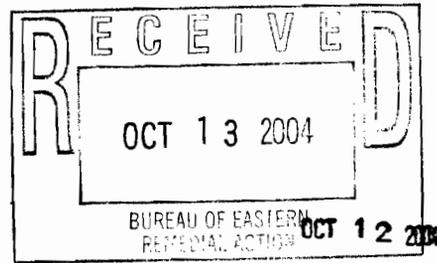




DEPARTMENT OF THE AIR FORCE
AIR FORCE REAL PROPERTY AGENCY



MEMORANDUM FOR SEE DISTRIBUTION LIST

FROM: AFRPA/DA-Griffiss
Environmental Section
153 Brooks Road
Rome, NY 13441

SUBJECT: Three Mile Creek and Six Mile Creek Long-Term Monitoring Work Plans

1. Attached please find the final Long-Term Monitoring Work Plans for Three Mile Creek and Six Mile Creek dated October 2004. Also attached are the responses to NYSDEC and USEPA comments on the August 2004 draft final Long-Term Monitoring Work Plans. All comments on the draft final work plans have been addressed and incorporated into these documents.

2. If you have any questions, please contact Mike Wojnas at (315) 330-2275.

A handwritten signature in black ink, appearing to read "Michael F. Mc Dermott", is written above the printed name.

MICHAEL F. MCDERMOTT
BRAC Environmental Coordinator

Attachments:

Final LTM Work Plans dated October 2004

DISTRIBUTION:

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FPM Group, Ltd.
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formerly Fanning, Phillips and Molnar

153 Brooks Road
Rome, NY 13441
315/336-7721
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October 12, 2004

Nanci E. Higginbotham
Environmental Program Manager
CEMWK-PM-ED
601 East 12th Street
Kansas City, MO 674106-2896

**RE: Final Long-Term Monitoring Work Plans for
Three Mile Creek and Six Mile Creek AOCs
Former Griffiss Air Force Base, Rome, NY
Revision 0.0: October 2004
Contract No. DACW41-02-D-0020-0002
FPM Project No. 32-04-02**

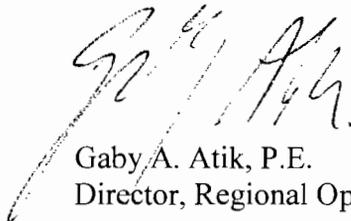
Dear Ms. Higginbotham,

FPM Group, Ltd. (FPM) is pleased to submit two (2) copies of the above-referenced Final Long-Term Monitoring Work Plans for Three Mile Creek and Six Mile Creek. NYSDEC and EPA comments to the Draft-Final version of this report have been addressed.

Additional copies have been distributed in accordance with the Air Force Real Property Agency's attached distribution list.

If you should have any questions or comments, please do not hesitate to call.

Very truly yours,



Gaby A. Atik, P.E.
Director, Regional Operations

GAA:bhp
Enc.
cc: Phillip Rosewicz, USACE (1 copy)
Michael Wojnas, AFRPA/DA-Griffiss (6 copies)

**Three Mile Creek and Six Mile Creek AOCs
Long-Term Monitoring Program
Former Griffiss Air Force Base
Rome, New York**

FINAL

**LONG TERM MONITORING
WORK PLAN**



Prepared by:

**FPM Group, Ltd.
153 Brooks Road
Rome, NY 13441**

**Contract No. DACW41-02-D-0020
Delivery Order: 0002**

**Revision 0.0
October 2004**

To: ISMTP@ADMIN@AFBDA.HDQ [<Charles_Merckel@fws.gov>],
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From: Mike Wojnas@Griffiss@AFBDA.OLX
Cc: ISMTP@ADMIN@AFBDA.HDQ [<g.atik@fpm-group.com>]
Subject: TMC & SMC LTM Work Plan
Attachment: BEYOND.RTF
Date: 10/5/2004 3:34 PM

Christina/Heather/Doug/Chuck: The following are the responses to your comments on the creek LTM work plans. We will make the revisions as requested and reissue the plans as final. Please check the response to DEC's 3rd comment (fish tissue collections in both creeks at the same time) and let me know if this is acceptable.

[DEC COMMENT] 1. For both TMC and SMC, section 1.2.3: The NYSDEC Newell et al. is under review to be revised at some point in the future. We'll just need to keep this in mind when we are reviewing the fish tissue results and have flexibility to go with any new guidance that may be developed; and a lot of effort should not be expended without checking with us first.

[RESPONSE:] The Air Force, USEPA and NYSDEC will review updated guidance and adopt applicable changes as necessary.

[DEC COMMENT] 2. For both TMC and SMC, section 3.4: NYSDOH rather than NYSDEC develops the guidance values for protection of human health from the state.

[RESPONSE:] NYSDOH will be inserted in lieu of NYSDEC.

[DEC COMMENT]: One other thing to think about for future sampling: It would be advantageous to do collections in both creeks at the same time. This would both reduce costs to the Air Force and allow comparison of results between creeks. You might want to tweak the timing of the sampling events at some point to allow this.

[RESPONSE:] TMC restoration is anticipated to be completed by Summer 2005. As a result, the Air Force proposes that the first fish sampling event at TMC be scheduled in conjunction with the second SMC fish sampling event in Fall 2007. This would allow consolidation of sampling events while providing time for fish populations to be re-established. Annual TMC water and sediment sampling will be initiated in Fall 2005 in conjunction with the second annual SMC water/sediment sampling event.

[EPA COMMENT] 1. Chuck wants reference to TMC as a drainage ditch changed. Remember the on-base portion of TMC is still the headwaters of the creek which runs into the barge canal.

[RESPONSE:] The drainage ditch reference will be changed as recommended.

[EPA COMMENT] 2. And as we spoke previously about this, EPA will want at least two rounds of sampling, including fish tissue sampling, before we would consider reducing the sampling frequency or sampling parameters. The way the wording appears in the LTM document it leads the reader to believe reduced sampling could occur after one round and a five year review. This would be incorrect.

[RESPONSE:] The wording will be clarified to address the comment.

Thanks Mike W

Michael Wojnas

Response to Comments
On Six Mile Creek and Three Mile Creek Long-Term
Monitoring Work Plan (February 2003)
from NYSDEC (C. Dowd)

Comment No.	Comment/Response
I	Section 1.2.1: The purpose of the long term monitoring is to evaluate the efficacy of the remedy at meeting the Remedial Action Objectives i.e. eliminating the existing and future potential adverse impacts to human health and/or fish and wildlife resources. The other objectives outlined here appear to be out of the scope of the long term monitoring plan.
	Response: The purpose of long term monitoring stated in the comment is correct and the long term monitoring plan is designed to “evaluate the efficacy of the remedy at meeting the Remedial Action Objectives”. However, the LTM plan goes beyond that purpose and also acts as an early warning system of potential influx of COCs.
II	Figure 3-2 - The Threemile Creek sampling locations shown on the figure are acceptable. The benthic analysis location should coincide with the sediment and surface water sampling location within the fish sampling area so that any correlation to contaminant concentrations can be made.
	Response: The benthic analysis location will be identified depending on field observations. As stated in Bode (September 1990), this location must be in wadeable riffles in the creek. Due to the fast flow of water in these riffles, a sediment deposit location is likely not available at this sampling location. Therefore, the benthic analysis location and the sediment and surface water sampling location will not be at the exact same location in the creek. Both sampling locations will be identified in the field as close in location as possible, to facilitate correlations between contaminants.
III	Section 3.3 - NYSDEC continues to disagree with this interpretation of the RI ecological investigation results. What is the purpose of the quotation marks around the phrase “slightly impaired”. Please remove.
	Response: As suggested in the comment, the quotation marks have been removed.
IV	Table 3-1- The first fish tissue collection should be conducted the year following remediation. Thereafter, fish should be sampled once every three years. While the proposed July to October time frame is acceptable, the availability of enough water for sampling the stream must be considered when selecting final dates.
	Response: The text in the footer of the table has been changed to reflect the comment. As described in the Draft Procedures for Collection and Preparation of Aquatic Biota for Contaminant Analysis, Section 1, Subsection C, point 1; “Flexibility to make these adjustments should be built into the sampling plan.” Field observations will be used to determine the exact sampling event dates.
V	Section 3.4 - LTM Objectives: 1. It is unlikely that the limited scope of the proposed monitoring can provide an early warning network or discriminate potential sources. 2. The only upstream source for Threemile Creek is the Air Force Base.
	Response: The sediment sampling results from follow up sampling rounds will be compared to the first (baseline) round of sediment samples. Significant increases in

	<p>COC detections will indicate the influx of COCs and thus the LTM program may act as an early warning system for downstream receptors. Moreover, surface water samples will indicate the influx of COCs much faster than sediment samples results will, adding to the purpose of the LTM program as an early warning system.</p> <p>The sampling locations (especially in Three Mile Creek) have been chosen so that detections in sampling results will indicate from which part of the base the influx is originating. Concerning upstream sources, stormwater runoff from the Parkway discharges to Three Mile Creek.</p>
VI	<p>Section 3.4 - LTM Extent: Please see attached NYSDEC fish collection and analysis procedures. In addition:</p> <ol style="list-style-type: none"> 1. Fish must be analyzed for PCBs and organochlorine pesticides via soxhlet extraction (EPA Method 8540C using 1:1 acetone/ hexane), cadmium and mercury. The approximate mass needed for all three analyses is no more than a total of 20 grams. It is not necessary to analyze the full suite of metals. 2. At each sampling location, the goal should be to collect enough fish to provide 10 samples for analysis. Each sample should consist of one of the following: <ol style="list-style-type: none"> A. a standard fillet from a legal size fish (at least 5 fillet samples should be provided), or B. a whole fish weighing 30 grams or greater which is ground up (however, larger individuals should always be selected if available), or C. a composite of several small, whole fish of the same species with a combined weight of 30 grams or greater if neither of the above is available. 3. Adjustments to the collection goal will undoubtedly be needed based upon field conditions. The final selection of fish samples will be done in the field by consultation with USEPA, USFWS and/or NYSDEC. 4. Prior to sampling, NYSDEC should be informed of the identity of the lab doing the analysis. Depending on the lab selected, a quality control review may be required including analysis of reference material or samples provided by NYSDEC.
	<p>Response:</p> <ol style="list-style-type: none"> 1. This comment has been included in the text. A fish sample of 40 grams is the minimum required by the laboratory (see response under comment IX). 2. With the recent comments incorporated, Three Mile Creek and Six Mile Creek both have five fish sampling locations. Up to 10 fish samples will be collected. This amount of samples per location, multiplied by the amount of locations per creek, will provide abundant data for creek evaluation. If the resultant data are skewed, the USAF will discuss additional samples and/or sample locations with EPA and NYSDEC. 3. The third point is understood and adjustments will be made according to field conditions. 4. The lab that will perform these analyses is Severn Trent Laboratories (STL), Inc., Buffalo, NY location. This lab has participated in a NYSDOH study on fish tissue

	analyses and is familiar with NYS requirements regarding fish tissue analyses.
VII	<p>Section 3.4 - LTM Re-evaluation Criteria - What is the basis for the two times baseline evaluation criterion? The results should be compared to ARARs, SCGs and remedial action goals to determine whether the goals of the remediation have been met.</p> <p>Response: The two time baseline criterion reference is removed from the text. Future sampling results will be compared to past sampling round results and all applicable ARARs, SCGs and remedial action goals.</p>
VIII	<p>Section 3.4 - Acceptable Limits on Decision: Levels of contaminants in fish must also meet values for protection of fish and wildlife.</p> <p>Response: The comment is accepted and the text has been changed to incorporate the comment.</p>
IX	<p>Section 4.4.3 - Fish Tissue Sampling:</p> <ol style="list-style-type: none"> 1. Creek chub is a minnow species which grows to about 6-12 inches and is not considered to be a predatory species. 2. It is not necessary to have 200 grams of fillet for the analysis. Fillets should not be composited unless one fillet from an edible size fish provides insufficient mass for the analysis. <p>Response: Chapter 4 has been deleted from the report because a basewide FSP has been created. The appropriate text applicable to this report has been added to Section 3. The text has been changed to include point 1 in this comment. For fish (fillet) analysis, 40 grams of fish flesh is the minimum required sample for analyses. For spikes and extra volume needed due to losses during extraction processes and homogenization, 50-100 grams of sample is requested by the laboratory. If possible, this latter amount of sample will be provided to the lab.</p>
Additional comments on the LTM plan for Sixmile Creek:	
X	<p>Figure 3-1 and 3-2 - The following additional surface water/sediment sampling locations are needed in order to monitor the various surface water inputs to Sixmile Creek (see attached drawings):</p> <ol style="list-style-type: none"> 1. In the wetlands east of Landfill 1 2. In the tributary northwest of the Weapons Storage Area 3. In Sixmile Creek at the former discharge of the leachate seeps from Landfill 1 4. Immediately upstream or immediately downstream of Perimeter Road. 5. Downstream of the Base below the confluence of Slate Creek and Sixmile Creek. <p>Response: Proposed location No. 1 and 2 will be added to the surface water and sediment sample location list. Proposed sample location No. 3 is not in the former discharge of the leachate seeps. The new, more downstream location of sample location No.2 is in line with the leachate locations, therefore this sample location will be substituted for proposed location No. 3. Proposed location No. 4 will be created by moving sample location No. 7 north of Perimeter Road. Proposed Location No. 5 will be included in the sample locations list.</p>
XI	<p>Figure 3-1 and 3-2 The following changes should be made to the proposed fish sampling locations. (This refers to fish collection only.)</p> <ol style="list-style-type: none"> 1. Location #2 should be moved further downstream to encompass the area of the former leachate seeps from Landfill 1

	<ol style="list-style-type: none"> 2. Location #7 should be moved upstream of the roads 3. An additional sampling location should be provided downstream of the Base below the confluence of Slate Creek and Sixmile Creek.
	<p>Response: Location No. 2 will be moved downstream so that the middle of the fish sampling interval coincides with the leachate seeps at Landfill 1. Location No. 7 will be moved upstream so that it is located north of Perimeter Road. An additional sample location will be added off base (see response to comment X).</p>
XII	<p>See attached figures for sampling locations.</p> <p>Response: Corrected site location maps have been added to this response to comments to illustrate the sample location changes.</p>

**Response to Comments
On Six Mile Creek and Three Mile Creek Long-Term
Monitoring Work Plan (February 2003)
from U.S. EPA (D. Pocze)**

