting the number of facility visits for routine field activities when the owner/operator demonstrates competence in achieving remedial results, including public involvement
- Establish performance standards that define clear and attainable results
- Using briefings, conversations, and progress reports from the owner/operator to replace some of the formal interim deliverables while still making this information publicly available where appropriate
- Encouraging communication among the project manager, owner/operator and the community; for example, make up-to-date facility information available at publicly accessible locations. Public participation remains a key component of the corrective action process

North Dakota is a leading state in developing and implementing these recommendations of EPA. In fact, North Dakota has been using this concept prior to EPA's guidance issuance. Our progress in achieving the environmental indicators at contaminated sites under control is a testament to the working relationship North Dakota shares with its facilities under corrective action and a results-based approach.

Addendum I

Statement of Basis - Remedy Modification

Area of Concern (AOC) A, Former Building 539

NDDH Permit HW-020

Introduction

This addendum updates the Statement of Basis (SOB) dated March 14, 2007, for NDDH permit HW-020 at Area of Concern (AOC) A, Former Building 539, and Environmental Restoration Program (ERP) Site TU504 at Grand Forks Air Force Base (GFAFB). It also provides background information and justification for the proposed remedy.

Proposed Remedy Modification

The original permitted remedy for AOC A (Former Building 539, TU504) was phytoremediation with monitored natural attenuation (MNA) to provide hydraulic control of the shallow aquifer to prevent off-site migration and to allow the natural attenuation process to remediate the contamination. The contaminants of concern are identified as chlorinated volatile organic compounds (VOCs), total petroleum hydrocarbon (TPH), and benzene.

Further development of technology has produced the means of expediting contaminant degradation, with potential toward earlier closure. A revised remedy (low pressure emulsified vegetable soil [EVO] injections) was implemented in 2014 to accelerate the remediation of groundwater at AOC A. However, the desired radius of influence (ROI) was unable to be achieved due to the low permeability formations. A revised injection approach utilizing environmental hydraulic fracturing (a controlled high-pressure injection technology) is proposed, which will address the issues encountered under the revised remedy (low pressure EVO injections).

Approval for consideration of alternatives to the current revised remedy (low pressure EVO injections) was received after discussion with the North Dakota Department of Health (NDDH) on 8 July 2015. The reasons for updating the remedy are presented below.

Background

AOC A is a former jet engine test cell facility (Former Building 539) that supported the USAF mission from the late 1950s through 1992. In 1995, a petroleum odor was detected in soils while foundation footings were removed during demolition of Former Building 539. Soil samples from the site were analyzed and found to contain a variety of organic compounds that were commonly used at the former building location, including jet propulsino fuel, JP-4 fuel, hydraulic fluid, engine oil, and solvents such as trichloroethene (TCE), and methyl ethyl ketone. Subsequent investigations were conducted under the Resource Conservation and Recovery Act (RCRA) RCRA Facility Investigation (RFI) process.

In 2002, phytoremediation was selected to mitigate the soil and groundwater contamination at AOC A, and to prevent the contaminant plume in the groundwater from migrating offsite. Annual groundwater monitoring began in 2002.

In 2013, low pressure EVO injectons were completed at Site AOC A. The injections were completed at

pressures ranging from 5 to 10 psi. However, due to field conditions (i.e. increasing injection pressures, decreasing flow rates, and daylighting issues), the low pressure injections were unable to penetrate into the low permeability formations and the desired radius of influence (ROI) was unable to be achieved.

Groundwater sampling results following the low pressure injection event indicate that contaminants of concern (COC) concentrations are stable or decreasing. However, COCs remain above the cleanup goals identified in the 2007 SOB. The May 2015 sampling event detected benzene, TCE, cis-1,2-DCE, TPH-DRO, and TPH-GRO above the cleanup goals in one or more monitoring wells (MW05, MW06, MW09, MW10, and MW11). The maximum concentrations detected were in MW05, and include TCE at 6,030 micrograms per liter ($\mu\text{g/L}$), cis-1,2-DCE at 6,310 $\mu\text{g/L}$, DRO at 1.33 mg/L, GRO at 2.12 mg/L, and benzene at 368 $\mu\text{g/L}$.

Proposed Remedy

While the revised remedy (low pressure EVO injections) did show a reduction in groundwater contaminant concentrations, these reductions are not substantial enough for achieving site closure. The lower permeability lithology of the site is most likely responsible for this result, as silts and clays are not conducive to successful implementation of permeation injections. Environmental hydraulic fracturing and injections could be used to overcome the shortcomings associated with traditional injection methods. Specifically, this type of pressurized injection often results in more controlled delivery into low-permeability zones and can accelerate site closure by increasing the spatial distribution of the amendments in the subsurface.


The proposed remedy involves environmental hydraulic fracturing and injections of EVO to promote reductive dechlorination of chlorinated solvents. The pressurized injections will be done at multiple surface locations and subsurface intervals where groundwater exceeds the cleanup goals identified in the 2007 SOB. Specifically, it is anticipated that between four and eight fracturing points will be initiated in the area of interest. In addition, up to three initiation depths within the zone of interest between 10 and 20 feet below ground surface will be implemented at each of the aforementioned fracturing points. More than one injection round may be required to achieve the cleanup goals identified in the 2007 SOB. The proposed injection approach will not adversely affect the existing phytoremediation plot.

Justification For Remedy Modification

Approval of the proposed remedy is based upon the following conclusions: the advantages of advanced technology, comparison with the original remedy and in consideration of Department of the Air Force goals.

The objective for AOC A (Former Building 539) is to remediate soil and groundwater until it meets the cleanup goals identified in the 2007 SOB. The original remedy (Phytoremediation and MNA) has been in place since 2002 and has not yet achieved site closure. The proposed remedy (environmental hydraulic fracturing and injections) is a more aggressive approach and will assist biodegradation of COCs, therefore reaching the cleanup levels and site closure more quickly than with the original remedy. Once the cleanup levels are achieved, there will be no further risk of contaminant migration, or risk to human health or the environment.

Once the cleanup levels have been achieved, No Further Action (or Site Closure) will be required at AOC A (Former Building 539).


RODNEY D. LEWIS, Colonel, USAF
Commander, 319th Air Base Wing

11 MAR 16
Date

UNCLASSIFIED

Addendum II

Statement of Basis – Remedy Modification

Area of Concern A, Former Building 539

NDDEQ Permit HW-020

Introduction

This addendum updates the Statement of Basis (SoB) dated March 14, 2007 and Addendum I to the SoB dated 11 March 2016 for North Dakota Department of Environmental Quality permit HW-020 at Area of Concern (AOC) A, Former Building 539, and Environmental Restoration Program Site TU504 at Grand Forks Air Force Base. It also provides background information and justification for the proposed remedy.

Proposed Remedy Modification

The original permitted remedy for AOC A (Former Building 539, TU504) was phytoremediation with monitored natural attenuation (MNA) to provide hydraulic control of the shallow aquifer to prevent off-site migration and to allow the natural attenuation process to remediate the contamination. The contaminants of concern are identified as chlorinated volatile organic compounds (VOCs), total petroleum hydrocarbons (TPH), and benzene.

Further development of technology has produced the means of expediting contaminant degradation, with potential toward earlier closure. A revised remedy (low pressure emulsified vegetable oil [EVO] injections) was implemented in 2014 to accelerate the remediation of groundwater at AOC A. However, the desired radius of influence (ROI) was unable to be achieved due to the low permeability formations. In 2016, under an amendment to this SoB, a revised injection approach utilizing hydraulic fracturing to increase the ROI was implemented. A review of post-injection monitoring results indicated decreases in trichloroethene (TCE) with increases in daughter products cis-1,2-dichloroethene (cis-1,2-DCE), trans-1,2-dichloroethene (trans-1,2-DCE), and vinyl chloride (VC) indicating a stall in the dechlorination process. Increases were observed in TPH and benzene concentrations following injections in 2016.