Comment No.	Comment/Response
1	The discussion of fish to evaluate both human health and ecological risk assessment purposes should clearly indicate that the fillet and offal (everything else) will be analyzed separately and mathematically recombined. The use of only the fillet portion would be inappropriate for ecological risk assessment.
	Response: Fillet and offal will be collected and analyzed if available in ample weight for analysis. If the fish are smaller than 6 inches in total length, whole fish will be analyzed for ecological evaluation and beheaded and eviscerated fish will be analyzed for human evaluation, as described in the NYSDEC Procedures for Collection and Preparation of Aquatic Biota for Contaminant Analysis, October 2002.
2	It should be made clear how the site five year review and the three year interval between benthic invertebrate qualitative and fish tissue concentration analysis are related. I understand that the former GAFB five-year review would be on a base-wide time-frame so the two events would not be related. However, at least two rounds of sampling would be necessary before any modifications to the monitoring plan would be made. The LTM should provide greater detail of the five-year review.
	Response: The five-year review will evaluate information available at the time the review is performed. Details of the five-year review will be developed by the Air Force, EPA and NYSDEC prior to initiation of the review.
3	The document references in various sections that “no risk assessment will be performed during any of the sampling rounds” and although I agree with this statement; please note, there are possible scenarios in which a new risk assessment would be required e.g., use changes or new exposure pathways.
	Response: The comment is accepted.
4	In Section 1.2.3 of both documents the sediment guidance values taken from the NYSDEC Technical Guidance document are referred to as ARARs. There are currently no sediment guidance values that are ARARs for ecological risk assessments. The text should be changed accordingly. Also, it would be helpful to include a list or table of the COCs and cleanup goals.
	Response: The text has been changed to incorporate the sediment ARAR comment..
5	In Section 2.1.5 of both documents the areas that are identified as “special-concern habitats”, which are associated with the creeks should be shown on Figures 3-2 of the respective documents.
	Response: The ‘special-concern habitats’ near Three and Six Mile Creek have been included on the figures in both reports.
6	In Section 3.4 of both documents the statement that “the fat content of the fish tissue is the highest and consequently the highest concentration of contaminants can be expected to have accumulated in fish tissue” should be qualified by indicating that it applies only to lipophilic contaminants of concern.
	Response: The text has been corrected to include the comment.

7	On Page 3-9 of both documents, the bullet stating, “other levels accepted/approved by NYSDEC or EPA” should be revised to state “... and EPA”.
	Response: The text has been changed to address the comment.
8	The Safety Plan is generic in some areas and it would be more effective and shorter if all areas were made site specific and the generic discussion limited or removed; however, this only a suggestion.
	Response: The suggestion has been accepted and will be incorporated in a Basewide Safety Plan that will address all sites undergoing LTM.

FINAL

**LONG TERM MONITORING
WORK PLAN**

Prepared for:

**Three Mile Creek Area of Concern
Long-Term Monitoring Program
Former Griffiss Air Force Base
Rome, New York**

through

**The United States Army Corps of Engineers
601 East 12th Street
Kansas City, MO 64106**

Prepared by:

**FPM Group, Ltd.
153 Brooks Road
Rome, NY 13441**

**Contract No. DACW41-02-D-0020
Delivery Order No. 0002**

**Revision 0.0
October 2004**

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LIST OF ACRONYMS AND ABBREVIATIONS

AFB	Air Force Base
AFCEE	Air Force Center for Environmental Excellence
ARAR	Applicable or Relevant and Appropriate Requirements
ASTM	American Society for Testing and Materials
AOC	Area of Concern
bgs	below ground surface
BRAC	Base Realignment and Closure
COC	contaminant of concern
CoC	chain of custody
DDE	1,1-dichloro-2,2-bis(chlorophenyl) ethylene
DO	Delivery Order
DOT	Department of Transportation
DQO	data quality objective
E&E	Ecology and Environmental, Inc.
ERPIMS	Environmental Resources Program Information Management System
FDA	Food and Drug Administration
FPM	FPM Group, Ltd.
FS	Feasibility Study
FSP	Field Sampling Plan
HSP	Health and Safety Plan
LAW	Law Engineering and Environmental Services, Inc.
LTM	long-term monitoring
MS/MSD	matrix spike/matrix spike duplicate
MSL	mean sea level
NYS	New York State
NYSBC	New York State Barge Canal
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
PAH	polynuclear aromatic hydrocarbon
PCB	polychlorinated biphenyl
PISCES	passive in-situ chemical extraction sample
POC	point of compliance
QA/QC	quality assurance/quality control

QAPP	Quality Assurance Project Plan
RA	Remedial Action
RI	Remedial Investigation
SAP	Sampling and Analysis Plan
SDG	Sample Delivery Group
SI	Supplemental Investigation
SVOC	semivolatile organic compound
USFWS	United States Fish and Wildlife Service
USACE	United States Army Corps of Engineers
VOC	volatile organic compound
WP	Work Plan

1 INTRODUCTION

1.1 Description of Intent

FPM Group, Ltd. (FPM), under contract with the United States Corps of Engineers (USACE), is conducting a long-term monitoring (LTM) program for sediment, surface water, fish tissue, and qualitative benthic community analysis at the Three Mile Creek Area of Concern (AOC) at the former Griffiss Air Force Base (AFB), Rome, New York. The LTM program will monitor the presence of contaminants of concern (COCs), assess the potential for migration of COCs and establish an early warning system for assuring compliance with potential COC receptors (human, and terrestrial and aquatic wildlife). The LTM program will be conducted in accordance with provisions of the Basic Contract # DACW41-02-D-0020 and Delivery Order (DO) # 0002.

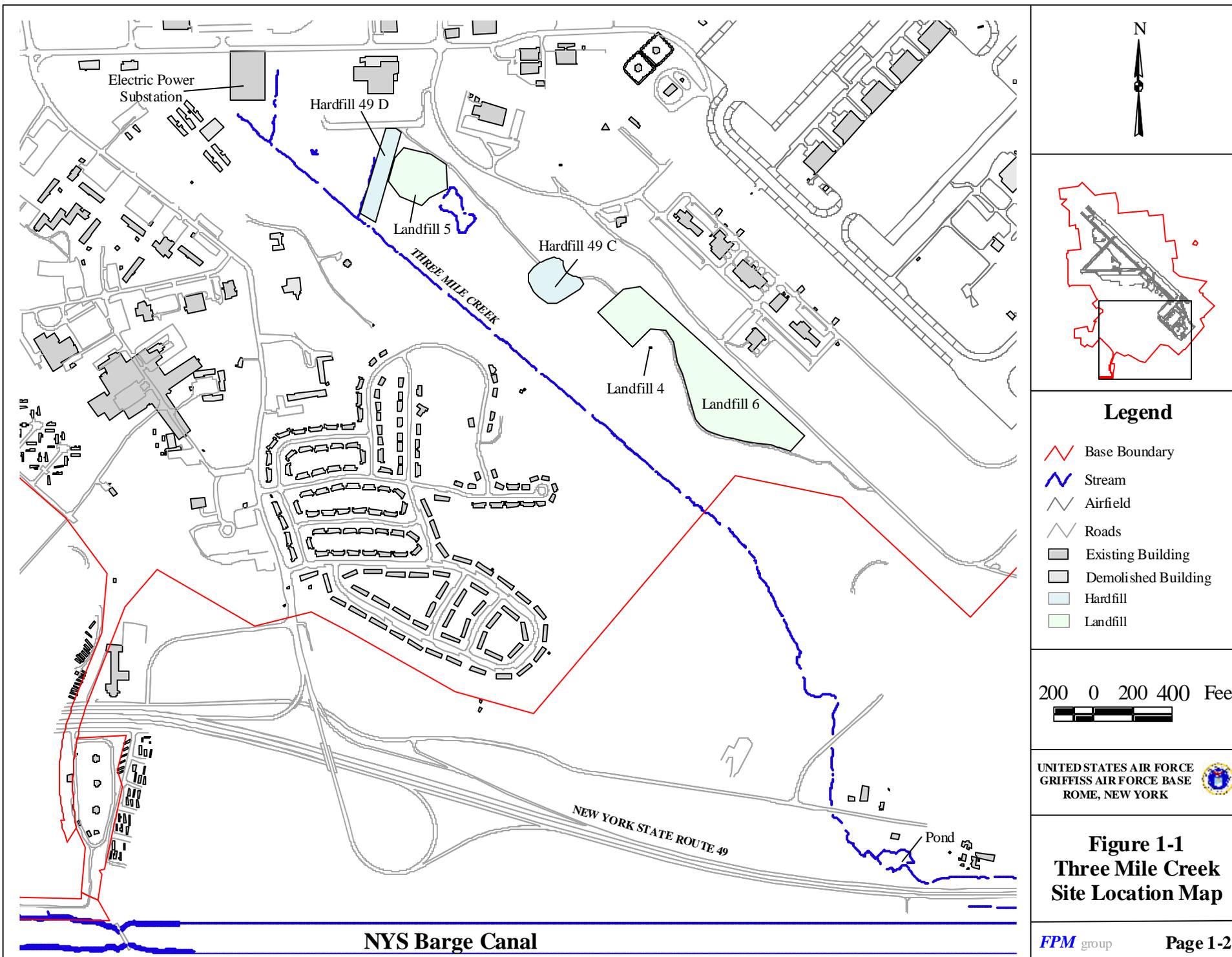
This Work Plan identifies the tasks to be accomplished for the LTM Program at the Three Mile Creek AOC and summarizes the results of previous investigations. Please refer to Figure 1-1 for the Three Mile Creek AOC location.

Sediment, surface water, and fish tissue samples, as appropriate, will be collected and analyzed for their respective COCs as identified during previous investigations. Qualitative benthic community analysis will be performed at all fish sampling locations every three years. Both existing data and information from new annual sampling will be utilized for overall performance evaluation. The first rounds' sampling results will function as a baseline for subsequent sampling rounds. Risk assessments are not planned to be performed during these sampling rounds, but might be performed if new exposure pathways or use changes are identified.

Mr. Michael McDermott is the Base Realignment and Closure (BRAC) Environmental Coordinator for this project; Mr. Michael Wojnas is the Griffiss Point of Contact; and Mr. Roy Willis serves as the AFCEE Team Chief. The principal FPM personnel include Dr. Kevin J. Phillips, P.E., Program Manager, Mr. Gaby A. Atik, P.E., Project Manager, Mr. Niels D.L. van Hoesel, Field Operations Manager, and David P. Forse, Health and Safety Officer. Additional field personnel will be selected from FPM staff.

The Health and Safety Plan (HSP) and the Field Sampling Plan (FSP) operational in conjunction with this WP are the Basewide HSP (FPM, December 2003a) and the Basewide FSP (FPM, December 2003b). Reference is also made to the AFCEE Quality Assurance Project Plan (QAPP), Version 3.1 (AFCEE, August 2001), with project-specific USACE-approved variances. The laboratory currently under contract, Severn Trent Laboratories, Inc., (Buffalo, NY location), will perform all analyses.

As described in the Record of Decision (ROD) (E&E, December 2003), the sediment and surface water field work will commence in Fall 2005. Fish sample collection and macroinvertebrate sampling will commence in Fall 2007 to coincide with the second round of fish/



macroinvertebrate sampling at Six Mile Creek. Field activities will recur annually. Data evaluation and report preparation will occur throughout the LTM program, including an annual report.

1.2 Long-Term Monitoring Approach

1.2.1 Long Term Monitoring Background

To illustrate how this LTM Program will operate, the following highlights the overall objectives, components, and constraints of the sediment, surface water and fish tissue LTM system.

The objectives of LTM are:

- To establish an early warning monitoring system for detection of influx of potential COCs after completion of remediation of all potential source sites;
- To evaluate influx, migration and degradation of COCs from former source of contamination sites; and
- To collect data that support attainment of regulatory requirements.

Typical components of a sediment and surface water LTM system include:

- One or more upgradient sampling location(s) representative of background conditions and/or potential influx of COCs;
- LTM sampling locations that track the COC migration or degradation trend; and
- Point-of-compliance (POC) sampling location(s) located downgradient of the former sources of contamination sites.

Constraints associated with a sediment and surface water LTM system include:

- Downgradient LTM sampling locations must be located to detect unexpected variations in sediment or surface water quality as efficiently as possible (i.e., with respect to surface water migration rates and downgradient flow direction); and
- POC sampling locations must be located upgradient from potential receptors to provide sufficiently early warning to protect potential receptors from exposure to known COCs.

Given the above objectives and constraints the design of an LTM system should consider the following tasks:

- Selecting sediment, surface water, fish tissue and qualitative benthic community analysis sampling locations, depending on the evaluation of existing data and the specific intended and distinct role of that monitoring point;

- Identifying performance evaluation criteria, including appropriate analysis methods for evaluating data variations;
- Identifying physical and chemical parameters (e.g., transport and attenuation properties) for the COCs;
- Identifying sediment, surface water, fish tissue and qualitative benthic community analysis sampling frequency at each monitoring point both for understanding the trends of COCs and/or their indicator analytes;
- Minimizing the costs and maximizing the benefits of the program; and
- Periodically assessing the LTM system for possible deletion or addition of sampling locations from the LTM program.

1.2.2 Purpose of LTM Program

This LTM WP has identified monitoring points that will best detect sediment, surface water and fish tissue COCs known to exist at the AOC site, and track their transport over time. Qualitative benthic community analysis will be performed to assess the quality of the aquatic benthic life in the creek, which can be considered an assessment for overall quality of the creek. The LTM program will use historic data and new information from annual sediment and surface water sampling rounds at specified sampling locations. Fish tissue sampling and a qualitative benthic community analysis will be performed every three years.

1.2.3 Scope of LTM Program

The DQO is to establish an early warning system to monitor the potential influx of contaminants of concern (COC) and to evaluate the effectiveness of RAs performed at potential source sites.

The LTM WP identifies sampling locations for inclusion in the LTM network and specifies sampling parameters and frequency of sampling. Downgradient sampling locations to be used for LTM will be chosen to “immediately” detect any unexpected variations in matrix quality. POC locations will be located upgradient from potential receptors to provide early warning.