Therefore, a revised remediation approach is proposed targeting treatment of residual chlorinated VOC and fuel contaminants in shallow soil and groundwater via *in situ* chemical oxidation (ISCO) through soil blending.

Background

AOC A is a former jet engine test cell facility (Former Building 539) that supported the United States Air Force mission from the late 1950s through 1992. In 1995, a petroleum odor was detected in soils while foundation footings were removed during demolition of Former Building 539. Soil samples from the site were analyzed and found to contain a variety of organic compounds that were commonly used at the former building location, including jet propulsion fuel number 4, hydraulic fluid, engine oil, and solvents such as TCE and methyl ethyl ketone.

UNCLASSIFIED

UNCLASSIFIED

Subsequent investigations were conducted under the Resource Conservation and Recovery Act Facility Investigation process.

In 2002, phytoremediation was selected to mitigate the soil and groundwater contamination at AOC A and to prevent the contaminant plume in the groundwater from migrating off site. Annual groundwater monitoring began in 2002.

In 2014, low pressure EVO injections were completed at AOC A. The injections were completed at pressures ranging from 5 to 10 psi. However, due to field conditions (i.e., increasing injection pressures, decreasing flow rates, and daylighting issues), the low pressure injections were unable to penetrate into the low permeability formations, and the desired ROI was unable to be achieved. Groundwater sampling results following the low pressure injection event indicated that contaminant of concern (COC) concentrations were stable or decreasing. However, COCs remained above the cleanup goals identified in the 2007 SoB.

In 2016, high pressure injections of LactOil were completed at AOC A near monitoring well MW05. The injections were completed at higher pressures to achieve a greater ROI. Groundwater sampling results following completion of injections indicated that concentration of TCE decreased at monitoring well MW05, while concentrations of TCE daughter products (cis-1,2-DCE, trans-1,2-DCE, and VC), TPH, and benzene increased, likely due to desorption of contaminants from soil to groundwater as a result of the fracturing and injections. As of the 2020 annual groundwater monitoring event, concentrations of COCs across AOC A remain above cleanup goals identified in the 2007 SoB.

Proposed Remedy

While the revised remedy (EVO/LactOil injections) did show a reduction of some COCs in groundwater, these reductions are not substantial enough for achieving site closure, and increases were observed in TPHs and benzene. The lower permeability lithology of the site and insufficient amount of EVO/LactOil amendment delivery are most likely responsible for this result, as silts and clays are not conducive to successful implementation of permeation injections, and the amount of amendment delivered is not sufficient to sustain the dechlorination process in the subsurface. Additionally, the injected amendments are not conducive to treatment of fuel-related contaminants (e.g., TPHs and benzene).

The proposed remedy involves treatment of contaminants via ISCO by blending Oxygen BioChem (OBC), a mixture of sodium persulfate and calcium peroxide, into the subsurface soil and groundwater. OBC provides a two-fold mechanism for treating all COCs through the introduction of a strong oxidant (persulfate) for short term ISCO treatment while also providing electron acceptors (oxygen and sulfate) for longer-term biological oxidation, which specifically targets VC and fuel contaminants.

The soil blending approach is to distribute OBC throughout the lateral extent of the contaminant plumes with concentrations above cleanup goals and vertically within the shallow aquifer identified during previous investigations. Depths targeted for treatment range from 0 to 15 feet below ground surface. The treatment area will be broken up into individual cells, with soil

UNCLASSIFIED

UNCLASSIFIED

blending occurring in one cell at a time. A total of approximately 10,600 square feet will be targeted for soil blending. To complete the soil blending, trees from the phytoremediation plot will need to be removed. These trees will not be replaced as the ISCO treatment is intended to reduce contaminant concentrations to below cleanup goals. Additionally, monitoring wells located within the soil blending area will be removed, and new wells matching construction of the removed wells will be reinstalled following soil blending for subsequent performance monitoring. Performance monitoring will consist of groundwater monitoring for site contaminants at site monitoring wells to ensure contaminants remain below cleanup levels. Persulfate will also be monitored for to evaluate lifespan of the treatment. During performance monitoring, naturally occurring components of the aquifer, such as metals and geochemical parameters, will be monitored for changes because of the ISCO remedy. Although changes in these components may occur, they will return to more naturally occurring states as the treatment lifespan ends. Following the implementation of this proposed remedy, sampling and analysis for methane, ethane, ethene, and total organic carbon will be discontinued and removed from the existing long-term monitoring sampling program.

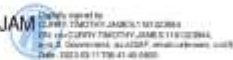
Justification for Remedy Modification

Approval of the proposed remedy is based upon the following conclusions: the advantages of advanced technology, comparison with the original and amended remedies, and in conjunction with the Department of Air Force goals.

The objective for AOC A is to remediate soil and groundwater until it meets the cleanup goals identified in the 2007 SoB. The original remedy (phytoremediation and MNA) has been in place since 2002 and has not yet achieved site closure. The first amended remedy (EVO/LactOil injections under low and high pressures) was a more aggressive approach that saw reductions in TCE; however, TCE daughter products and fuel contaminants began to increase. The proposed remedy (ISCO via soil blending) is a more aggressive approach and will assist in chemical breakdown of all contaminants as well as biological oxidation of VC and fuel contaminants; therefore, reaching the cleanup goals and site closure more quickly than with the original and first amended remedy. Once the cleanup goals are achieved, there will be no further risk of contaminant migration or risk to human health or the environment.

Once the cleanup goals have been achieved, No Further Action (or Site Closure) will be required at AOC A.

CURRY,TIMOTHY,JAM
ES.1161223944



TIMOTHY J. CURRY, Colonel, USAF
Commander, 319th Reconnaissance Wing

3/11/23

Date

UNCLASSIFIED

AOC B

Former Building 501

Closure Documentation

DRAFT

GRAND FORKS AIR FORCE BASE
Grand Forks AFB, North Dakota
March 14, 2007

Facility/Unit Type:	United States Air Force Building 501 (Area of Concern [AOC] 501)
Contaminants:	Benzene, Total Petroleum hydrocarbons
Media:	Soil and groundwater
Remedy:	Monitored Natural Attenuation (MNA) through annual groundwater monitoring at six wells throughout the site

INTRODUCTION

The Grand Forks Air Force Base (AFB) Corrective Action Program is conducted under the authority of Sections 3004(u), 3004(v), 3005(c)(3), 3008(h), 3013, 6001, and 7003 of the Resource Conservation and Recovery Act (RCRA)(42 U.S.C. 6901 et seq.) as amended by the Hazardous and Solid Waste Amendments of 1984 (HSWA) (Pub. L. No. 98-616, 98 Stat. 3221) and the Federal Facility Compliance Act of 1992 (Pub. L. 102-386, 106 Stat. 1505). North Dakota has been delegated authority under the RCRA Corrective Action Program by the U.S. Environmental Protection Agency (USEPA) and has program responsibility for this action by virtue of that delegation.

The objective of a RCRA corrective action program is to evaluate the nature and extent of the release of contaminants; to evaluate site characteristics, including identification of solid waste management units, geophysical information, areas and populations threatened by the release, and actual and potential threats to human health and the environment; and to identify, develop, and implement an appropriate corrective measure or measures to protect human health and the environment.