To meet these DQOs, the LTM program will include the following tasks for the Three Mile Creek AOC:

- **Ongoing review and update of existing data including geological and hydrogeological framework, contaminant history, and site use history;**
The New York State Department of Environmental Conservation (NYSDEC) Class A, A-S, AA, and AA-S Surface Water Quality Standards are identified as the chemical-specific Applicable or Relevant and Appropriate Requirements (ARARs) for surface water. Sediment sample ARARs including the most stringent criteria or guidance values are specified in Table 2-3b of the final FS Addendum (E&E, July 2002). At present, no

sediment guidance values are ARARs for ecological receptors. Fish sample guidance thresholds for protection of human health will be calculated as prescribed by the NYSDOH. Fish sample guidance thresholds for protection of piscivorous wildlife will be derived from the NYSDEC Technical Report 87-3 (Newell, 1987) or a more current revised update, if applicable. The terms “cleanup goals,” “cleanup criteria,” “ARARs,” “New York State [NYS] Surface Water Quality Standards and Guidance Values” and “state standards” are used interchangeably throughout the text.

Periodic review of the LTM program is essential for optimal functioning: sampling results relative to the cleanup goals shall be reanalyzed periodically, and COC trends shall be re-evaluated and updated to provide new projections for LTM closure dates. In the interest of optimal, cost-effective monitoring, a specific set of COCs shall be identified as requiring continued observation for this AOC site.

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2 BACKGROUND

2.1 Environmental Setting

2.1.1 Physiography and Topography

The former Griffiss AFB is located in the city of Rome in Oneida County, New York (refer to Figure 2-1). The former Base lies within the Mohawk Valley between the Appalachian plateau and the Adirondack Mountains. A rolling plateau northeast of the former Base reaches an elevation of 1300 ft above mean sea level (MSL). The New York State Barge Canal (NYSBC) and the Mohawk River valley south of the former Base lie below 430 ft MSL. The topography across the former Base is relatively flat with elevations ranging from 435 ft MSL in the southwest portion to 595 ft MSL in the northwest portion of the former Base.

2.1.2 Geology

Unconsolidated sediments at the Griffiss AFB consist primarily of glacial till with minor quantities of clay and sand and significant quantities of silt and gravel. The thickness of these sediments ranges from 0 feet in the northeast portion to more than 130 feet in the southern portion of the former Base. The average thickness of the unconsolidated sediments is 25 to 50 feet in the central portion and 100 to 130 feet in the south and southwest portions of the former Base. The bedrock beneath the former AFB generally dips from the northeast to the southwest and consists of the black Utica Shale. It is a gray and black carbonaceous unit with a high/medium organic content (Law Engineering and Environmental Services, Inc. [LAW], December 1996). More details on the geologic features were discussed in Sections 3 and 4 of the AOC Long-Term Monitoring Baseline Study (FPM, July 2000).

2.1.3 Hydrogeology

The shallow water table aquifer lies within the unconsolidated sediments, where depth to groundwater ranged from 0 ft below ground surface (bgs) in the southwest portion to 63 ft bgs in the northeast portion of the former Base during the December 1998 synoptic Base-wide water-level measurement of wells (FPM, July 2000). Groundwater across the former Base generally flows from the northeast to the southwest. Several creeks, drainage culverts, and sewers (mostly acting as drains for shallow groundwater), intercept surface water runoff. A comprehensive description of regional and local geology, hydrogeology, and lithology for the former Griffiss AFB was given in Section 4 of the AOC Long-Term Monitoring Baseline Study (FPM, July 2000), and in the Remedial Investigation (RI) by Law (LAW, December 1996), and in the Supplemental Investigation (SI) prepared by E&E (E&E, November 1998).

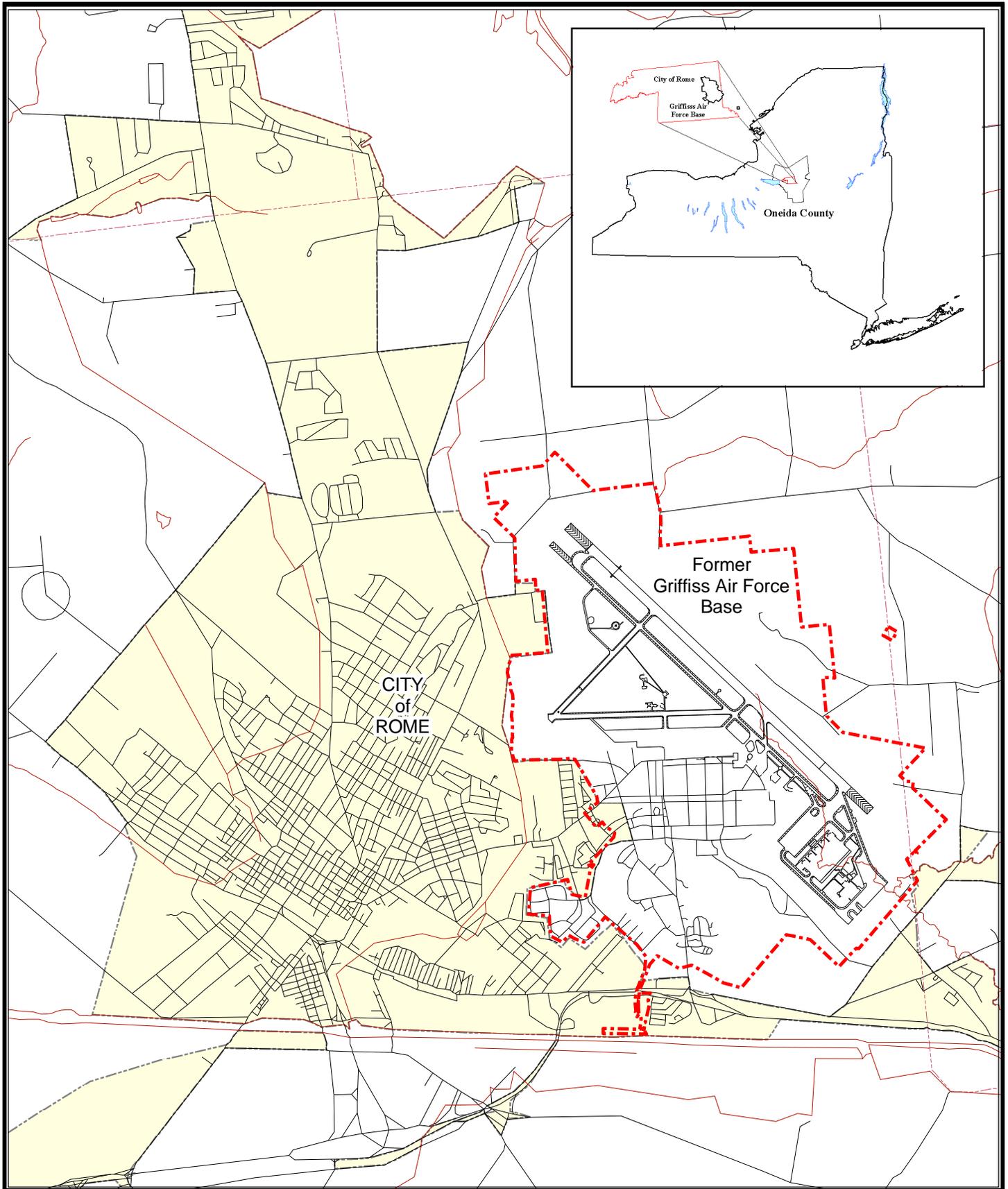


FIGURE 2-1
Base Location Map



UNITED STATES AIR FORCE
GRIFFISS AIR FORCE BASE
ROME, NEW YORK



2.1.4 Climate

The former Griffiss AFB experiences a continental climate characterized by warm, humid, moderately wet summers and cold winters with moderately heavy snowfalls. The mean annual precipitation is 45.6 inches, which includes the mean annual snowfall of 107 inches. The annual evapotranspiration rate is 23 inches. The average temperature during the winter season is 20 degrees Fahrenheit; temperatures during the spring, summer, and fall vary from 31 to 81 degrees Fahrenheit. The prevailing winds are from the southwest, with an average wind speed of 5 knots.

The former Griffiss AFB is located in a region prone to acid precipitation; the annual average pH of precipitation recorded for 1992 at the three closest stations ranged from 4.25 to 4.28. Fluctuations in pH have an inverse correlation to precipitation, such that lower pH levels correlate with higher amounts of precipitation (LAW, December 1996).

2.1.5 Biology

The former Griffiss AFB, covering 3,552 acres of property within the Erie-Ontario ecozone of the Great Lakes Physiographic Province, has been heavily disturbed from an ecological perspective. Although there are a few undisturbed communities within the former Base's boundary, the 1993 Inventory of Rare Plant Species and Significant Natural Communities identified six significant habitats of special concern occurring on the former Base (New York Natural Heritage Program, January 1994). There are five special-concern habitats identified by the Inventory that are adjacent to or within the confines of AOCs at the former Base. These special-concern habitats include: (1) a white-cedar-dominated rich sloping fen adjacent to the Six Mile Creek floodplain, (2) a hemlock-hardwood swamp located in a mature forest occurring hydraulically upgradient of Landfill 1 (Ammo Storage Area); (3) a rich graminoid fen adjacent to the southeast corner of the runway, situated on top of the buried section of Six Mile Creek; (4) a pitch pine-scarlet oak woods at the southeaster edge of Three Mile Creek; and (5) a hemlock-hardwood swamp of several acres at the southern end of Three Mile Creek. Two of these are of concern to the Three Mile Creek AOC (Nos. 4 and 5, see Figure 3-2). The pitch pine-scarlet oak woods site is quite small (less than one acre) and located on the southeastern margin of the site. The hemlock-hardwood swamp is located adjacent to Three Mile Creek at the southern part of it's stretch. LTM activities will strictly be performed in Three Mile Creek or it's banks, therefore disturbance of this adjacent special-concern habitat is not anticipated.

Although no plant or animal species at the former Base has been considered threatened or endangered by the U.S. Department of the Interior, some species listed on the NYS Threatened Species List have been identified, with habitats relevant to the AOCs at the former Base. Whorled mountain mint (*Pycnanthemum verticillatum* var *verticillatum*) has been identified in the open wet-meadow wetland at Landfill 7 (no. 5). It also thrives in the white-cedar-dominated

rich sloping fen adjacent to the Landfill 1 (no. 1). Significant disturbance of the sites and vegetation is not expected during the execution of the LTM program.

3 SITE-SPECIFIC INFORMATION

This section of the Work Plan contains a detailed discussion of the Three Mile Creek AOC, including a description of the environmental setting, a characterization of the background conditions, and an identification of the tasks that need to be accomplished for long-term monitoring, including:

- A listing of sampling locations to be monitored including recommended frequencies, analyses to be performed, and their location relative to the creek; and
- A discussion of LTM re-evaluation criteria.

3.1 Site Location and History

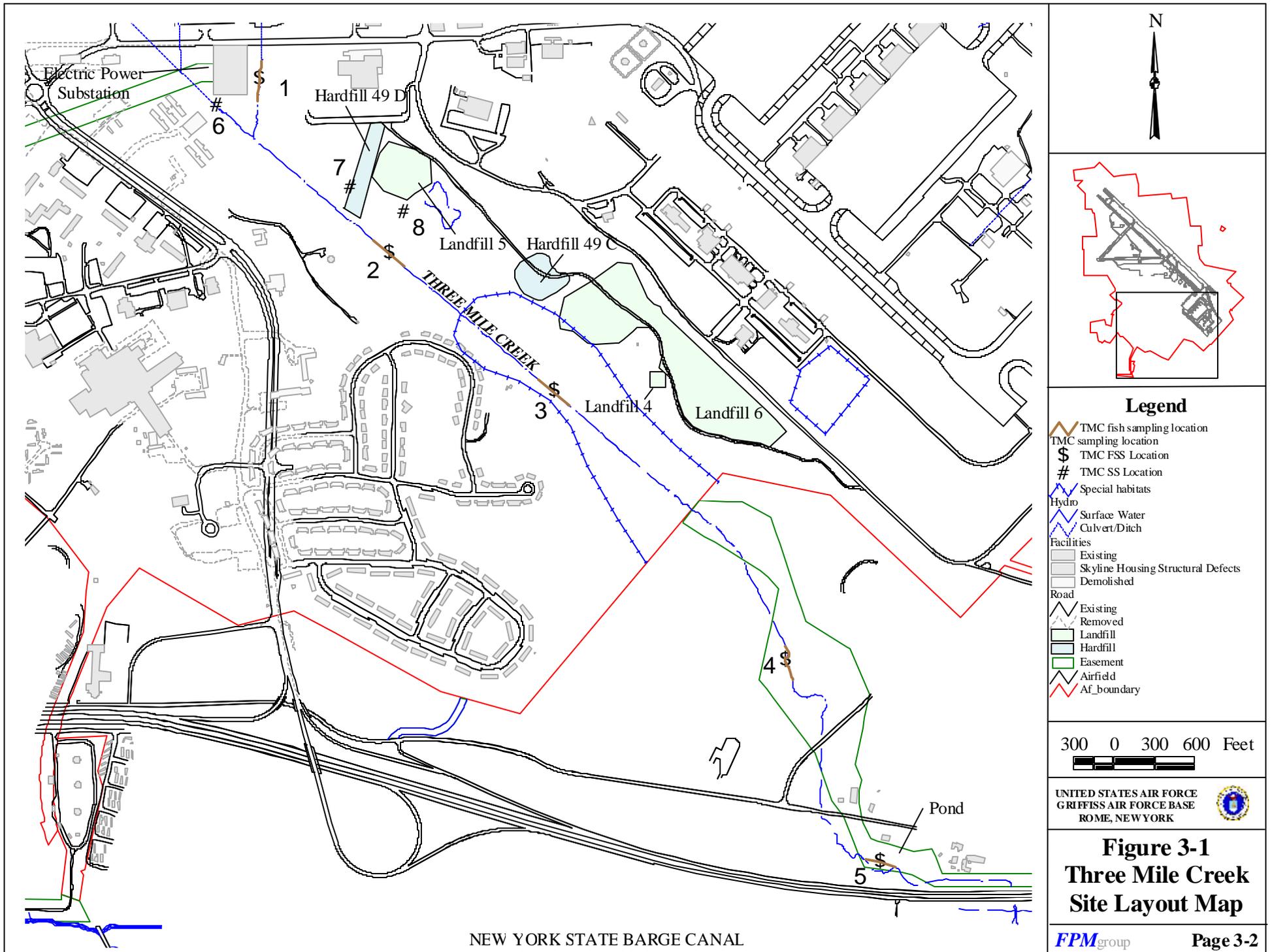
The Three Mile Creek AOC is located in a forested area in the southern part of the former Griffiss AFB. It is bordered by the Electrical Power Substation on the northwest side, Landfills 4, 5, and 6 on the northeast side, and the former skyline housing development on the southwest side (Figure 3-1).