This Statement of Basis is part of the corrective action process and is a requirement of the RCRA Corrective Action Permit, issued to Grand Forks AFB by the North Dakota Department of Health (NDDH). The purpose of the Statement of Basis is multi-fold: 1) identify remedies evaluated; 2) identify the proposed remedy and rationale for its selection; 3) provide information on how the public can become involved in the selection process; and 4) solicit public review and comment on the proposed remedy. This Statement of Basis

summarizes information obtained during investigations and remedial actions conducted at Building 501 (Area of Concern [AOC] 501).

FACILITY DESCRIPTION

AOC 501 includes Building 501 that supports a petroleum, oil, and lubricants (POL) area for a U.S. Air Force (USAF) refueling mission. Infrastructure around the site, including multiple aboveground storage tanks (ASTs), underground storage tanks (USTs), piping, and manifold systems, supplies fuel to the flightline area. Investigation of AOC 501 began in 1996 as a site investigation (SI) under the North Dakota Department of Health (NDDH) UST Program and forwarded to the Corrective Actions program because SWMU were located at the site. NDDH is the lead regulatory agency for cleanup of contaminated areas in North Dakota.

Building 501 (AOC 501)

AOC 501 is located in the south-central portion of the Base south of 1st Avenue between Eielson Street and B Street. A 50,000-gallon UST located on the east side of Building 501 and extending approximately 10 feet under the building was closed in-place prior to 1996. A 17,000-gallon diesel fuel UST located adjacent to the southwest corner of the building and extending partially under the building was also closed in-place prior to 1996.

A 15,000-gallon diesel fuel UST located northwest of Building 501 was also previously removed and an oil/water separator was installed nearby. Any subsurface contamination resulting from the use of this UST was presumably recovered at the time of the removal.

A 100-gallon UST, which was removed in 1995, was located near the northeast corner of Building 501 and had been used as a product recovery UST during maintenance activities inside the building. A 2,000-gallon UST located adjacent to the south side of the building was replaced in May of 1995 with a 2,000-gallon jet propellant fuel UST, which is currently in service.

Evidence of soil contamination was visually observed during the excavation and removal of the 2,000-gallon UST in 1995. Soil contamination was presumed to originate from leaks in the UST because no documentation of fuel releases, such as from tank overfilling, was found. The quantity of the release is unknown. The SI under the NDDH UST Program was initiated to characterize the nature and extent of the contamination.

NDDH UST Program SI

The NDDH UST Program works with owners and operators of USTs to ensure that leak detection, new installations, upgrades, and tank closures are completed in accordance with North Dakota's UST Rules.

Under the NDDH UST Program, the objective of an investigation at a contaminant release site is to determine the extent and environmental impact of the released contaminant(s). This includes: (1) delineating the horizontal and vertical extent of contaminants of concern (COCs) in the soil and groundwater; (2) identifying and evaluating receptors; (3) characterizing the nature of the COC present; and (4) adequately defining the site geology and hydrogeology. Installation of soil borings and monitoring wells for soil and groundwater sampling and for aquifer testing is included to determine the extent of contamination and the general characteristics of the aquifer, such as groundwater flow direction, hydraulic gradient, and hydraulic conductivity.

During the excavation and replacement of the 2,000-gallon UST in 1995, one groundwater sample and two soil samples were collected and analyzed for benzene, toluene, ethylbenzene, and total xylenes (BTEX) and total petroleum hydrocarbons (TPH) as diesel range organics (DRO). BTEX compounds were detected in the soil samples (toluene up to 600 micrograms per kilogram [$\mu\text{g}/\text{kg}$]), but the TPH results were inconclusive. The groundwater sample contained

TPH and BTEX compounds (benzene up to 21 micrograms per liter [$\mu\text{g}/\text{L}$]).

Grand Forks Air Force Base (GFAFB) personnel reported that the 100-gallon UST was in very poor condition and could not be removed in one piece.

In the fall of 1996, an initial SI under the NDDH UST Program was conducted at the Building 501 site. During this investigation, 28 direct push technology (DPT) borings were placed in the general area surrounding Building 501. Thirty soil samples and 20 groundwater samples were collected from these locations and analyzed for BTEX and TPH as DRO and gasoline range organics (GRO).

Soil samples from 12 DPT borings contained TPH (combined DRO and GRO) concentrations ranging from 200 to 7,400 milligrams per kilogram (mg/kg), which exceed the NDDH UST action level guideline (100 mg/kg). BTEX was reported at 13 DPT boring locations at concentrations ranging from 10 to 68,000 $\mu\text{g}/\text{kg}$.

Total lead analysis was also performed on the soil samples collected from DPT borings. Lead was detected in 25 samples at concentrations ranging from 6 to 14 mg/kg .

Groundwater collected from eight of the DPT boring locations contained TPH concentrations ranging from 680 to 54,500 $\mu\text{g}/\text{L}$, exceeding the state action level guideline of 500 $\mu\text{g}/\text{L}$. Benzene was detected at five of the DPT boring locations ranging from 12 to 1,100 $\mu\text{g}/\text{L}$, exceeding the state action level guideline of 5 $\mu\text{g}/\text{L}$.

Total lead analysis was performed on 20 groundwater samples collected from 20 probe hole locations. Lead was detected in 13 samples in concentrations ranging from 0.056 to 48 milligrams per liter (mg/L).

Based on the results of these investigations, GFAFB notified the NDDH of the need for further investigation at Building 501. Since the site is outside the boundary of solid waste management unit (SWMU) 11, the site was designated an AOC at Building 501. All subsequent investigations or remedial actions were conducted through the Resource Conservation and Recovery Act (RCRA) corrective action process.

RCRA Facility Investigation/Corrective Measures Study

The RCRA Corrective Action Program oversees the cleanup of existing contamination and any releases at active facilities. In its ongoing effort to improve the corrective action program, the U.S. Environmental Protection Agency (EPA), with the assistance of interested stakeholders, identified several improvements to increase the efficiency and cost-effectiveness of facility cleanups.

One of the improvements is "results-based" cleanup guidance, as outlined under the RCRA Cleanup Reforms announcement (EPA530-F-99-018, July 1999 available at: <http://www.epa.gov/correctiveaction/reforms/reforms1.pdf>). Results-based corrective action encourages technical and administrative innovation to achieve environmentally protective cleanups on a facility-specific basis.

Results-based approaches emphasize outcomes, or results, in cleaning up actual releases, rather than the process used to achieve those results. The benefits of a results-based corrective action are:

- Improved focus on the end goals of corrective action and intermediate milestones, such as environmental indicators, rather than on unnecessary adherence to a predetermined administrative process
- Generally, more rapid achievement of results
- Resource savings to both owner/operator and implementing agency

Additional information about the results-based corrective action approach is included in Attachment A.

After the SI, six permanent monitoring wells were installed at AOC 501 in 2000. These wells were sampled in October 2000 for BTEX, TPH as DRO and GRO, and natural attenuation indicators (methane, nitrate/nitrite, sulfate, and alkalinity). Aquifer tests were also conducted on wells at AOC 501. The results of this investigation confirmed the presence of TPH and BTEX in the soil and groundwater at AOC 501, but also indicated that a significant reduction in contaminant mass had occurred since the initial SI in 1996. Maximum TPH and benzene concentrations in groundwater in 1996 were

54,500 µg/L and 1,100 µg/L, respectively. Results from the October 2000 monitoring well installation and groundwater sampling indicated maximum concentrations for TPH and benzene of 2,020 µg/L and 110 µg/L, respectively.

Assessment of the natural attenuation parameters at the site indicated that the assimilative capacity of the aquifer was sufficient to degrade contaminants in the groundwater. It was therefore concluded that natural attenuation was a viable alternative for remediating the plume. In addition, retardation and contaminant velocity calculations suggest that significant contaminant attenuation is occurring at the site.