The Three Mile Creek AOC is a creek with an approximately length of 10,000 ft, a width of 10 ft and a depth ranging from 2 inches at its origination to 2 ft at the furthest downstream area (near the New York State Barge Canal). The creek originates at two stormwater culvert outlets located at Ellsworth Road and Wright Drive (near the Electrical Power Substation. Two additional smaller culverts that drain the area surrounding the Electrical Power Substation enter the creek slightly downstream from the two larger culverts.

The creek receives both surface water runoff and groundwater from the surrounding watershed. Drainage is received from Landfills 4, 5, and 6, the Electric Power Substation and the south central part of the Base including former floor drains. Three Mile Creek flows in a southeasterly direction and eventually flows into the NYS Barge Canal (about one mile south of the former Base).

3.2 Hydrogeological Setting

The Three Mile Creek AOC is located in the southern part of the former Griffiss AFB. The topography is generally sloping towards the southeast. The creek receives greatly varying amounts of surface water runoff, both via the culverts as well as the watershed. The creek also receives more stable amounts of groundwater inflow from the culverts and along its stretch.



3.3 Summary of Previous Investigations

Preliminary studies of Three Mile Creek were performed in 1981, 1987, and 1988. Soil, sediment, surface water, groundwater, and fish tissue samples were collected. Numerous metals, PAHs, PCBs, and pesticides were detected in the streambed sediments and the fish tissue was contaminated with PCBs, some PAHs, and metals. The results of these studies led to the performance of an RI from 1993 through 1995.

The RI was performed to characterize the nature and extent of environmental contamination at the Three Mile Creek AOC to determine whether remedial action was necessary to eliminate potential threats to human health and the environment from exposures that might arise under existing or expected future site conditions. The RI included an aquatic survey, surface water sampling, sediment sampling, and fish tissue sampling.

The aquatic survey was used to evaluate creek habitat, water quality, benthic and drift macroinvertebrate communities, and fish populations within four 100-meter segments of the on-base part of the creek (one near the Electrical Power Substation, one near Landfill 5, one near the Thor Street residential area, and one further downstream just inside the base boundary). At approximately the same locations, sediment samples were collected for toxicity testing and fish samples were collected for pesticides, PCBs, and metals analyses. Results from the sediment toxicity tests performed as part of the aquatic survey indicated that chemicals were not present at levels acutely toxic to aquatic life. A slight impairment of benthic macroinvertebrate populations was noted at the locations near Landfill 5 and near the base boundary. The fish population assessment indicated that fish communities were in poor to fair condition which could be due to site contaminants and, in part, to the lack of quality habitat. The results of the fish tissue analysis indicated the presence of PCBs, pesticides, and mercury at levels exceeding NYSDEC ecological risk guidelines for protection of piscivorous wildlife.

Surface water samples were collected from 12 locations along Three Mile Creek and analyzed for VOCs, SVOCs, PCBs, pesticides, metals, glycols, radionuclides and water quality parameters. One VOC, 15 SVOCs, four pesticides, and seven metals were detected at concentrations above the most stringent criteria for surface water. Sediment samples were collected at two depths below the surface water/sediment interface (0.5 ft. and 1.0 ft.) from 15 locations, including the 12 locations along Three Mile Creek and three locations along the drainage ditch near Landfill 5. The samples were analyzed for VOCs, SVOCs, pesticides, herbicides, PCBs, dioxins, metals, and radionuclides. Three VOCs, 22 SVOCs, 18 pesticides, dioxin, and ten metals were detected at concentrations above the most stringent criteria for sediment.

In 1995, NYSDEC performed passive in situ concentration/extraction sampling (PISCES) at one location in Three Mile Creek to test for PCBs and other organochlorines. PCBs and DDE were

detected. Naturally occurring conditions such as below average rainfall and low flow in the stream may have affected the ability of PISCES to detect contaminants.

In 1997, for a separate investigation of PCB contamination associated with Landfill 5, sediment samples were collected at two depth intervals (0 to 0.5 ft. and 1 to 1.5 ft.) from seven locations in the Landfill 5 tributary to Three Mile Creek. PCBs were detected at concentrations above the most stringent criteria.

In June 1997, as part of a basewide supplemental investigation (SI), three PISCES samples and two surface water samples were collected from Three Mile Creek for pesticide and PCB analysis. Pesticides were detected in two of the PISCES samples. No contaminants were detected in the surface water.

In July 1998, additional SI samples were taken from the off-base portion of Three Mile Creek to fill data gaps that had been identified in the RI sampling. These included two surface water samples and eight sediment samples. Four metals were detected in surface water samples above the most stringent criteria. Concentrations of 18 SVOCs, DDD, PCB 1260, and five metals detected in sediment were above the most stringent criteria.

A visual inspection of the habitat quality of Three Mile Creek was conducted in 1999, by the Air Force, USACE, NYSDEC, EPA, and US Fish and Wildlife Service to gain a better understanding of creek conditions and the impact of potential remedial actions. In the same year, for the Three Mile Creek feasibility study (FS), sediment samples were collected from six locations in Three Mile Creek pond (located off-base between NYS Routes 365 and 49) and analyzed for PCBs, cadmium, and lead. In 2001, the same six locations in the pond were vertically profiled to depths of 3.5 feet below creek bottom to determine the vertical extent of sediment contamination and the appropriate depth for sediment remediation. Twelve additional samples were collected, two samples per location. PCBs, cadmium, and lead were all detected at concentrations exceeding the most stringent criteria.

The 2001 FS investigation also included sampling along the on-base portion of the Three Mile Creek channel and the Landfill 5 tributary in order to define the vertical and lateral extent of contamination to better determine the potential breadth and depth of sediment remediation in those areas. Samples of sediment and native soil (beneath sediment) were collected at selected locations from depth intervals of up to 3.5 feet. Five VOCs, 24 SVOCs, 15 pesticides, two PCBs, dioxins, and 10 metals were detected at concentrations exceeding the most stringent criteria. While many of the same chemicals were also detected in the native soil samples, the concentrations were not as great, and fewer exceeded the most stringent criteria (E&E, July 2002).

3.4 Three Mile Creek LTM Plan

The LTM program for Three Mile Creek will be implemented after RA completion and site restoration at Three Mile Creek and after all RAs at sites potentially influencing Three Mile Creek have been completed. The LTM sampling will be performed during the late summer/early fall (August/October). At that time of the year, the fat content of the fish tissue is the highest and consequently the highest concentration of lipophilic contaminants can be expected to have accumulated in fish tissue. During the initial sampling round, baseline information for sediment, surface water and fish tissue contaminants shall be collected. A qualitative benthic community analysis will also be performed at each fish sample location.

LTM Need - Exceedances were reported for VOCs, SVOCs, metals, pesticides, PCBs, and dioxins in sediment samples in the FS (E&E, January 1998), the draft FS Addendum (E&E, March 2000) and the final FS Addendum (E&E, July 2002). Fish tissue was reported to contain significant levels of metals, pesticides and PCBs. Table 3-1 summarizes the LTM sampling rationale for the Three Mile Creek AOC. Sediment and surface water samples will be collected annually and fish tissue samples will be collected every three years.

LTM Objectives – Sampling of sediment, surface water, and fish tissue in Three Mile Creek is recommended to achieve the following objectives:

- Establish first round sediment concentrations in the sampling round performed in the year following the completion of all RAs;
- Monitor and confirm the effectiveness of the RAs that have been or will have been performed at potential sources of contamination (Landfill 4, 5, and 6, and the Electrical Power Substation) and Three Mile Creek itself;
- Monitor the potential influx of contaminants from potential sources of contamination (i.e., early warning system).

LTM Extent – The focus of the sediment sampling is on detecting changes in the sediment quality through the potential influx of contamination from upstream sources and potential sources of contamination that have been remediated. Sediment surface samples will therefore be collected from 0 to 6 inch below top of sediment in order to monitor any influx of contamination effectively. To demonstrate the absence of COCs, annual monitoring for VOCs, SVOCs, metals, and pesticides/PCBs is recommended for both sediment and surface water (see Table 3-1). The annual sampling results will be compared to the most stringent criterion or guidance value as described in Table 2-3b of the Final FS Addendum (E&E, July 2002) and to previous sampling results.

Table 3-1

Three Mile Creek LTM Field Activities Rationale

Matrix	Analysis	Frequency	Rationale
Sediment/ Surface water	VOCs, SVOCs, metals, pesticides/ PCBs.	Annually ¹	Monitoring of the effectiveness of the RAs on potential source sites. Frequency based on relatively low flow regime and limited sediment transport.
Fish tissue	Pesticides/PCBs, cadmium and mercury, % lipid.	Every three years ²	Monitoring of fish for pesticides/PCBs, and cadmium and mercury is proposed to identify potential bioaccumulation of contaminants of concern.
Benthic Organisms (Qualitative)	According to Bode et al. (September 1990) and Bode et al. (June 2002).	Every three years ²	The quality of the benthic community in TMC will be evaluated applying NYSDEC approved protocols.

Notes:

¹ An annual frequency for sediment sampling is commensurate with the rate at which changes in sediment quality are expected; that is, given that the sources of contamination are remediated. Frequent changes in sediment quality are not expected. Surface water samples are planned for collection at the same rate as sediments.

² A three year frequency for fish tissue (or benthic organisms) analysis and qualitative benthic community evaluation is commensurate with recommendations from NYSDEC personnel. Sampling will commence the year after the remedial activities have been completed and preferable within the August-October timeframe.

The eight sediment and surface water sampling locations have been chosen in consideration of results from previous investigations and following discussions with NYSDEC and EPA personnel. During sediment sampling, sediment deposition locations in the vicinity of the proposed locations will be targeted for sample collection. Surface water samples will be collected from the same location before the sediment samples.

Fish tissue collection will be performed in accordance with NYSDEC Guidelines (NYSDEC, October 2002). Tissue samples will be collected at five of the eight sediment and surface water sampling locations to identify potential tissue contamination and potential accumulation of COCs. Electrofishing will be the preferred method of fish collection from the 100-meter stretches of the creek as indicated in Figure 3-1. All fish will be collected, sorted, measured, and weighted. Forty gram fish samples will be collected as requested by the laboratory for all analyses combined. Qualitative benthic community analysis will be performed every three years at all five fish sample locations according to the protocols described in Bode et al., September 1990 and Bode et al., June 2002.

Fish samples will be collected every three years until the results of two subsequent rounds of sampling do not exceed the calculated NYSDOH and EPA Guidance Values for human health or the ecological risk level for piscivorous wildlife. For ecological evaluation, a bottom feeder (White sucker [*Catostomus commersoni*]) and an omnivorous species (Creek chub [*Semolilus atromaculatus*]) will be targeted. For human health evaluation, a bottom feeder (white sucker) and a different predatory species (Trout [*Trutta sp.*]) will be targeted.

The fish samples will be analyzed for pesticides, PCBs, cadmium, mercury, and % lipid as described in Table 3-1. The samples will be analyzed by the current laboratory under contract: Severn Trent Laboratories, Inc; Buffalo, NY location). The sampling locations and analyses are tabulated in Table 3-2 and can be seen in Figure 3-1.

LTM Re-evaluation Criteria – The LTM plan will be re-evaluated every three years to assess the creek conditions. Proposed re-evaluation procedures follow:

- The sediment and surface water results from subsequent sampling events will be compared to baseline concentrations established during the first sampling round and all applicable ARARs, SCGs, and remedial action goals. These annual concentrations serve as general guidelines for changes in sediment quality as a result of releases to Three Mile Creek. If the concentrations show an increasing trend, the Air Force, in consultation with the EPA and NYSDEC, will evaluate modifying the LTM network to identify potential causes of concentration increases.
- If, after consultation with the regulatory agencies, the monitoring results indicate that the goals of the program are not being attained, alterations to the remedy will be evaluated.
- Alterations to the frequency and duration of the LTM plan may be sought by the Air Force at any time. In general, the basis for such requests will be as explained in the following section.

Acceptable Limits on Decisions – Decisions will be made based on data collected in accordance with the FSP associated with this LTM WP (FPM, December 2003) and analyzed by the laboratory in accordance with the AFCEE QAPP (including associated USACE project-specific variances). The data will then be reviewed and validated based on an evaluation of the results in relation to the AFCEE QAPP (Version 3.1, or later) in conjunction with the EPA National Functional Guidelines. The AFCEE QAPP specifies accuracy and precision objectives while the EPA National Functional Guidelines provides general data usability guidance.

The decision to discontinue sampling will be evaluated during three-year reviews provided that the following objectives are met:

- A) All the RAs planned for sites that potentially impact Three Mile Creek have been completed,

Table 3-2
Three Mile Creek Sampling Locations and Analyses

Location Number	Location within Three Mile Creek	Detailed Location Description	Sample Matrix	No. of samples per location	Analyses performed per sample	Total No. of Analyses
1	Northern end of the northern fork of TMC (Three Mile Creek).	Appr. 100 ft south of the culvert on Ellsworth Road.	Sediment	1	Full suite ¹	5
			Surface water	1	Full suite ¹	5
			Fish Tissue	10 ²	Fish suite ³	40
2	Downstream of the Landfill 5 tributary.	Appr. 500 ft downstream of the Landfill 5 tributary in TMC.	Sediment	1	Full suite ¹	5
			Surface water	1	Full suite ¹	5
			Fish Tissue	10 ²	Fish suite ³	40
3	Downstream of Landfill 5.	Appr. 1500 ft upstream of the base boundary in TMC.	Sediment	1	Full suite ¹	5
			Surface water	1	Full suite ¹	5
			Fish Tissue	10 ²	Fish suite ³	40
4	Downstream of Base boundary.	Appr. 1500 ft downstream of the Base boundary in TMC.	Sediment	1	Full suite ¹	5
			Surface water	1	Full suite ¹	5
			Fish Tissue	10 ²	Fish suite ³	40
5	In the Three Mile Creek Pond.	Pond between Route 365 and Route 49.	Surface water	1	Full suite ¹	5
			Surface water	1	Full suite ¹	2
			Fish Tissue	10 ²	Fish suite ³	40

Notes:

¹ Full suite of analyses includes VOCs (SW 8260), SVOCs (SW 8270), metals (SW 6010B), pesticides (SW 8081) and PCBs (SW 8082).