Long-Term Monitoring Program (LTMP)

The LTMP began in the fall of 2002. Total BTEX concentrations in groundwater have generally decreased over the monitoring period (October 2000 to October 2006) and benzene has been the only constituent over the maximum concentration level (MCL) at GFB501-MW02, which represents the center of the contaminant plume. TPH concentrations at GFB501-MW02 have also shown a decreasing trend, but the concentration exceeds the NDDH regulatory guideline.

Results for 2002 indicated that the capacity of the natural system at AOC 501 continued to exhibit the potential to attenuate and degrade POL contaminants in the groundwater. However, the concentration of benzene in monitoring well GFB501-MW02 increased slightly in October 2002 to 150 µg/L. TPH concentration also increased from 2,020 µg/L to 3,070 µg/L in the heart of the contaminant plume. Groundwater levels increased significantly between October 2000 and October 2002, which may have been the reason for the higher contaminant concentration as the groundwater was exposed to POL contaminated soil in the vadose zone (i.e., the unsaturated soil above the groundwater).

Results from the LTMP in 2003 indicated that TPH concentrations in the groundwater at monitoring well GFB501-MW02 increased to 4,710 µg/L. The benzene concentration also increased to 174 µg/L from 150 µg/L reported in October 2002 while the groundwater elevation remained constant.

The results from the 2004 LTMP reversed the trend of increasing concentration of TPH but continued the trend of increasing benzene concentration. Benzene concentration increased to 260 µg/L, but groundwater elevation at the site also increased and may have exposed the groundwater to more contamination in the vadose zone. All monitoring wells exhibited contaminant concentrations below regulatory guidelines with the exception of TPH and benzene in well GFB501-MW02 at the heart of the contaminant plume.

The results from the 2005 LTMP continued the trend of decreasing TPH concentration and reversed the trend of increasing benzene concentration. The benzene concentration in well GFB501-MW02 was 160 µg/L, which was down from 260 µg/L in 2004, while the TPH concentration was estimated at 970 µg/L, which was down from 1,720 µg/L the year before. All other monitoring wells at AOC 501 failed to detect benzene or TPH above the reporting limit. As in 2004, no monitoring wells exhibited contaminant concentrations exceeding the regulatory guidelines except for well GFB501-MW02 where benzene and TPH exceeded regulatory guidelines. Natural attenuation data continued to indicate that the groundwater system at AOC 501 has sufficient capacity to attenuate and degrade the TPH and BTEX concentrations.

The results from the 2006 LTMP indicated that this trend of decreasing benzene and TPH concentrations continues. Benzene is reported at 98 µg/L and TPH is 420 µg/L. These concentrations are down from the concentrations reported 2005 and down from the historic high concentrations of 1,100 µg/L for benzene and 54,500 µg/L for TPH in 1996. The data indicate that the groundwater system at AOC 501 has sufficient capacity to attenuate and degrade the TPH and BTEX concentrations.

EXPOSURE PATHWAYS

Exposure pathways considered for the TPH and benzene contaminants at AOC 501 include inhalation of contaminants from volatilization from soil to air, dermal contact with soil, ingestion of soil, and exposure to groundwater. Potential human receptors are occasional grounds maintenance workers, refueling personnel, and

construction personnel during maintenance or renovation of the existing utilities and other infrastructure requiring excavation.

Because Base access is restricted and near-term residential use of the site is not probable, only exposure for the on-site worker may pose an unacceptable health risk. The nearest residential-use area is over one mile away. Institutional controls established for the site, which notify site workers of the potential hazards and establish engineering and administrative control requirements to mitigate potential exposure risks, are sufficient to control the potential for exposure.

Risk to wildlife is considered very low because the area is industrial without sufficient habitat and activities discourage wildlife from inhabiting the area. No endangered species or sensitive environmental concerns are present and wetland habitat is not a concern given the distance of such habitat from the site. No complete exposure pathway to an ecological receptor is identified.

Table 1 summarizes the maximum concentrations for contamination detected at AOC 501 and the cleanup goals for the COCs.

PROPOSED REMEDY

The corrective measures identified in the CMS for AOC 501 included no action and monitored natural attenuation (MNA). Institutional controls were considered as part of both alternatives during the remedial activities. However, institutional controls were not considered part of the permanent remedy because land use will be unrestricted upon completion of remedial efforts. The proposed remedy was selected after evaluating the feasibility and effectiveness of the proposed alternatives in meeting the remedial objectives for the site, including reduction of the potential for acute and chronic human health risks. Table 2 summarizes the comparison of alternatives.

The proposed remedial action for AOC 501 is MNA or intrinsic bioremediation. Natural attenuation is achieved when naturally occurring in-situ processes transform contaminants to harmless constituents without requiring engineering actions and controls. Natural

**TABLE 1
CONTAMINATION DETECTED AND CLEANUP GOALS**

Media	Estimated Volume	Contaminant	Maximum Concentration ¹	Action Level	Cleanup Goal ²
Soil	Various depths	TPH	7,400 ppm	100 ppm ³	100 ppm
		benzene			
Groundwater	Not given	TPH	54,500 ppb	500 ppb ⁴	500 ppb
		benzene	1,100 ppb	5 ppb ⁵	5 ppb

1 – The maximum concentrations were reported in the 1996 SI.

2 – The Cleanup Goal has been established to be equal to the Action Level.

3 – The Cleanup Goal for TPH in soil is consistent with NDDH guidance for remediation of petroleum spills, "Guidelines for Cleanup Action Levels for Gasoline and Other Petroleum Hydrocarbons," NDDH, Division of Waste Management - Underground Storage Tank Program, in accordance with North Dakota Underground Storage Tank (UST) Rules, Chapter 33-24-08 of the North Dakota Administrative Code (NDAC) Article 33-24.

4 – There is no MCL for TPH in groundwater, but the remedial action is consistent with NDDH guidelines for TPH cleanup action levels, "Guidelines for Cleanup Action Levels for Gasoline and Other Petroleum Hydrocarbons," NDDH, Division of Waste Management - Underground Storage Tank Program.

5 – MCL (Title 40, Code of Federal Regulations [CFR], Part 141, Subpart G).

attenuation is non-intrusive and does not disrupt existing facilities or mission activities during remediation. Contaminants are degraded to simpler and less toxic products by natural processes. Additionally, because the process is in-situ, immediate risk of exposure to contaminants is avoided.

Natural attenuation is the preferred alternative in the Air Force Center for Environmental Excellence (AFCEE) remediation matrix. The AFCEE matrix ranks technologies and processes to be considered for implementation at Air Force sites with common contaminants, such as petroleum hydrocarbons. The matrix indicates that natural attenuation should always be considered as a remedy first and selected based on defensible risk assessment. Natural attenuation, as a remedy, is generally less expensive than conventional ex-situ remediation techniques.

Petroleum hydrocarbons have been shown to be naturally biodegradable at numerous sites throughout the world including sites at GFAFB. The physical aquifer characteristics at AOC 501 of low permeability contributing to

non-destructive adsorption and dispersion, and the aquifer geochemistry contributing to destructive microbial processes of aerobic biodegradation, denitrification, iron reduction, manganese reduction, and sulfanogenesis have been demonstrated to be occurring at sufficient capacity to transform contaminants to harmless compounds. This will also result in mobility control of the contaminants. This MNA approach is scientifically defensible based upon contaminant sources, pathways, and potential receptors.