² Fish samples will be collected from the largest specimens available. A combined number of ten samples will be collected from both the bottom feeder and predatory species, depending on availability. Fillet samples (5) analysis results are used for human evaluation. The offal samples (5) from the filleted fish are also analyzed so that results can be mathematically combined and used for ecological evaluation. If no fillets are available, 5 'whole fish' (beheaded and eviscerated) will be collected and its offal will be analyzed also. If no fillets or whole fish are available, 10 composite samples will be collected.

³ Fish suite of analyses includes pesticides/PCBs (SW8540C), cadmium and mercury (SW 6010B/ SW7470) and % lipid.

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Table 3-2 Continued
Three Mile Creek Sampling Locations and Analyses

Location Number	Location within Three Mile Creek	Detailed Location Description	Sample Matrix	No. of samples per location	Analyses performed per sample	Total No. of Analyses
6	On the northern side of the southern fork of TMC.	Appr. 30 ft south of the culvert of Wright Drive.	Sediment	1	Full suite ¹	5
			Surface water	1	Full suite ¹	5
7	In Landfill 5 tributary.	Appr. 200 ft upstream of the confluence of the Landfill 5 tributary and TMC.	Sediment	1	Full suite ¹	5
			Surface water	1	Full suite ¹	5
8	In the wetland downgradient of Landfill 5.	The wetland adjacent to TMC (south of Landfill 5).	Sediment	1	Full suite ¹	5
			Surface water	1	Full suite ¹	5

Notes:

¹ Full suite of analyses includes VOCs (SW 8260), SVOCs (SW 8270), metals (SW 6010B), pesticides (SW 8081) and PCBs (SW 8082).

² Fish samples will be collected from the largest specimens available. A combined number of ten samples will be collected from both the bottom feeder and predatory species, depending on availability. Fillet samples (5) analysis results are used for human evaluation. The offal samples (5) from the filleted fish are also analyzed so that results can be mathematically combined and used for ecological evaluation. If no fillets are available, 5 'whole fish' (beheaded and eviscerated) will be collected and its offal will be analyzed also. If no fillets or whole fish are available, 10 composite samples will be collected.

³ Fish suite of analyses includes pesticides/PCBs (SW8540C), cadmium and mercury (SW 6010B/ SW7470) and % lipid.

B) Levels of contaminants in fish meet values for protection of fish and wildlife and no fish advisories are in place,

C) Concentrations in the sediment have stabilized at:

- levels below the NYS Guidance Values as described in Table 2-3b of the FS Addendum (E&E, July 2002); or
- levels indicative of background conditions; or
- other levels accepted/approved by NYSDEC and EPA.

Recommendations for LTM Optimization will be made after at least two sampling rounds have been completed (i.e. after two years for sediment and surface water and after six years for fish tissue and macroinvertebrates). Any change in the number of LTM sampling locations, the

analyses performed at these sampling locations or sampling frequency will be subject to USEPA and NYSDEC approval.

4 LTM REPORTING REQUIREMENTS

Results of the LTM will be reported on an annual basis. Reporting will include the following:

- Summary of field sampling activities (including field documentation logs);
- Data Assessment (including laboratory results and data validation reports, when applicable);
- Data Presentation;
- Data Evaluation and Summary, including:
 - Comparison to standards and guidances;
 - Comparison to baseline and subsequent LTM sampling results;
 - Trend charts and statistical analysis;
 - A detailed discussion of LTM re-evaluation and resulting recommendations for LTM optimization.

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5 REFERENCES

- Air Force Center for Environmental Excellence, Technical Services Quality Assurance Program, Quality Assurance Project Plan, Version 3.1, August 2001.
- Bode, et al., Quality Assurance Work Plan for Biological Stream Monitoring in New York State, New York State Department of Environmental Conservation, Division of Water, June 2002.
- Bode, et al., Biological Impairment Criteria for Flowing Water in New York State, New York State Department of Environmental Conservation, Division of Water, September 1990.
- Ecology and Environment, Inc., Draft Feasibility Study for the Former Griffiss Air Force Base Three Mile Creek AOC, Griffiss Air Force Base, January 1998.
- Ecology and Environment, Inc., Draft Three Mile Creek Feasibility Study Addendum, Former Griffiss Air Force Base, Rome, New York, March 2000.
- Ecology and Environment, Inc., Final Report for Supplemental Investigations of Areas of Concern, Griffiss Air Force Base, November 1998.
- Ecology and Environment, Inc., Final Three Mile Creek Feasibility Study Addendum, Former Griffiss Air Force Base, Rome, New York, July 2002.
- Ecology and Environment, Inc., Three Mile Creek Proposed Plan, Former Griffiss Air Force Base, Rome, New York, July 2003.
- EPA, Guidance for Assessing Chemical Contaminant Data for Use in Fish Advisories, Volume 1, Fish Sampling and Analysis, third edition, November 2000.
- FPM Group Ltd., Draft Field Sampling Plan, Long-Term Monitoring Program, Revision 2.0, December 2003b.
- FPM Group Ltd., Draft Site Safety and Health Plan, Long-Term Monitoring Program, Revision 2.0, December 2003a.
- FPM Group, Ltd., Draft Report, AOC Long-Term Monitoring Baseline Study, Griffiss Air Force Base, Revision 1.0, July 2000.
- Law Engineering and Environmental Services, Inc., Draft Final Primary Report, Remedial Investigation at Griffiss Air Force Base, New York, December 1996.

Newell, A.J., Johnson, D.W., and Allen, L.K., 1987, Niagara River Project: Fish flesh criteria for piscivorous wildlife: New York State Department of Environmental Conservation, Technical Report 87-3.

New York National Heritage Program, 1993 Inventory of Rare Plant Species and Significant Natural Communities, January 1994.

NYSDEC, Draft Procedures for Collection and Preparation of Aquatic Biota for Contaminants Analysis, Division of Fish, Wildlife & Marine Resources, Bureau of Habitat, October 2002.

FINAL

**LONG TERM MONITORING
WORK PLAN**

Prepared for:

**Six Mile Creek Area of Concern
Long-Term Monitoring Program
Former Griffiss Air Force Base
Rome, New York**

through

**The United States Army Corps of Engineers
601 East 12th Street
Kansas City, MO 64106**

Prepared by:

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**Contract No. DACW41-02-D-0020
Delivery Order No. 0002**

**Revision 0.0
October 2004**

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LIST OF ACRONYMS AND ABBREVIATIONS

AFB	Air Force Base
AFCEE	Air Force Center for Environmental Excellence
ARAR	Applicable or Relevant and Appropriate Requirements
ASTM	American Society for Testing and Materials
AOC	Area of Concern
bgs	below ground surface
BRAC	Base Realignment and Closure
COC	contaminant of concern
CoC	chain of custody
DDE	1,1-dichloro-2,2-bis(chlorophenyl) ethylene
DO	Delivery Order
DOT	Department of Transportation
DQO	data quality objective
E&E	Ecology and Environmental, Inc.
ERPIMS	Environmental Resources Program Information Management System
FDA	Food and Drug Administration
FPM	FPM Group, Ltd.
FS	Feasibility Study
FSP	Field Sampling Plan
HSP	Health and Safety Plan
LAW	Law Engineering and Environmental Services, Inc.
LTM	long-term monitoring
MS/MSD	matrix spike/matrix spike duplicate
MSL	mean sea level
NYS	New York State
NYSBC	New York State Barge Canal
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
PAH	polynuclear aromatic hydrocarbon
PCB	polychlorinated biphenyl
PISCES	passive in-situ chemical extraction sample
POC	point of compliance
QA/QC	quality assurance/quality control

QAPP	Quality Assurance Project Plan
RA	Remedial Action
RI	Remedial Investigation
SAP	Sampling and Analysis Plan
SDG	Sample Delivery Group
SI	Supplemental Investigation
SVOC	semivolatile organic compound
USFWS	United States Fish and Wildlife Service
USACE	United States Army Corps of Engineers
VOC	volatile organic compound
WP	Work Plan

1 INTRODUCTION

1.1 Description of Intent

FPM Group, Ltd. (FPM), under contract with the United States Corps of Engineers (USACE), is conducting a long-term monitoring (LTM) program for sediment, surface water, fish tissue, and qualitative benthic community analysis at the Six Mile Creek Area of Concern (AOC) at the former Griffiss Air Force Base (AFB), Rome, New York. The LTM program will monitor the presence of contaminants of concern (COCs), assess the potential for migration of COCs and establish an early warning system for assuring compliance with potential COC receptors (human, and terrestrial and aquatic wildlife). The LTM program will be conducted in accordance with provisions of the Basic Contract # DACW41-02-D-0020 and Delivery Order (DO) # 0002.

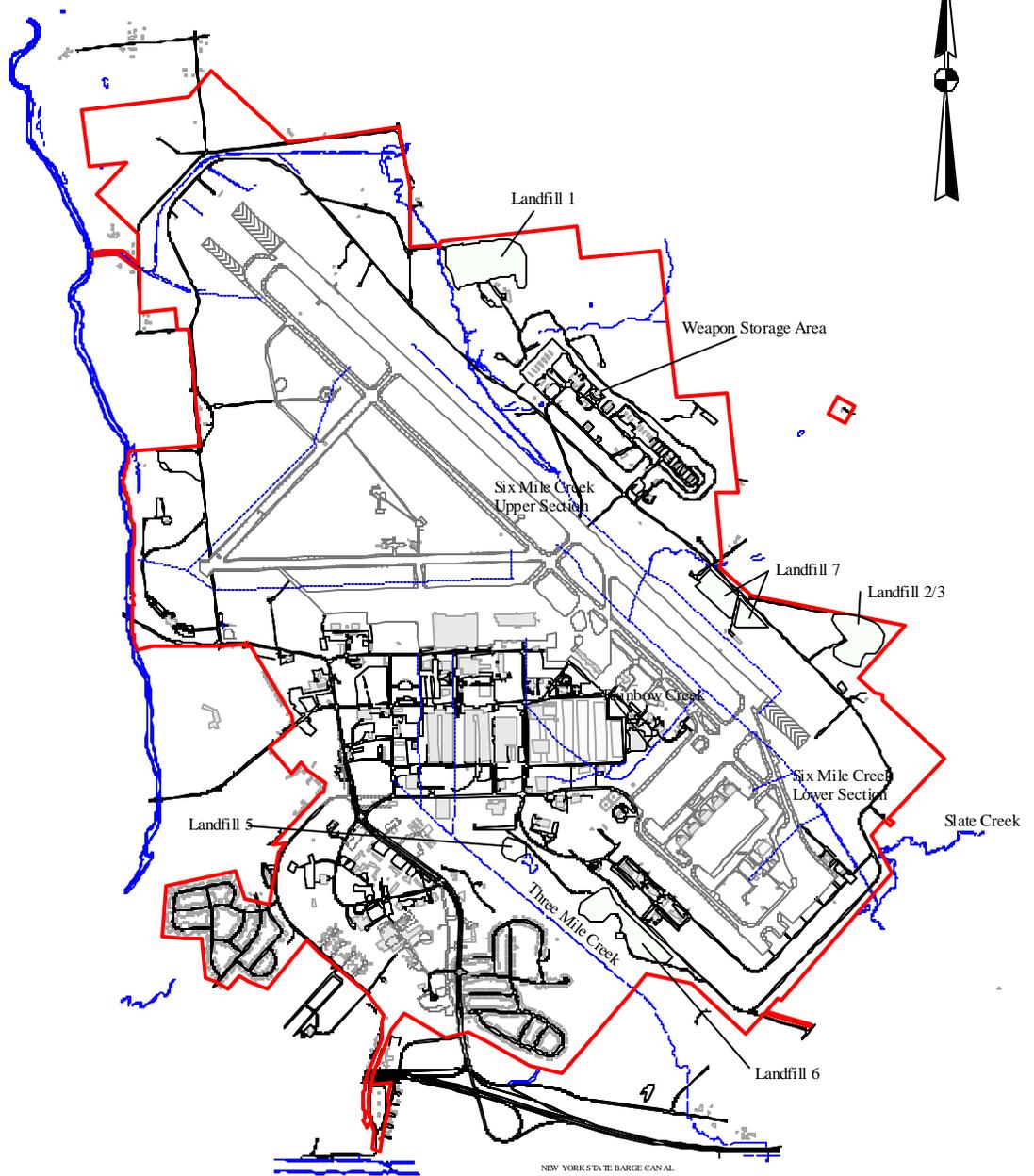
This Work Plan identifies the tasks to be accomplished for the LTM Program at the Six Mile Creek AOC and summarizes the results of previous investigations. Please refer to Figure 1-1 for the Six Mile Creek AOC location.

Sediment, surface water, and fish tissue samples, as appropriate, will be collected and analyzed for their respective COCs as identified during previous investigations. Qualitative benthic community analysis will be performed at all fish sampling locations every three years. Both existing data and information from new annual sampling will be utilized for overall performance evaluation. The first rounds' sampling results will function as a baseline for subsequent sampling rounds. Risk assessments are not planned to be performed during these sampling rounds, but might be performed if new exposure pathways or use changes are identified.

Mr. Michael McDermott is the Base Realignment and Closure (BRAC) Environmental Coordinator for this project; Mr. Michael Wojnas is the Griffiss Point of Contact; and Mr. Roy Willis serves as the AFCEE Team Chief. The principal FPM personnel include Dr. Kevin J. Phillips, P.E., Program Manager, Mr. Gaby A. Atik, P.E., Project Manager, Mr. Niels D.L. van Hoesel, Field Operations Manager, and David P. Forse, Health and Safety Officer. Additional field personnel will be selected from FPM staff.

The Health and Safety Plan (HSP) and the Field Sampling Plan (FSP) operational in conjunction with this WP are the Basewide HSP (FPM, December 2003a) and the Basewide FSP (FPM, December 2003b). Reference is also made to the AFCEE Quality Assurance Project Plan (QAPP), Version 3.1 (AFCEE, August 2001), with project-specific USACE-approved variances. The laboratory currently under contract, Severn Trent Laboratories, Inc., (Buffalo, NY location), will perform all analyses.

As described in the Record of Decision (ROD) (E&E, December 2003), the field work will commence in October 2004. Field activities will recur annually. Data evaluation and report preparation will occur throughout the LTM program, including an annual report.