The shallow groundwater flows at an estimated 1.5 to 5 feet per year but does not flow to surface waters through seeps or springs. The tightness of the clay soils present at this site act as a natural control to slow contaminant migration. The contaminated shallow groundwater at this site is not used at the Base or in the surrounding areas. Any contaminated soil in the limited vadose zone (the dry portion of the soil profile) is expected to be remediated with the groundwater. The vadose zone is measured to be less than five feet from the ground surface to the top of the groundwater.

**TABLE 2
COMPARISON OF ALTERNATIVES**

Criteria*	No Action	MNA	
General Standards	1	Minimal human health risks are identified at the site, so No Action is considered protective.	Minimal human health risks are identified at the site, so MNA is considered protective. More sampling is included than No Action, so MNA is considered more protective.
	2	Applicable or relevant and appropriate requirements (ARARs) are anticipated to be met under No Action.	ARARs are anticipated to be met using MNA.
	3	No Action achieves long-term effectiveness based on preliminary modeling. However, no provisions are included in No Action to refine the model to better predict degradation rates.	MNA achieves long-term effectiveness, and monitoring will better predict or improve confidence in the modeled rates of contaminant degradation.
	4	No Action will eventually reduce contamination through natural attenuation.	MNA will eventually reduce contamination through natural attenuation. Monitoring of the contamination will allow refinement of the modeling to better predict rates of contaminant degradation.
Selection Decision Factors	5	No Action based on present land use presents no known current risks.	MNA presents limited short-term risks for worker exposure during monitoring activities.
	6	Easily implemented.	Easily implemented.
	7	\$0	\$800,000
	8	NDDH does not believe No Action provides adequate protection.	NDDH agrees to MNA as the selected remedy.
	9	Limited public interest, but the public has indicated concern over costs of previous environmental activities at the Base.	

* - Criteria include:

- 1 Overall Protection of Human Health and the Environment
- 2 Compliance with Applicable or Relevant and Appropriate Requirements
- 3 Long-Term Effectiveness and Performance
- 4 Reduction of Toxicity, Mobility, and Volume
- 5 Short-Term Effectiveness
- 6 Implementability
- 7 Cost
- 8 State Acceptance
- 9 Public Acceptance

AOC 501 is located in the south-central portion of the Base with little risk to human health or wildlife. Receptors may include incidental visits by birds and range animals such as rabbits and gophers. This wildlife is discouraged from using this area due to man-made structures (ASTs, secondary containment, buildings, and parking areas), operations, security patrols, and vehicle traffic. There is little cover for wildlife. Primary

health risks are to human populations working in disturbed soil at the site because contamination is approximately 5 feet below the ground surface.

The shallow groundwater at the Base and surrounding areas naturally has high dissolved solids, making the water unsuitable for consumption without treatment. Also, abundant

clean drinking water supplies are available in the local community, so it is unrealistic to assume consumptive use of this shallow groundwater. It is believed that the natural attenuation process will reduce any petroleum contamination to concentrations below action levels prior to reaching receptors due to factors mentioned above. The occasional worker that will be involved in excavation at the site will be protected by institutional controls already in place. Workers will be notified through the underground utility notification system that soil and groundwater contamination will be encountered in the area. Precautions can then be taken by workers to avoid exposure.

Selection of natural attenuation will be accompanied by sampling and modeling to quantify contaminant mass and predict natural attenuation rates. A long-term monitoring program will be implemented to monitor natural attenuation model predictions and ensure no migration of contaminants. Current institutional controls include restricted access to and use of the site due to POL Area activities at this site. However, no land use restrictions are expected of this site regarding future use. The estimated time for remediation to occur at this site is approximately 20 years but will continue until clean or the risk posed is acceptable for future industrial use.

The proposed remedy of MNA will be accomplished as follows:

- Annual groundwater monitoring will be conducted at AOC 501. Up to six groundwater monitoring wells will be sampled as appropriate.
- Groundwater samples collected during the annual monitoring will be analyzed for COCs and natural attenuation parameters.
- A report detailing the results of the monitoring and evaluating the natural attenuation potential of the groundwater system at the site will be developed following each annual sampling event. After several monitoring events, a site model will be developed. Recommendations will be

presented in each annual report concerning the performance of the selected remedy and suggest potential changes to enhance remediation efforts.

- MNA will continue until concentrations of COCs have been reduced below established regulatory levels shown to be protective of human health and the environment
- Results of the RFI/CMS estimate remediation time to be approximately 20 years
- MNA will no longer be required once contamination levels are reduced below cleanup levels

The total cost, including operation and maintenance costs, is approximately \$800,000

INNOVATIVE TECHNOLOGIES CONSIDERED

None.

PUBLIC PARTICIPATION

The public comment period for this SOB is 60 calendar days.

The remedy proposed for selection at AOC 501, which is MNA, has been in place for several years. All corrective actions at this site have been announced at Restoration Advisory Board meetings and no public comments have been received. The Information Repository for AOC 501 is available to the public at:

Grand Forks Public Library
2110 Library Cir, Grand Forks, ND 58201
(701) 772-8116

Hours: Monday-Thursday 9 am to 9 pm
Friday and Saturday 9 am to 5 pm
Sunday 1 pm to 5 pm

NEXT STEPS

The NDDH will initiate the permit modification process for the Grand Forks AFB's Corrective Action Permit after selection of a remedy from the CMS.

KEY WORDS:

soil, groundwater; MNA; monitored natural attenuation; institutional controls; dermal contact, inhalation, ingestion; benzene; BTEX; TPH; containment, monitoring

CONTACT:

Curtis Erickson
North Dakota Department of Health
Division of Waste Management
918 East Divide Avenue – 3rd Floor
Bismarck, ND 58501-1947
(701) 328-5166

ATTACHMENT A RESULTS-BASED CORRECTIVE ACTION APPROACH

Throughout the years of implementing the Corrective Action program and other cleanup programs (for example, the Superfund program), a results-based approach has been developed that project managers and owner/operators may use to more efficiently identify releases and risks and to accelerate facility cleanup. A successful RCRA program allows flexible program implementation that incorporates many different technical solutions and administrative approaches to site management. Approaches that focus owner/operators on program goals and appropriately reduce the process towards attaining those goals are termed "results-based" and are the primary focus of the effort to improve the corrective action program.

One of the improvements is "results-based" cleanup guidance, as outlined under the RCRA Cleanup Reforms announcement (EPA530-F-99-018, July 1999 available at: <http://www.epa.gov/correctiveaction/reforms/reforms1.pdf>). Greater use of results-based corrective action approaches has been the U.S. Environmental Protection Agency's (EPA's) stated policy since the 1996 Advanced Notice of Proposed Rulemaking (ANPR), Corrective Action for Solid Waste Management Units at Hazardous Waste Management Facilities (61FR19432). Results-based corrective action encourages technical and administrative innovation to achieve environmentally protective cleanups on a facility-specific basis.

Results-based approaches emphasize outcomes, or results, in cleaning up actual releases, rather than the process used to achieve those results. Results-based approaches involve setting goals and, where appropriate, allowing owner/operators to move towards those goals without the implementing agency unnecessarily dictating how owners or operators will attain the goals. EPA continues to encourage program implementers and facility owner/operators to focus on the desired result of cleanup rather than a mechanistic cleanup process. The benefits of a results-based corrective action are:

- Improved focus on the end goals of corrective action and intermediate milestones, such as environmental indicators, rather than on unnecessary adherence to a predetermined administrative process
- Generally, more rapid achievement of results
- Resource savings to both owner/operator and implementing agency

Additionally, the Superfund program began developing presumptive remedy guidance in 1991 using past experience to streamline cleanups. Presumptive remedies are preferred technologies for common categories of sites, based on historical patterns of remedy selection and EPA's scientific and engineering evaluation of performance data on technology implementation. EPA expects project managers to use presumptive remedies at appropriate RCRA facilities to help ensure consistency in remedy selection and implementation and to reduce the cost and time required to investigate and remediate similar types of sites. In general, even though EPA's presumptive remedy guidance documents were developed for CERCLA sites, project managers should use them at appropriate RCRA corrective action facilities to focus investigations and simplify the evaluation of remedial alternatives and remedy selection processes.

The following is a list of some oversight activities that have been adapted to facilities to decrease the level of oversight as deemed appropriate. These include, but are not limited to:

- Eliminating duplicative state/federal reviews of documents
- Eliminating interim deliverables while maintaining accountability of the owner/operator to produce a measurable end product
- Time-limited review where agency approval is not required for the owner/operator to proceed
- Increasing the use of meetings, briefings, and other communication methods to identify and resolve issues early on rather than using formal documentation methods

- Limiting the number of facility visits for routine field activities when the owner/operator demonstrates competence in achieving remedial results, including public involvement
- Establish performance standards that define clear and attainable results
- Using briefings, conversations, and progress reports from the owner/operator to replace some of the formal interim deliverables while still making this information publicly available where appropriate
- Encouraging communication among the project manager, owner/operator and the community; for example, make up-to-date facility information available at publicly accessible locations. Public participation remains a key component of the corrective action process

North Dakota is a leading state in developing and implementing these recommendations of EPA. In fact, North Dakota has been using this concept prior to EPA's guidance issuance. Our progress in achieving the environmental indicators at contaminated sites under control is a testament to the working relationship North Dakota shares with its facilities under corrective action and a results-based approach.

AOC C

Former Building 619

Closure Documentation

DRAFT



**NORTH DAKOTA DEPARTMENT OF HEALTH
Environmental Health Section**

Location:
1200 Missouri Avenue
Bismarck, ND 58504-5264

Fax #:
701-328-5200

Mailing Address:
P.O. Box 5520
Bismarck, ND 58506-5520

REF FILE: Grand Forks Air Force Base HW-020

January 26, 2001

MARY GILTNER
319 CES/CD
525 6TH AVE
GRAND FORKS AFB ND 58205-6434

Dear Mrs. Giltner:

This letter is written regarding Grand Forks AFB's notification of a newly identified Area Of Concern (AOC): Building 619, a former jet engine test cell.

Based on the information supplied, Building 619 was used to conduct tests on and clean the AGM-28 "Hound Dog" missile system. The building was constructed in 1963. The demolition date of Building 619 is unknown; however, the termination of the "Hound Dog" missile system was in 1975.

Based on the analysis results from the August 1999 Final Report, RCRA Corrective Action Study - SWMU Sites, a number of organic constituents were detected.

In a memorandum dated October 14, 1998 the EPA consolidated existing guidance on the "Management of Remediation Waste under RCRA." This guidance considers contaminated environmental media to contain hazardous waste: "(1) when they exhibit a characteristic hazardous waste or (2) when they are contaminated with concentrations of hazardous constituents from listed hazardous wastes that are above health-based levels."

Soil and groundwater concentrations of the hazardous waste constituents sampled at Building 619 were below the treatment standards for hazardous waste. For example, methylene chloride was detected in soil at a concentration of .011 parts per million (ppm). The treatment standard for methylene chloride in nonwaste waters is 30 ppm. Similarly, for xylenes detected in groundwater at .017 ppm, the treatment standard for this constituent in waste water is 320 ppm. Vinyl chloride was detected in the groundwater at a maximum concentration of .004 ppm. The waste water treatment standard is .27 ppm. The analytical results for the suite of organic constituents detected in the soil and groundwater samples are similarly orders of magnitude below the treatment standards for the respective constituents.

Environmental media (e.g., soils, groundwater, and sediments) with concentrations below health-based levels are not considered hazardous waste and usually do not require

Environmental Health
Section Chief's Office
701-328-5150

Air
Quality
701-328-5188

Municipal
Facilities
701-328-5211

Waste
Management
701-328-5166

Water
Quality
701-328-5210

Printed on recycled paper.

Mary Giltner

2

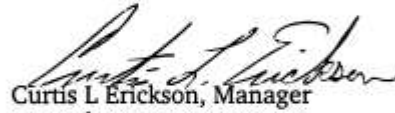
January 26, 2001

remediation, e.g., the risked-based screening level for methylene chloride in soil is 8.9 ppm in residential soil with dermal exposure. The risked-based screening level for xylenes in tap water is 1.4 ppm for residential ingestion and inhalation. The risked-based screening level for vinyl chloride in tap water is .43 ppm for residential ingestion and inhalation. These risk-based screening levels are considerably more conservative than the present and planned future industrial uses for this site and above the detected concentration levels of the contaminants of concern. These screening levels are from EPA Region VI's Human Health Medium-Specific Screening Levels.

Based on the analysis results, it is the Division's decision that the contaminated media at this site does not contain hazardous waste and does not require remediation. No further action is required at Building 619.

If you have any questions regarding this letter, contact Mr. Robert Disney of this office at 328-5166.

Sincerely,




Curtis L. Erickson, Manager
Hazardous Waste Program
Division of Waste Management

CLE:RD:lj

ATTACHMENT G HAZARDOUS WASTE PERMIT APPLICATION – PART A

DRAFT

United States Environmental Protection Agency RCRA SUBTITLE C SITE IDENTIFICATION FORM	
---	---

1. Reason for Submittal (Select only one.)

<input type="checkbox"/>	Obtaining or updating an EPA ID number for on-going regulated activities (Items 10-17 below) that will continue for a period of time.
<input type="checkbox"/>	Submitting as a component of the Hazardous Waste Report for _____ (Reporting Year)
<input type="checkbox"/>	Site was a TSD facility, a reverse distributor, and/or generator of $\geq 1,000$ kg of non-acute hazardous waste, > 1 kg of acute hazardous waste, or > 100 kg of acute hazardous waste spill cleanup in one or more months of the reporting year (or State equivalent LQG regulations)
<input type="checkbox"/>	Notifying that regulated activity is no longer occurring at this Site
<input type="checkbox"/>	Obtaining or updating an EPA ID number for conducting Electronic Manifest Broker activities
<input checked="" type="checkbox"/>	Submitting a new or revised Part A (permit) Form

2. Site EPA ID Number

N	D	3	5	7	1	9	2	4	7	5	9
---	---	---	---	---	---	---	---	---	---	---	---

3. Site Name

Grand Forks AFB

4. Site Location Address

Street Address 460 Steen Blvd			
City, Town, or Village Grand Forks AFB		County Grand Forks	
State North Dakota	Country United States	Zip Code 58205-6231	
Latitude 47° 56' 40"	Longitude -97° 25'	<input type="checkbox"/> Use Lat/Long as Primary Address	

5. Site Mailing Address

Same as Location Street Address

Street Address Mr. Larry Olderbak AFCEC/CZOM 525 Tuskegee Airmen Blvd			
City, Town, or Village Grand Forks AFB			
State North Dakota	Country United States	Zip Code 58205	

6. Site Land Type

<input type="checkbox"/> Private	<input type="checkbox"/> County	<input type="checkbox"/> District	<input checked="" type="checkbox"/> Federal	<input type="checkbox"/> Tribal	<input type="checkbox"/> Municipal	<input type="checkbox"/> State	<input type="checkbox"/> Other
----------------------------------	---------------------------------	-----------------------------------	---	---------------------------------	------------------------------------	--------------------------------	--------------------------------