Legend

-  Base Boundary
-  Stream
-  Airfield/Roads
-  Existing Building
-  Demolished Building

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**Figure 1-1
Six Mile Creek Site Location Map**

1.2 Long-Term Monitoring Approach

1.2.1 Long Term Monitoring Background

To illustrate how this LTM Program will operate, the following highlights the overall objectives, components, and constraints of the sediment, surface water and fish tissue LTM system.

The objectives of LTM are:

- To establish an early warning monitoring system for detection of influx of potential COCs after completion of remediation at potential source sites;
- To evaluate influx, migration and degradation of COCs from former source of contamination sites; and
- To collect data that support attainment of regulatory requirements.

Typical components of a sediment and surface water LTM system include:

- One or more upgradient sampling location(s) representative of background conditions and/or potential influx of COCs;
- LTM sampling locations that track the COC migration or degradation trend; and
- Point-of-compliance (POC) sampling location(s) located downgradient of the former sources of contamination sites.

Constraints associated with a sediment and surface water LTM system include:

- Downgradient LTM sampling locations must be located to detect unexpected variations in sediment or surface water quality as efficiently as possible (i.e., with respect to surface water migration rates and downgradient flow direction); and
- POC sampling locations must be located upgradient from potential receptors to provide sufficiently early warning to protect potential receptors from exposure to known COCs.

Given the above objectives and constraints the design of an LTM system should consider the following tasks:

- Selecting sediment, surface water, fish tissue, and qualitative benthic community analysis sampling locations, depending on the evaluation of existing data and the specific intended and distinct role of that monitoring point;
- Identifying performance evaluation criteria, including appropriate analysis methods for evaluating data variations;

- Identifying physical and chemical parameters (e.g., transport and attenuation properties) for the COCs;
- Identifying sediment, surface water, fish tissue and qualitative benthic community analysis sampling frequency at each monitoring point both for understanding the trends of COCs and/or their indicator analytes;
- Minimizing the costs and maximizing the benefits of the program; and
- Periodically assessing the LTM system for possible deletion or addition of sampling locations from the LTM program.

1.2.2 Purpose of LTM Program

This LTM WP has identified monitoring points that will best detect sediment, surface water and fish tissue COCs known to exist at the AOC site, and track their transport over time. Qualitative benthic community analysis will be performed to assess the quality of the aquatic benthic life in the creek, which can be considered an assessment for overall quality of the creek. The LTM program will use historic data and new information from annual sediment and surface water sampling rounds at specified sampling locations. Fish tissue sampling and a qualitative benthic community analysis will be performed every three years.

1.2.3 Scope of LTM Program

The DQO is to establish an early warning system to monitor the potential influx of COCs and to evaluate the effectiveness of Remedial Actions (RAs) performed at potential source sites.

The LTM WP identifies sampling locations for inclusion in the LTM network and specifies sampling parameters and frequency of sampling. Downgradient sampling locations to be used for LTM will be chosen to “immediately” detect any unexpected variations in matrix quality. POC locations will be located upgradient from potential receptors to provide early warning.

To meet these DQOs, the LTM program will include the following tasks for the Six Mile Creek AOC:

- **Ongoing review and update of existing data including geological and hydrogeological framework, contaminant history, and site use history;**
The New York State Department of Environmental Conservation (NYSDEC) Class A, A-S, AA, and AA-S Surface Water Quality Standards are identified as the chemical-specific Applicable or Relevant and Appropriate Requirements (ARARs) for surface water. Sediment sample ARARs including the most stringent criteria or guidance values are specified in Table 2-3b of the final FS Addendum (E&E, July 2002). At present, no sediment guidance values are ARARs for ecological receptors. Fish sample guidance

thresholds for protection of human health will be calculated as prescribed by the NYSDOH. Fish sample guidance thresholds for protection of piscivorous wildlife will be derived from the NYSDEC Technical Report 87-3 (Newell, 1987) or a more current revised update, if applicable. The terms “cleanup goals,” “cleanup criteria,” “ARARs,” “New York State [NYS] Surface Water Quality Standards and Guidance Values” and “state standards” are used interchangeably throughout the text.

Periodic review of the LTM program is essential for optimal functioning: sampling results relative to the cleanup goals shall be reanalyzed periodically, and COC trends shall be re-evaluated and updated to provide new projections for LTM closure dates. In the interest of optimal, cost-effective monitoring, a specific set of COCs shall be identified as requiring continued observation for this AOC site.

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2 BACKGROUND

2.1 Environmental Setting

2.1.1 Physiography and Topography

The former Griffiss AFB is located in the city of Rome in Oneida County, New York (refer to Figure 2-1). The former Base lies within the Mohawk Valley between the Appalachian plateau and the Adirondack Mountains. A rolling plateau northeast of the former Base reaches an elevation of 1300 ft above mean sea level (MSL). The New York State Barge Canal (NYSBC) and the Mohawk River valley south of the former Base lie below 430 ft MSL. The topography across the former Base is relatively flat with elevations ranging from 435 ft MSL in the southwest portion to 595 ft MSL in the northwest portion of the former Base.

2.1.2 Geology

Unconsolidated sediments at the Griffiss AFB consist primarily of glacial till with minor quantities of clay and sand and significant quantities of silt and gravel. The thickness of these sediments ranges from 0 feet in the northeast portion to more than 130 feet in the southern portion of the former Base. The average thickness of the unconsolidated sediments is 25 to 50 feet in the central portion and 100 to 130 feet in the south and southwest portions of the former Base. The bedrock beneath the former AFB generally dips from the northeast to the southwest and consists of the black Utica Shale. It is a gray and black carbonaceous unit with a high/medium organic content (Law Engineering and Environmental Services, Inc. [LAW], December 1996). More details on the geologic features were discussed in Sections 3 and 4 of the AOC Long-Term Monitoring Baseline Study (FPM, July 2000).

2.1.3 Hydrogeology

The shallow water table aquifer lies within the unconsolidated sediments, where depth to groundwater ranged from 0 ft below ground surface (bgs) in the southwest portion to 63 ft bgs in the northeast portion of the former Base during the December 1998 synoptic Base-wide water-level measurement of wells (FPM, July 2000). Groundwater across the former Base generally flows from the northeast to the southwest. Several creeks, drainage culverts, and sewers (mostly acting as drains for shallow groundwater), intercept surface water runoff. A comprehensive description of regional and local geology, hydrogeology, and lithology for the former Griffiss AFB was given in Section 4 of the Long-Term Monitoring Baseline Study (FPM, July 2000), and in the Remedial Investigation (RI) prepared by Law (LAW, December 1996), and in the Supplemental Investigation (SI) prepared by E&E (E&E, November 1998).

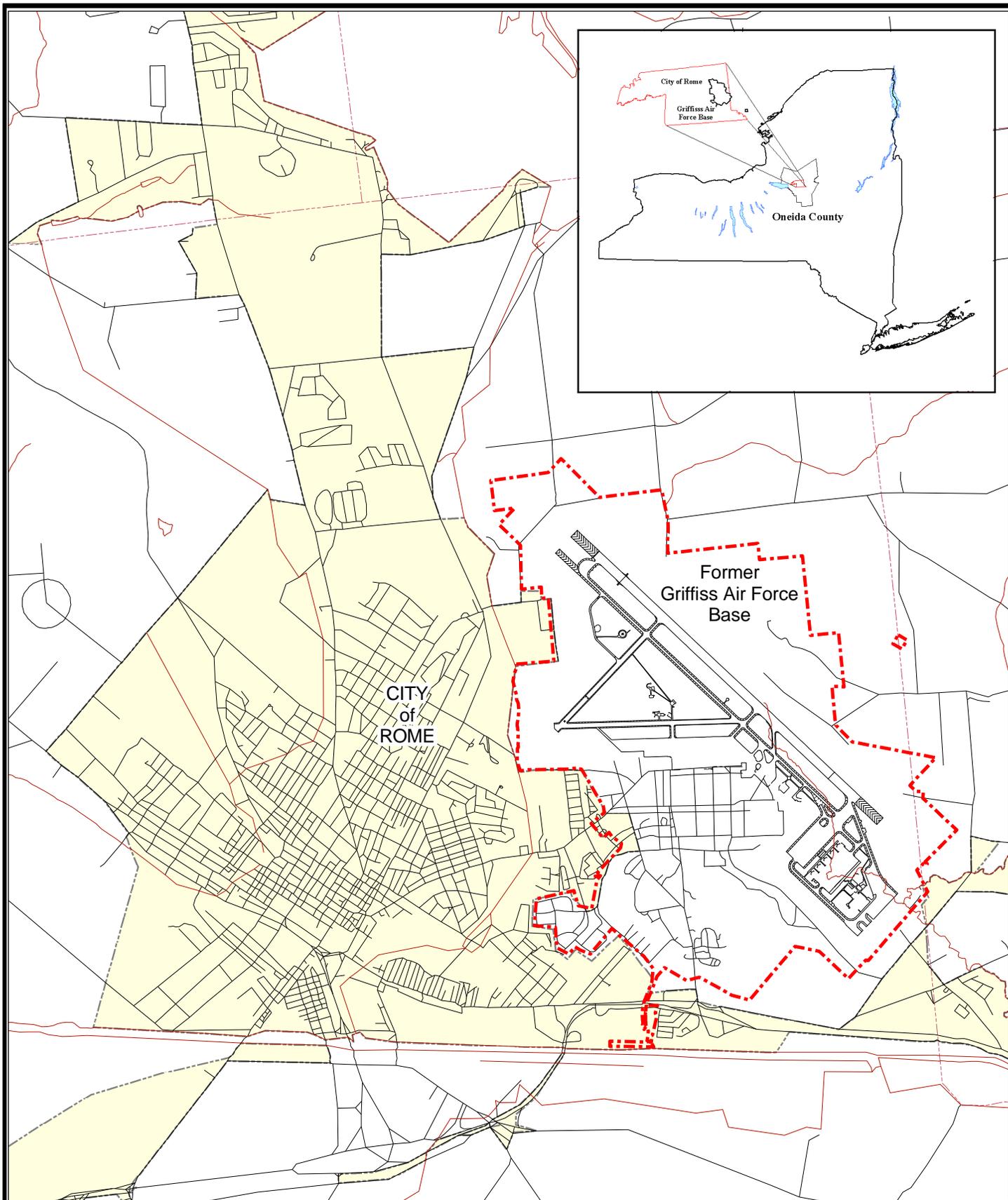


FIGURE 2-1
Base Location Map

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2.1.4 Climate

The former Griffiss AFB experiences a continental climate characterized by warm, humid, moderately wet summers and cold winters with moderately heavy snowfalls. The mean annual precipitation is 45.6 inches, which includes the mean annual snowfall of 107 inches. The annual evapotranspiration rate is 23 inches. The average temperature during the winter season is 20 degrees Fahrenheit; temperatures during the spring, summer, and fall vary from 31 to 81 degrees Fahrenheit. The prevailing winds are from the southwest, with an average wind speed of 5 knots.

The former Griffiss AFB is located in a region prone to acid precipitation; the annual average pH of precipitation recorded for 1992 at the three closest stations ranged from 4.25 to 4.28. Fluctuations in pH have an inverse correlation to precipitation, such that lower pH levels correlate with higher amounts of precipitation (LAW, December 1996).

2.1.5 Biology

The former Griffiss AFB, covering 3,552 acres of property within the Erie-Ontario ecozone of the Great Lakes Physiographic Province, has been heavily disturbed from an ecological perspective. Although there are a few undisturbed communities within the former Base's boundary, the 1993 Inventory of Rare Plant Species and Significant Natural Communities identified six significant habitats of special concern occurring on the former Base (New York Natural Heritage Program, January 1994). There are five special-concern habitats identified by the Inventory that are adjacent to or within the confines of AOCs at the former Base. These special-concern habitats include: (1) a white-cedar-dominated rich sloping fen adjacent to the Six Mile Creek floodplain; (2) a hemlock-hardwood swamp located in a mature forest occurring hydraulically upgradient of Landfill 1 (Ammo Storage Area); (3) a rich graminoid fen adjacent to the southeast corner of the runway, situated on top of the buried section of Six Mile Creek; (4) a pitch pine-scarlet oak woods at the southeastern edge of Three Mile Creek; and (5) a hemlock-hardwood swamp of several acres at the southern end of Three Mile Creek. Three of the five habitats are of concern to the Six Mile Creek AOC (no. 1, 2, and 3), since they are located adjacent to the Six Mile Creek AOC or are located on sites that potentially influence Six Mile Creek. LTM activities will be performed strictly in Six Mile Creek or its banks; therefore, disturbance of these adjacent special-concern habitats is not anticipated.

Although no plant or animal species at the former Base has been considered threatened or endangered by the U.S. Department of the Interior, some species listed on the NYS Threatened Species List have been identified, with habitats relevant to the AOCs at the former Base. Whorled mountain mint (*Pycnanthemum verticillatum* var *verticillatum*) has been identified in the open wet-meadow wetland at Landfill 7 (no. 5). It also thrives in the white-cedar-dominated rich sloping fen adjacent to the Landfill 1 (no. 1). Significant disturbance of the sites and vegetation is not expected during the execution of the LTM program.

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3 SITE-SPECIFIC INFORMATION

This section of the Work Plan contains a detailed discussion of the Six Mile Creek AOC, including a description of the environmental setting, a characterization of the background conditions, and an identification of the tasks that need to be accomplished for long-term monitoring, including:

- A listing of sampling locations to be monitored including recommended frequencies, analyses to be performed, and their locations relative to the creek; and
- A discussion of LTM re-evaluation criteria.

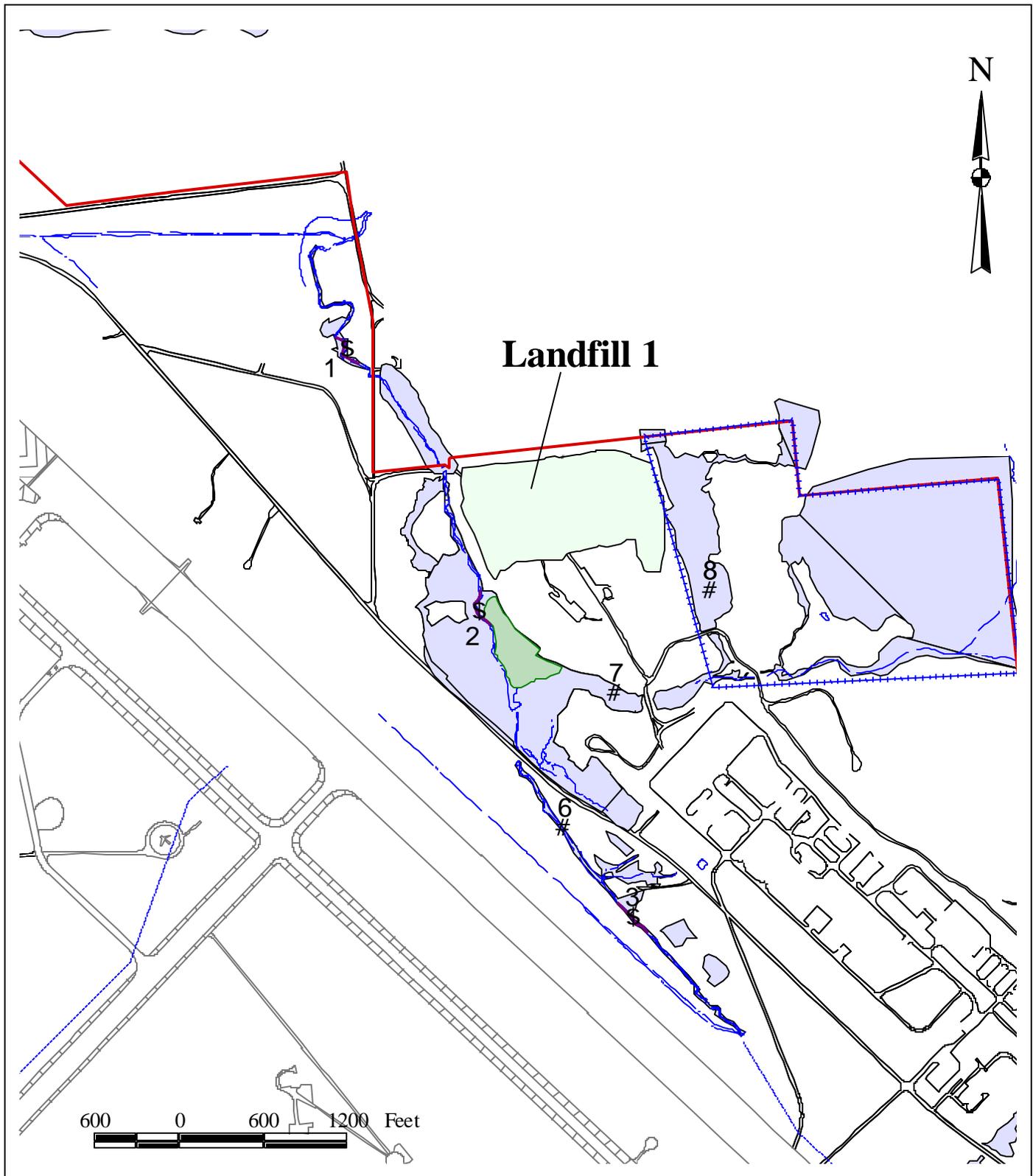
3.1 Site Location and History

Six Mile Creek, a natural stream bordered by wetlands, enters the former Griffiss AFB from the north and exits to the southeast, intersecting the base runway. The creek is approximately 8 feet wide and 3 feet deep prior to entering the base and approximately 20 feet wide and 4 feet deep after leaving the base. The on-base portion of the creek is approximately 8,400 feet long, split in an upper and a lower section, plus an additional 7,200 feet within the runway culvert separating both sections (Figure 3-1 and 3-2). The creek continues off base for approximately 2 miles, ultimately flowing into the New York State Barge Canal.

Prior to base construction, Six Mile Creek reportedly was used for agricultural irrigation. Currently, the on-base portion of the creek serves as a surface water runoff and storm water drainage system for the base. The creek flows through a water-control structure that maintains normal base flow into the creek channel and diverts floodwaters through a diversion channel to the Mohawk River. A portion of the creek has been culverted.

Surface water runoff from Landfills 1, 2/3, and 7, the Weapon Storage Area (WSA), WSA Landfill, runway, on-base shops, and Rainbow Creek flows to the creek, and leachate from the same landfills has been draining directly into the creek. Portions of the base storm water system discharge to the on-base lower portion of the creek. In addition to storm water, this system received such base waters as rinse water and washdown, which may have contained oils, solvents, and fuels from various base shops.

The Six Mile Creek AOC also includes the aqueous film-forming foam (AFFF) lagoon, which is located between the WSA fence line and Perimeter Road. This 50-by-50-foot retention pond, which received aqueous waste overflow from the AFFF system at Building 917, has periodically overflowed, potentially resulting in surface discharges to Six Mile Creek.



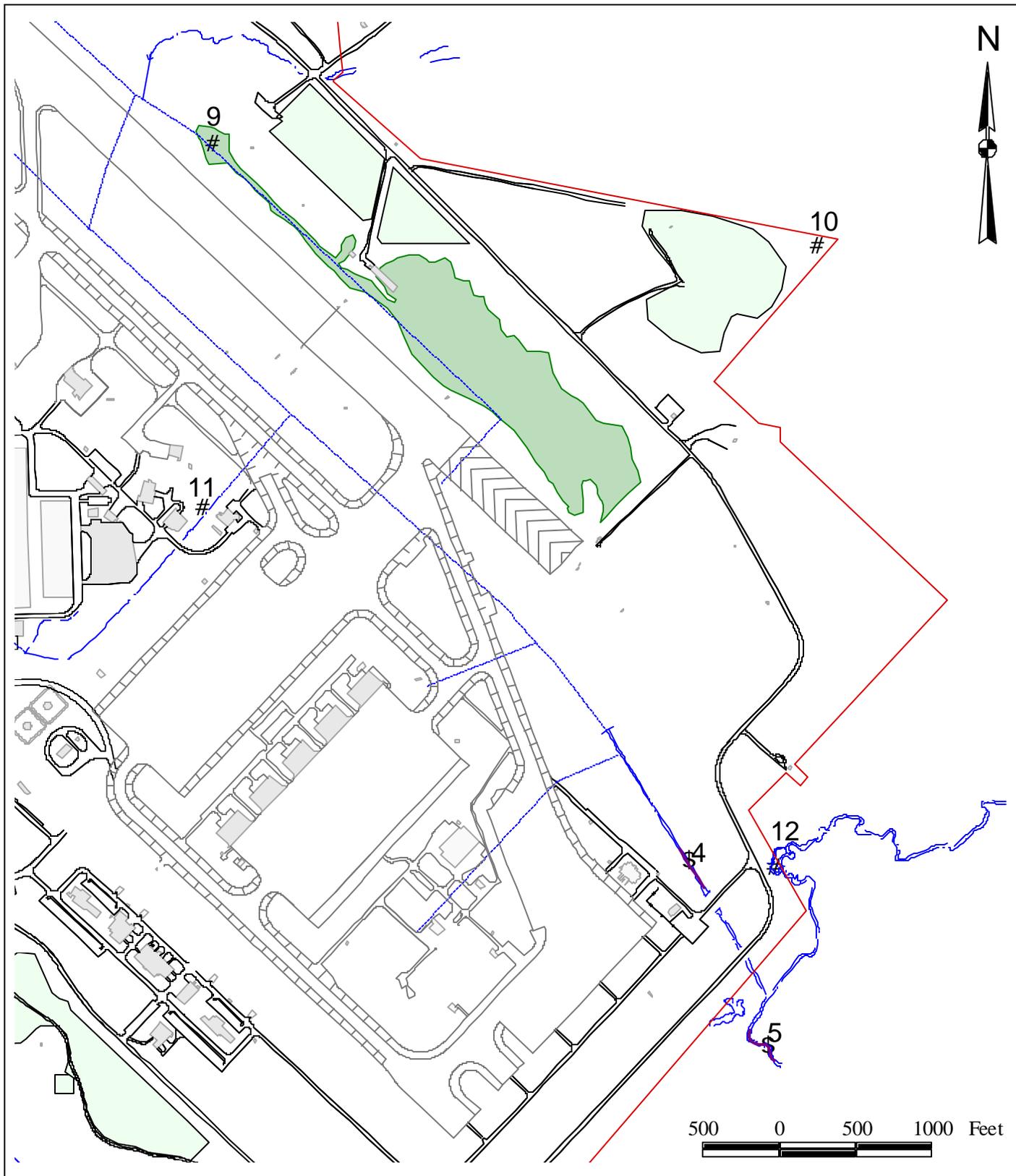
Legend	
	Fish sampling stretch
	SMC Fish/Sed./SW Location
	SMC Sed./SW Location
	Landfill
	Af boundary
	Stream/creek
	Special habitat
	Wetland
	Airfield
	Road
	Rich Graminoid Fen
Building	
	Existing
	Demolished

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**Figure 3-1
Six Mile Creek Upper Section Map**

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Key to Features

- | | | |
|-----------------------|-------------------------------------|------------------------------------|
| Fish Sampling Stretch | Road | Existing |
| Airfield | EXISTING | Skyline Housing Structural Defects |
| Base Boundary | REMOVED | Demolished |
| Stream/Creek | SMC Locations | Rich Sloping Fan |
| Storm Drain | SMC Fish Location | Landfill |
| | SMC Sediment/Surface water Location | Wetland |

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**Figure 3-2
Six Mile Creek Lower Section Map**

Six Mile Creek has been classified as a Class C stream. According to the New York Code of Rules and Regulations (NYCRR) 701, the best usage for Class C stream waters is fishing, where waters shall be suitable for fish propagation and survival. Based on an Aquatic Habitat Assessment, at least 12 species of fish are found in Six Mile Creek (E&E, Proposed Plan, July 2003).

3.2 Hydrogeological Setting

The Six Mile Creek AOC is located in the northeastern part of the former Griffiss AFB. The topography is generally sloping towards the southeast. The creek receives greatly varying amounts of inflow from off-base sources through the Butternut Creek diversion ditch and from surface water runoff from the watershed. The creek also receives more stable amounts of groundwater inflow along its stretch.

3.3 Summary of Previous Investigations

Preliminary studies of Six Mile Creek were performed in 1981 and 1988. Soil, sediment, and fish tissue samples were collected. Numerous metals and PAHs were detected in the sediments. Several metals and PCBs were detected in the fish tissue samples at levels below the Food and Drug Administration's (FDA's) action level of 2.0 ppm but above the 0.1 ppm level representing risk to piscivorous wildlife. The results of these studies led to the performance of an RI in 1994 and 1995.

The RI was performed to evaluate the nature and extent of environmental contamination at the site and to determine whether remedial action was necessary to eliminate potential threats to human health and the environment from exposures that might arise under existing or expected future site conditions. The RI included an aquatic survey that evaluated creek habitat, water quality, benthic and drift macroinvertebrate communities, and fish populations at three stations along the northern course of the creek (SMC-FS1, SMC-FS2, and SMC-FS3, similar in location to location 1, 2, and 3 on Figure 3-1). At approximately the same three locations, sediment samples were collected for toxicity testing and fish samples were collected for pesticides, PCBs, and metals analyses. Results from the sediment toxicity tests performed as part of the aquatic survey indicated that chemicals were not present at levels acutely toxic to aquatic life; however, the macroinvertebrate community at one station was classified as slightly impaired.

During the RI, surface water samples were collected over several rounds of sampling from 21 locations: 14 along on- and off-base portions of Six Mile Creek, one at the AFFF lagoon, three in the Mohawk River, and three in the Barge Canal. Two VOCs, 14 SVOCs, four pesticides, six metals, cyanide, and sulfide were detected at concentrations above the most stringent criteria for surface water. Sediment samples were collected at two depths below the surface water/sediment interface from the same 21 locations. Three VOCs, 18 SVOCs, 20 pesticides, one PCB and six

metals were detected at concentrations above the most stringent criteria for sediment.

In 1995, NYSDEC conducted a macroinvertebrate community analysis in Six Mile Creek just downstream of the Base boundary at the Route 365 bridge. The water quality was assessed as being moderately impacted based on a significantly impacted benthic community. Fish population data indicated that fish communities were generally in fair condition and whole-body fish tissue concentrations indicated that PCBs, pesticides and mercury were present at levels exceeding NYSDEC ecological risk guidelines. The concentration of PCBs in fish tissue also exceeded the previously mentioned FDA action level.

Also in 1995, NYSDEC performed passive in situ concentration/extraction sampling (PISCES) on the lower portion of Six Mile Creek to test for PCBs and other organochlorines. No contaminants were detected. However, naturally occurring conditions such as below average rainfall and low flow in the stream may have affected the ability of PISCES samplers to detect contaminants.

As part of a basewide supplemental investigation (SI) performed in June 1997, one water sample was collected from a storm sewer manhole located within the Six Mile Creek culverted section, and two surface water samples were collected from the storm sewer outfalls at the headwaters of Rainbow Creek. No contaminants were detected in these water samples. In addition, ten PISCES samples were collected for pesticides and PCBs analyses from Six Mile Creek, two from unnamed tributaries to the creek, and one from the Rainbow Creek Tributary. No PCBs were detected. The levels of pesticides found in Rainbow Creek and downstream in Six Mile Creek were higher than in the upper portion of Six Mile Creek and the other tributaries. There are no screening criteria for PISCES samples. Also in 1997, a removal action was performed at Rainbow Creek (sediment removal) and the adjacent Coal Storage Yard (sediment and debris removal).

In July 1998, additional SI samples were collected, primarily from off-base locations, to fill data gaps that had been identified in the RI sampling. These included two surface water samples and 12 sediment samples. Three metals were detected above the most stringent criteria for surface water. Ten SVOCs, PCBs, dioxins/furans, and two metals were above the most stringent criteria for sediment.

In July 1999, the habitat quality of the creek was visually inspected by AFRPA, USACE, NYSDEC, EPA, and United States Fish and Wildlife Service (USFWS). A brief walkover of the on-base portion revealed the presence of orange floc (iron oxide) at a few locations above and below the culvert. This was attributed to the presence of leachate seeps with extensive orange floc upstream at Landfill 1. A more extensive walkover of the off-base portion of the creek revealed an aquatic habitat of relatively high quality. The surrounding habitat is also of high quality for plants and wildlife, including extensive areas of forest, shrub, and emergent wetlands.

The presence of cloudiness and some orange floc in the water column was observed. The floc is probably due to Landfill 1 seepage and may be partly of natural origin (E&E, Proposed Plan, July 2003).