7. North American Industry Classification System (NAICS) Code(s) for the Site (at least 5-digit codes)

A. (Primary) 928110	C.
B.	D.

8. Site Contact Information

Same as Location Address

First Name Larry	MI	Last Name Olderbak
Title Restoration Program Manager		
Street Address AFCEC/CZOM 525 Tuskegee Airmen Blvd		
City, Town, or Village Grand Forks AFB		
State North Dakota	Country United States	Zip Code 58205-6434
Email lawrence.olderbak@us.af.mil		
Phone 701-747-4183	Ext	Fax

9. Legal Owner and Operator of the Site

A. Name of Site's Legal Owner

Same as Location Address

Full Name United States Air Force	Date Became Owner (mm/dd/yyyy) 9/1/1958
Owner Type <input type="checkbox"/> Private <input type="checkbox"/> County <input type="checkbox"/> District <input checked="" type="checkbox"/> Federal <input type="checkbox"/> Tribal <input type="checkbox"/> Municipal <input type="checkbox"/> State <input type="checkbox"/> Other	
Street Address 460 Steen Blvd	
City, Town, or Village Grand Forks AFB	
State North Dakota	Country United States Zip Code 58205-6231
Email	
Phone 701-747-4150	Ext Fax
Comments	

B. Name of Site's Legal Operator

Same as Location Address

Full Name United States Air Force, William E. Bentley	Date Became Operator (mm/dd/yyyy) 9/1/1958
Operator Type <input type="checkbox"/> Private <input type="checkbox"/> County <input type="checkbox"/> District <input checked="" type="checkbox"/> Federal <input type="checkbox"/> Tribal <input type="checkbox"/> Municipal <input type="checkbox"/> State <input type="checkbox"/> Other	
Street Address 525 Tuskegee Airmen Blvd	
City, Town, or Village Grand Forks AFB	
State North Dakota	Country United States Zip Code 58205-6434
Email willian.bentley.1@us.af.mil	
Phone 701-747-4769	Ext Fax
Comments Person is the Base Civil Engineer (BCE) and a new incumbent rotates in this position typically every two years.	

10. Type of Regulated Waste Activity (at your site)

Mark "Yes" or "No" for all current activities (as of the date submitting the form); complete any additional boxes as instructed.

A. Hazardous Waste Activities

<input checked="" type="checkbox"/> Y <input type="checkbox"/> N	1. Generator of Hazardous Waste—If "Yes", mark only one of the following—a, b, c	
<input type="checkbox"/>	a. LQG	-Generates, in any calendar month, 1,000 kg/mo (2,200 lb/mo) or more of non-acute hazardous waste (includes quantities imported by importer site); or - Generates, in any calendar month, or accumulates at any time, more than 1 kg/mo (2.2 lb/mo) of acute hazardous waste; or - Generates, in any calendar month or accumulates at any time, more than 100 kg/mo (220 lb/mo) of acute hazardous spill cleanup material.
<input checked="" type="checkbox"/>	b. SQG	100 to 1,000 kg/mo (220-2,200 lb/mo) of non-acute hazardous waste and no more than 1 kg (2.2 lb) of acute hazardous waste and no more than 100 kg (220 lb) of any acute hazardous spill cleanup material.
<input type="checkbox"/>	c. VSQG	Less than or equal to 100 kg/mo (220 lb/mo) of non-acute hazardous waste.
<input type="checkbox"/> Y <input checked="" type="checkbox"/> N	2. Short-Term Generator (generates from a short-term or one-time event and not from on-going processes). If "Yes", provide an explanation in the Comments section. <i>Note: If "Yes", you MUST indicate that you are a Generator of Hazardous Waste in Item 10.A.1 above.</i>	
<input type="checkbox"/> Y <input checked="" type="checkbox"/> N	3. Treater, Storer or Disposer of Hazardous Waste—Note: Part B of a hazardous waste permit is required for these activities.	
<input type="checkbox"/> Y <input checked="" type="checkbox"/> N	4. Receives Hazardous Waste from Off-site	
<input type="checkbox"/> Y <input checked="" type="checkbox"/> N	5 Recycler of Hazardous Waste	
<input type="checkbox"/>	a.	Recycler who stores prior to recycling
<input type="checkbox"/>	b.	Recycler who does not store prior to recycling
<input type="checkbox"/> Y <input checked="" type="checkbox"/> N	6. Exempt Boiler and/or Industrial Furnace—If "Yes", mark all that apply.	
<input type="checkbox"/>	a.	Small Quantity On-site Burner Exemption
<input type="checkbox"/>	b.	Smelting, Melting, and Refining Furnace Exemption

B. Waste Codes for Federally Regulated Hazardous Wastes. Please list the waste codes of the Federal hazardous wastes handled at your site. List them in the order they are presented in the regulations (e.g. D001, D003, F007, U112). Use an additional page if more spaces are needed.

D001	D002	D003	D004	D005	D006	D007
D008	D009	D011	D018	D023	D035	D039
D040	F002	F003	F005	U154	U159	

C. Waste Codes for State Regulated (non-Federal) Hazardous Wastes. Please list the waste codes of the State hazardous wastes handled at your site. List them in the order they are presented in the regulations. Use an additional page if more spaces are needed.

N/A						

11. Additional Regulated Waste Activities (NOTE: Refer to your State regulations to determine if a separate permit is required.)**A. Other Waste Activities**

<input type="checkbox"/> Y <input checked="" type="checkbox"/> N	1. Transporter of Hazardous Waste—If "Yes", mark all that apply.
<input type="checkbox"/>	a. Transporter
<input type="checkbox"/>	b. Transfer Facility (at your site)
<input type="checkbox"/> Y <input checked="" type="checkbox"/> N	2. Underground Injection Control
<input type="checkbox"/> Y <input checked="" type="checkbox"/> N	3. United States Importer of Hazardous Waste
<input type="checkbox"/> Y <input checked="" type="checkbox"/> N	4. Recognized Trader—If "Yes", mark all that apply.
<input type="checkbox"/>	a. Importer
<input type="checkbox"/>	b. Exporter
<input type="checkbox"/> Y <input checked="" type="checkbox"/> N	5. Importer/Exporter of Spent Lead-Acid Batteries (SLABs) under 40 CFR 266 Subpart G—If "Yes", mark all that apply.
<input type="checkbox"/>	a. Importer
<input type="checkbox"/>	b. Exporter

B. Universal Waste Activities

<input type="checkbox"/> Y <input checked="" type="checkbox"/> N	1. Large Quantity Handler of Universal Waste (you accumulate 5,000 kg or more) - If "Yes" mark all that apply. Note: Refer to your State regulations to determine what is regulated.
<input type="checkbox"/>	a. Batteries
<input type="checkbox"/>	b. Pesticides
<input type="checkbox"/>	c. Mercury containing equipment
<input type="checkbox"/>	d. Lamps
<input type="checkbox"/>	e. Aerosol Cans
<input type="checkbox"/>	f. Other (specify) _____
<input type="checkbox"/>	g. Other (specify) _____
<input type="checkbox"/> Y <input checked="" type="checkbox"/> N	2. Destination Facility for Universal Waste Note: A hazardous waste permit may be required for this activity.