3.4 Six Mile Creek LTM Plan

The LTM program for the Six Mile Creek AOC will be implemented during the late summer/early fall (August/October) 2004, after all RAs at sites potentially influencing Six Mile Creek have been completed. At that time of the year, the fat content of the fish tissue is the highest and consequently the highest concentration of lipophilic contaminants can be expected to have accumulated in fish tissue. During the initial sampling round, baseline information for sediment, surface water and fish tissue contaminants shall be collected. A qualitative benthic community analysis will also be performed at each fish sample location.

LTM Need - Exceedances were reported for VOCs, SVOCs, metals, pesticides, and PCBs in sediment and surface water samples during the RI. Fish tissue was reported to contain significant levels of metals, pesticides and PCBs. Table 3-1 summarizes the LTM sampling rationale for the Six Mile Creek AOC. Sediment and surface water samples will be collected annually and fish tissue samples (including qualitative benthic community analysis) will be collected every three years.

LTM Objectives – Sampling of sediment, surface water, and fish tissue in Six Mile Creek is recommended to achieve the following objectives:

- Monitor contaminant migration and degradation in Six Mile Creek;
- Monitor and confirm the effectiveness of the RAs that have been performed at potential sources of contamination (Landfills 1, 2/3, and 7, WSA, WSA Landfill, Building 35, Pumphouse 5, and Rainbow Creek);
- Monitor the potential influx of contaminants from potential sources of contamination (i.e., early warning system).

LTM Extent – Given the elevated concentrations for several COCs detected in earlier investigations, annual monitoring for VOCs, SVOCs, metals, pesticides and PCBs is recommended for both sediment and surface water (Table 3-1). The focus of the sediment sampling is on detecting changes in the sediment quality. Sediment surface samples will therefore be collected from 0 to 6 inches below the top of sediment in order to monitor any influx of contamination effectively. The annual sampling results will be compared to the most stringent criterion or guidance value as described in Table 2-3b of the Final FS Addendum for Three Mile Creek (E&E, July 2002), and to previous sampling results.

The twelve sediment and surface water sampling locations, described in Table 3-2, have been chosen in consideration of results from previous investigations and following discussions with NYSDEC and EPA personnel. During the sediment sampling, sediment deposition locations in the vicinity of the proposed locations will be targeted for sample collection.

Table 3-1
Six Mile Creek LTM Field Activities Rationale

Matrix	Analysis	Frequency	Rationale
Sediment/ Surface water	VOCs, SVOCs, metals, pesticides/ PCBs.	Annually ¹	Monitoring of contaminant migration and degradation in Six Mile Creek and adjacent potential source tributaries/ sites. Frequency based on relatively low flow regime and limited sediment transport.
Fish tissue	Pesticides/PCBs, cadmium and mercury, % lipid.	Every three years ²	Monitoring of fish for pesticides/PCBs, and cadmium and mercury is proposed to identify potential bioaccumulation of contaminants of concern.
Benthic Organisms (Qualitative)	According to Bode et al. (September 1990) and Bode et al. (June 2002).	Every three years ²	The quality of the benthic community in SMC will be evaluated applying NYSDEC-approved protocols.

Notes:

¹ An annual frequency for sediment sampling is commensurate with the rate at which changes in sediment quality are expected; that is, insofar as the sources of contamination are remediated. Frequent changes in sediment quality are not expected. Surface water samples are planned for collection at the same rate as sediments.

² A three-year frequency for fish tissue analysis and qualitative benthic community evaluation is commensurate with recommendations from NYSDEC personnel. Sampling will commence the year after the remedial activities have been completed and preferably within the August/October timeframe.

Fish tissue collection will be performed in accordance with NYSDEC Guidelines (NYSDEC, October 2002). Electrofishing will be the preferred method of fish collection from the 100-meter stretches of the creek as indicated in Figures 3-2 and 3-3. All fish will be collected, sorted, measured, and weighted. Tissue samples will be collected at five of the twelve sediment and surface water sampling locations to identify potential tissue contamination and potential accumulation of COCs. Forty gram fish samples will be collected as requested by the laboratory

Table 3-2
Six Mile Creek Sampling Locations and Analyses

Location Number	Location within Six Mile Creek	Detailed Location Description	Sample Matrix	No. of samples per location	Analyses performed per sample	Total No. of Analyses
1	On the northern end of the upper section of SMC (Six Mile Creek).	Appr. 800 ft downstream of the entrance point of SMC at Butternut Creek.	Sediment	1	Full suite ¹	5
			Surface water	1	Full suite ¹	5
			Fish Tissue	10 ²	Fish suite ³	40
2	Around the middle point of the upper section of SMC.	Appr. 3000 ft downstream of the entrance point of SMC on the Base.	Sediment	1	Full suite ¹	5
			Surface water	1	Full suite ¹	5
			Fish Tissue	10 ²	Fish suite ³	40
3	Upstream of the entrance to the culvert of SMC.	Appr. 1000 ft upstream of the start of the culvert.	Sediment	1	Full suite ¹	5
			Surface water	1	Full suite ¹	5
			Fish Tissue	10 ²	Fish suite ³	40
4	Upstream of Perimeter Road.	Appr. 300 ft upstream of the Base boundary in SMC.	Sediment	1	Full suite ¹	5
			Surface water	1	Full suite ¹	5
			Fish Tissue	10 ²	Fish suite ³	40
5	Downstream of confluence of SMC and Slate Creek.	Appr. 500 ft downstream of Base boundary.	Sediment	1	Full suite ¹	5
			Surface water	1	Full suite ¹	5
			Fish Tissue	10 ²	Fish suite ³	40
6	Downstream of the wetlands south of LF 1.	Appr. 600 ft. downstream of the underpass under Perimeter Road.	Sediment	1	Full suite ¹	5
			Surface water	1	Full suite ¹	5

Notes:

¹ Full suite of analyses includes VOCs (SW 8260), SVOCs (SW 8270), metals (SW 6010B), pesticides (SW 8081) and PCBs (SW 8082).

² Fish samples will be collected from the largest specimens available. A combined number of ten samples will be collected from both the bottom feeder and predatory species, depending on availability. Fillet samples (5) analysis results are used for human evaluation. The offal samples (5) from the filleted fish are also analyzed so that results can be mathematically combined and used for ecological evaluation. If no fillets are available, 5 'whole fish' (beheaded and eviscerated) will be collected and their offal will be analyzed also. If no fillets or whole fish are available, 10 composite samples will be collected.

³ Fish suite of analyses includes pesticides/PCBs (SW8540C), cadmium and mercury (SW 6010B/ SW7470) and % lipid.

Table 3-2 Continued
Six Mile Creek Sampling Locations and Analyses

Location Number	Location within Six Mile Creek	Detailed Location Description	Sample Matrix	No. of samples per location	Analyses performed per sample	Total No. of Analyses
7	In the tributary northwest of the Weapons Storage Area.	Appr. 750 ft upstream in the tributary south of Landfill 1.	Sediment	1	Full suite ¹	5
			Surface water	1	Full suite ¹	5
8	In the wetlands east of Landfill 1.	Appr. 500 ft southeast of Landfill 1.	Sediment	1	Full suite ¹	5
			Surface water	1	Full suite ¹	5
9	In wetlands southwest of Landfill 7.	Appr. 750 ft southwest of Perimeter Road at the northern edge of the wetland.	Sediment	1	Full suite ¹	5
			Surface water	1	Full suite ¹	5
10	In wetlands northeast of Landfill 2/3.	Appr. 500 ft northeast of the Landfill 2/3 boundary.	Sediment	1	Full suite ¹	5
			Surface water	1	Full suite ¹	5
11	In Rainbow Creek, at the beginning of the culvert.	Appr. 50 ft southwest of the Rainbow Creek culvert.	Sediment	1	Full suite ¹	5
			Surface water	1	Full suite ¹	5
12	In Slate Creek.	Appr. 1000 ft upstream of the confluence of SMC and Slate Creek.	Sediment	1	Full suite ¹	5
			Surface water	1	Full suite ¹	5

Notes:

¹ Full suite of analyses includes VOCs (SW 8260), SVOCs (SW 8270), metals (SW 6010B), pesticides (SW 8081) and PCBs (SW 8082).

² Fish samples will be collected from the largest specimens available. A combined number of ten samples will be collected from both the bottom feeder and predatory species, depending on availability. Fillet samples (5) analysis results are used for human evaluation. The offal samples (5) from the filleted fish are also analyzed so that results can be mathematically combined and used for ecological evaluation. If no fillets are available, 5 'whole fish' (beheaded and eviscerated) will be collected and their offal will be analyzed also. If no fillets or whole fish are available, 10 composite samples will be collected.

³ Fish suite of analyses includes pesticides/PCBs (SW8540C), cadmium and mercury (SW 6010B/ SW7470) and % lipid.

for all analyses combined. Qualitative benthic community analysis will be performed every three years at all five fish sample locations according to the protocols described in Bode et al., September 1990 and Bode et al., June 2002.

Fish samples will be collected every three years until the results of two subsequent rounds of sampling do not exceed the calculated NYSDOH and EPA Guidance Values for human health or the ecological risk level for piscivorous wildlife. For ecological evaluation, a bottom feeder (White sucker [*Catostomus commersoni*]) and an omnivorous species (Creek chub [*Semolilus atromaculatus*]) will be targeted. For human health evaluation, a bottom feeder (white sucker) and a predatory species (Trout [*Trutta sp.*]) will be targeted.

The fish samples will be analyzed for pesticides, PCBs, cadmium, mercury, and % lipid, as shown in Table 3-1. The samples will be analyzed by the current laboratory under contract: Severn Trent Laboratories, Inc; Buffalo, NY location. The sampling locations and analyses are tabulated in Table 3-2 and are shown in Figures 3-1 and 3-2.

LTM Re-evaluation Criteria – The LTM plan will be re-evaluated every year to assess the creek conditions. Proposed re-evaluation procedures follow:

- The sediment and surface water results from subsequent sampling events will be compared to the baseline concentrations established during the first sampling round and all applicable ARARs, SCGs and remedial action goals. These annual concentrations serve as general guidelines for changes in sediment quality as a result of releases to Six Mile Creek. If the concentrations show an increasing trend, the Air Force, in consultation with the EPA and NYSDEC, will evaluate modifying the LTM network to identify potential causes of concentration increases.
- If, after consultation with the regulatory agencies, the monitoring results indicate that the goals of the program are not being attained, alterations to the remedy will be evaluated.
- Alterations to the frequency and duration of the LTM plan may be sought by the Air Force at any time. In general, the basis for such requests will be as explained in the following section.

Acceptable Limits on Decisions – Decisions will be made based on data collected in accordance with the FSP associated with this LTM WP (FPM, December 2003) and analyzed by the laboratory in accordance with the AFCEE QAPP (including associated USACE project-specific variances). The data will then be reviewed and validated based on an evaluation of the results in relation to the AFCEE QAPP (Version 3.1, or later) in conjunction with the EPA National Functional Guidelines. The AFCEE QAPP specifies accuracy and precision objectives while the EPA National Functional Guidelines provides general data usability guidance.

The decision to discontinue sampling will be evaluated during yearly reviews provided that the following objectives are met:

- A) All the RAs planned for sites that potentially impact Six Mile Creek have been completed;
- B) Levels of contaminants in fish meet values for protection of fish and wildlife and no fish advisories are in place;
- C) Concentrations in the sediment have stabilized at:
 - levels below the NYS Guidance Values as described in Table 2-3b of the FS Addendum (E&E, July 2002); or
 - levels indicative of background conditions; or
 - other levels accepted/approved by NYSDEC and EPA.

Recommendations for LTM Optimization will be made after at least two sampling rounds have been completed (i.e. after two years for sediment and surface water and after six years for fish tissue and macroinvertebrates). Any change in the number of LTM sampling locations, the sampling performed at these sampling locations, or sampling frequency will be subject to USEPA and NYSDEC approval.

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4 LTM REPORTING REQUIREMENTS

Results of the LTM will be reported on an annual basis. Reporting will include the following:

- Summary of field sampling activities (including field documentation logs);
- Data Assessment (including laboratory results and data validation reports, when applicable);
- Data Presentation;
- Data Evaluation and Summary, including:
 - Comparison to standards and guidances;
 - Comparison to baseline and subsequent LTM sampling results;
 - Trend charts and statistical analysis;
 - A detailed discussion of LTM re-evaluation and resulting recommendations for LTM optimization.

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5 REFERENCES

- Air Force Center for Environmental Excellence, Technical Services Quality Assurance Program, Quality Assurance Project Plan, Version 3.1, August 2001.
- Bode, et al., Quality Assurance Work Plan for Biological Stream Monitoring in New York State, New York State Department of Environmental Conservation, Division of Water, June 2002.
- Bode, et al., Biological Impairment Criteria for Flowing Water in New York State, New York State Department of Environmental Conservation, Division of Water, September 1990.
- Ecology and Environment, Inc., Final Report for Supplemental Investigations of Areas of Concern, Griffiss Air Force Base, November 1998.
- Ecology and Environment, Inc., Final Records of Decision for Areas of Concern (AOCs), Three Mile Creek and Six Mile Creek, Former Griffiss Air Force Base, Rome, New York, December 2003.
- Ecology and Environment, Inc., Six Mile Creek Proposed Plan, Former Griffiss Air Force Base, Rome, New York, July 2003.
- EPA, Guidance for Assessing Chemical Contaminant Data for Use in Fish Advisories, Volume 1, Fish Sampling and Analysis, third edition, November 2000.
- FPM Group Ltd., Draft Field Sampling Plan, Long-Term Monitoring Program, Revision 2.0, December 2003b.
- FPM Group Ltd., Draft Site Safety and Health Plan, Long-Term Monitoring Program, Revision 2.0, December 2003a.
- FPM Group, Ltd., Draft Report, AOC Long-Term Monitoring Baseline Study, Griffiss Air Force Base, Revision 1.0, July 2000.
- Law Engineering and Environmental Services, Inc., Draft Final Primary Report, Remedial Investigation at Griffiss Air Force Base, New York, December 1996.
- Newell, A.J., Johnson, D.W., and Allen, L.K., 1987, Niagara River Project: Fish flesh criteria for piscivorous wildlife: New York State Department of Environmental Conservation, Technical Report 87-3.

New York National Heritage Program, 1993 Inventory of Rare Plant Species and Significant Natural Communities, January 1994.

NYSDEC, Draft Procedures for Collection and Preparation of Aquatic Biota for Contaminant Analysis, Division of Fish, Wildlife & Marine Resources, Bureau of Habitat, October 2002.