C. Used Oil Activities

<input type="checkbox"/> Y <input checked="" type="checkbox"/> N	1. Used Oil Transporter—If "Yes", mark all that apply.
<input type="checkbox"/>	a. Transporter
<input type="checkbox"/>	b. Transfer Facility (at your site)
<input type="checkbox"/> Y <input checked="" type="checkbox"/> N	2. Used Oil Processor and/or Re-refiner—If "Yes", mark all that apply.
<input type="checkbox"/>	a. Processor
<input type="checkbox"/>	b. Re-refiner
<input type="checkbox"/> Y <input checked="" type="checkbox"/> N	3. Off-Specification Used Oil Burner
<input type="checkbox"/> Y <input checked="" type="checkbox"/> N	4. Used Oil Fuel Marketer—If "Yes", mark all that apply.
<input type="checkbox"/>	a. Marketer Who Directs Shipment of Off-Specification Used Oil to Off-Specification Used Oil Burner
<input type="checkbox"/>	b. Marketer Who First Claims the Used Oil Meets the Specifications

D. Pharmaceutical Activities

<input checked="" type="checkbox"/> Y <input type="checkbox"/> N	1. Operating under 40 CFR Part 266, Subpart P for the management of hazardous waste pharmaceuticals—if “Yes”, mark only one. Note: See the item-by-item instructions for definitions of healthcare facility and reverse distributor.
<input checked="" type="checkbox"/>	a. Healthcare Facility
<input type="checkbox"/>	b. Reverse Distributor
<input type="checkbox"/> Y <input checked="" type="checkbox"/> N	2. Withdrawing from operating under 40 CFR Part 266, Subpart P for the management of hazardous waste pharmaceuticals. Note: You may only withdraw if you are a healthcare facility that is a VSQG for all of your hazardous waste, including hazardous waste pharmaceuticals.

12. Eligible Academic Entities with Laboratories—Notification for opting into or withdrawing from managing laboratory hazardous wastes pursuant to 40 CFR Part 262, Subpart K.

<input type="checkbox"/> Y <input checked="" type="checkbox"/> N	A. Opting into or currently operating under 40 CFR Part 262, Subpart K for the management of hazardous wastes in laboratories— If “Yes”, mark all that apply. Note: See the item-by-item instructions for definitions of types of eligible academic entities.
<input type="checkbox"/>	1. College or University
<input type="checkbox"/>	2. Teaching Hospital that is owned by or has a formal written affiliation with a college or university
<input type="checkbox"/>	3. Non-profit Institute that is owned by or has a formal written affiliation with a college or university
<input type="checkbox"/> Y <input checked="" type="checkbox"/> N	B. Withdrawing from 40 CFR Part 262, Subpart K for the management of hazardous wastes in laboratories.

13. Episodic Generation

<input type="checkbox"/> Y <input checked="" type="checkbox"/> N	Are you an SQG or VSQG generating hazardous waste from a planned or unplanned episodic event, lasting no more than 60 days, that moves you to a higher generator category. If “Yes”, you must fill out the Addendum for Episodic Generator.
--	---

14. LQG Consolidation of VSQG Hazardous Waste

<input type="checkbox"/> Y <input checked="" type="checkbox"/> N	Are you an LQG notifying of consolidating VSQG Hazardous Waste Under the Control of the Same Person pursuant to 40 CFR 262.17(f)? If “Yes”, you must fill out the Addendum for LQG Consolidation of VSQG hazardous waste.
--	---

15. Notification of LQG Site Closure for a Central Accumulation Area (CAA) (optional) OR Entire Facility (required)

<input type="checkbox"/> Y <input checked="" type="checkbox"/> N	LQG Site Closure of a Central Accumulation Area (CAA) or Entire Facility.
A. <input type="checkbox"/> Central Accumulation Area (CAA) or <input type="checkbox"/> Entire Facility	
B. Expected closure date: _____ mm/dd/yyyy	
C. Requesting new closure date: _____ mm/dd/yyyy	
D. Date closed : _____ mm/dd/yyyy	
<input type="checkbox"/>	1. In compliance with the closure performance standards 40 CFR 262.17(a)(8)
<input type="checkbox"/>	2. Not in compliance with the closure performance standards 40 CFR 262.17(a)(8)

16. Notification of Hazardous Secondary Material (HSM) Activity

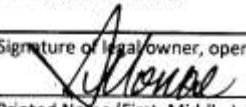
<input type="checkbox"/> Y <input checked="" type="checkbox"/> N	Are you notifying under 40 CFR 260.42 that you will begin managing, are managing, or will stop managing hazardous secondary material under 40 CFR 260.30, 40 CFR 261.4(a)(23), (24), (25), or (27)? If "Yes", you must fill out the Addendum to the Site Identification Form for Managing Hazardous Secondary Material.
--	---


17. Electronic Manifest Broker

<input type="checkbox"/> Y <input checked="" type="checkbox"/> N	Are you notifying as a person, as defined in 40 CFR 260.10, electing to use the EPA electronic manifest system to obtain, complete, and transmit an electronic manifest under a contractual relationship with a hazardous waste generator?
--	--

18. Comments (include item number for each comment)

19. Certification I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fines and imprisonment for knowing violations. **Note: For the RCRA Hazardous Waste Part A permit Application, all owners and operators must sign (see 40 CFR 270.10(b) and 270.11).**

Signature of legal owner, operator or authorized representative 	Date (mm/dd/yyyy) 08/15/2024
Printed Name (First, Middle Initial Last) Colonel Timothy A. Monroe, USAF	Title Commander, 319th Reconnaissance Wing
Email timothy.monroe@us.af.mil	
Signature of legal owner, operator or authorized representative	Date (mm/dd/yyyy)
Printed Name (First, Middle Initial Last)	Title
Email	

United States Environmental Protection Agency HAZARDOUS WASTE PERMIT PART A FORM	
--	---

1. Facility Permit Contact

First Name	Larry	MI	Last Name	Olderbak
Title	Restoration Program Manager			
Email	lawrence.olderbak@us.af.mil			
Phone	707-747-4183	Ext	Fax	

2. Facility Permit Contact Mailing Address

Street Address	525 Tuskegee Airmen Blvd		
City, Town, or Village	Grand Forks AFB		
State	North Dakota	Country	United States
Zip Code	58205		

3. Facility Existence Date (mm/dd/yyyy)

9/1/1958

4. Other Environmental Permits

A. Permit Type	B. Permit Number										C. Description	
N	N	D	0	0	2	0	6	2	1			NPDES Waste Water Discharge
N	N	D	R	0	5	-	0	3	1	4		NPDES Storm Water Discharge
E	0	3	4	4								Land Treatment Facility
P	A	O	P	-	2	8	5	1	4			Air Minor Source Permit-to-Operate
E	M	B	7	6	2	7	5	4	-	0		USFWS Depredation Permit

5. Nature of Business

Grand Forks AFB is an active Air Force Installation which supports the 319th Reconnaissance Wing. All activities provide for nation defense.
--

6. Process Codes and Design Capacities

Line Number	A. Process Code				B. Process Design Capacity		C. Process Total Number of Units	D. Unit Name
					(1) Amount	(2) Unit of Measure		

7. Description of Hazardous Wastes (Enter codes for Items 7.A, 7.C and 7.D(1))

Line No.	A. EPA Hazardous Waste No.	B. Estimated Annual Qty of Waste	C. Unit of Measure	D. Processes											
				(1) Process Codes					(2) Process Description (if code is not entered in 7.D(1))						

8. Map

Attach to this application a topographical map, or other equivalent map, of the area extending to at least one mile beyond property boundaries. The map must show the outline of the facility, the location of each of its existing intake and discharge structures, each of its hazardous waste treatment, storage, or disposal facilities, and each well where it injects fluids underground. Include all spring, rivers, and other surface water bodies in this map area. See instructions for precise requirements.

9. Facility Drawing

All existing facilities must include a scale drawing of the facility. See instructions for more detail.

10. Photographs

All existing facilities must include photographs (aerial or ground-level) that clearly delineate all existing structures; existing storage, treatment, and disposal areas; and sites of future storage, treatment, or disposal areas. See instructions for more detail.

11. Comments