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ACRONYMS AND ABBREVIATIONS

AFCEE	Air Force Center for Environmental Excellence
ANG	Air National Guard
ANGB	Air National Guard Base
ANGI	Air National Guard Instruction
AOC	area of concern
ARAR	applicable or relevant and appropriate requirement
AVGAS	aviation gasoline
CDI	chronic daily intake
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CERCLIS	Comprehensive Environmental Response, Compensation, and Liability Information System
CFR	Code of Federal Regulations
CMR	Code of Massachusetts Regulations
COC	contaminant of concern
COPC	chemical of potential concern
DAD	dermally absorbed dose
DOD	U.S. Department of Defense
DSRP	drainage structure removal program
EB	Eastern Briarwood
EDB	ethylene dibromide (1,2-dibromoethane)
EPA	U.S. Environmental Protection Agency
EPC	exposure point concentration
ETR	extraction, treatment, reinjection
FFA	Federal Facility Agreement

ACRONYMS AND ABBREVIATIONS

FS-#	Fuel Spill-#
ft msl	feet mean sea level
GAC	granular activated carbon
HEAST	Health Effects Assessment Summary Table
HI	hazard index
HQ	hazard quotient
IRIS	Integrated Risk Information System
IROD	Record of Decision for Interim Action
IRP	Installation Restoration Program
LTM	long-term monitoring
LUC	land use control
M	million
MassDEP	Massachusetts Department of Environmental Protection
MCL	maximum contaminant level
mg/kg-day	milligrams per kilogram per day
MMR	Massachusetts Military Reservation
MMCL	Massachusetts maximum contaminant level
MPP	Mashpee Pitted Plain
NCP	National Oil and Hazardous Substances Contingency Plan
NDIL	Non-Destructive Inspection Laboratory
NGB	National Guard Bureau
NPL	National Priorities List
OU	operable unit
PCE	tetrachloroethene
PCT	Plume Cleanup Team

ACRONYMS AND ABBREVIATIONS

PP	Proposed Plan
PRG	preliminary remediation goal
RAO	remedial action objective
RCRA	Resource Conservation and Recovery Act
RfD	reference dose
RI	remedial investigation
RME	reasonable maximum exposure
ROD	Record of Decision
RPM	remedial program manager
SD-5	Storm Drain-5
SERGOU	Southeast Region Groundwater Operable Unit
SF	slope factor
SI	site investigation
SPEIM	system performance and ecological impact monitoring
SRTF	Sandwich Road Treatment Facility
TCE	trichloroethene
UCL_{95}	95 percent upper confidence limit on the mean
USCG	U.S. Coast Guard
UST	underground storage tank
VOC	volatile organic compound
WA	Western Aquafarm
µg/L	micrograms per liter

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1.0 DECLARATION

1.1 SITE NAME AND LOCATION

The Massachusetts Military Reservation (MMR) on Cape Cod Massachusetts lies within the boundaries of the towns of Bourne, Mashpee, and Sandwich, and abuts the town of Falmouth. This site is listed on the National Priority List (NPL) as Otis Air National Guard/Camp Edwards in Falmouth, Massachusetts. This Record of Decision (ROD) addresses the groundwater at Eastern Briarwood (EB), Western Aquafarm (WA), and Storm Drain-5 (SD-5). The Comprehensive Environmental Response, Compensation and Liability Information System (CERCLIS) number for the MMR site is MA2570024487.

1.2 STATEMENT OF BASIS AND PURPOSE

This ROD presents the selected remedies for Eastern Briarwood, Western Aquafarm, and SD-5 groundwater, which were chosen in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendment and Reauthorization Act (SARA), and to the extent practicable, the National Oil and Hazardous Substances Contingency Plan (NCP). This decision is based on the administrative record for this site. The EB, WA, and SD-5 source areas have been addressed as separate operable units (OU). This ROD addresses the EB, WA, and SD-5 groundwater operable units.

The United States Department of Defense (DOD) (U.S. Air Force) is the lead agency for CERCLA remedial actions at the MMR. The U.S. Environmental Protection Agency (EPA), the U.S. Air Force, and the National Guard Bureau (NGB) are parties to the Federal Facility Agreement (FFA) (EPA et al. 2002) for this site. They, along with the Commonwealth of Massachusetts Department of Environmental Protection (MassDEP), concur with the selected remedy.

1.3 ASSESSMENT OF THE SITE

The response action selected in this ROD for the SD-5 site will be protective of the public health and welfare and the environment from actual or threatened releases of hazardous substances into the environment. No further action is necessary at the Eastern Briarwood and Western Aquafarm sites to be protective of human health and the environment.

1.4 DESCRIPTION OF SELECTED REMEDY

The EB, WA, and SD-5 source areas have been addressed as separate OUs. This ROD will only address the selected remedies for current EB, WA, and SD-5 groundwater contamination.

Volatile organic compounds (VOCs) were detected in groundwater samples collected from the Eastern Briarwood area. In recent years (2000 to 2004), there has been only one detection of any VOC with a concentration above the respective state and federal drinking water standard. After review of the conservative assumptions used in the risk assessment, the EPA, MassDEP and Air Force Center for Environmental Excellence (AFCEE) concluded that VOC concentrations in Eastern Briarwood groundwater did not pose unacceptable human health risks. Based on the review of the risk assessment for Eastern Briarwood and the spatial and temporal distribution of VOCs in Eastern Briarwood groundwater, the EPA, MassDEP, and AFCEE concluded that no additional action was warranted to be protective of human health and the environment.

VOCs were also detected in groundwater samples collected from the Western Aquafarm area. Even though the concentrations were below the drinking water standard, the risk assessment indicated there was a potential for unacceptable non-cancer health risks to future residents, associated with the VOC concentrations in one monitoring well. VOC concentrations have been decreasing with time in the Western Aquafarm area, which is within a secured portion of the MMR. Because there is no potential for current or future residential exposure to the remaining contamination at Western Aquafarm, the EPA,

MassDEP, and AFCEE agreed that no further action is warranted to be protective of human health and the environment.

The selected remedy for SD-5 groundwater includes the following components:

- Periodic groundwater sampling and analysis for trichloroethene (TCE).
- Periodic review and optimization of the sampling program.
- Monitoring, which will continue for two years beyond the time at which the remedial action objectives have been met.
- Existing land use controls (LUCs), which will remain in place to prevent or reduce human exposure to TCE-contaminated groundwater.
- Five-year reviews, which will be performed to determine if the remedy is still appropriate and protective.
- A residual risk assessment to be conducted if deemed necessary.

1.5 STATUTORY DETERMINATIONS

The selected remedy for Eastern Briarwood and Western Aquafarm groundwater is consistent with CERCLA and, to the extent practicable, the NCP; is protective of human health and the environment; and is cost-effective. Because the selected remedy for Eastern Briarwood and Western Aquafarm groundwater is no further action, there are no applicable or relevant and appropriate requirements (ARARs) with which to comply.

The selected SD-5 groundwater remedy is consistent with CERCLA and, to the extent practicable, the NCP; is protective of human health and the environment; complies with federal and Commonwealth of Massachusetts requirements that are ARARs for the remedial action; and is cost-effective. Although groundwater treatment was a principal element of the interim remedy for the SD-5 groundwater contamination, groundwater will not be treated under the final remedy. The remedy does not meet the statutory preference for treatment because there are no immediate health risks from contaminants, and data show that the groundwater contamination is not expanding significantly and will not impact sensitive areas during the time required for natural degradation to achieve cleanup goals. Because contamination above levels that allow for unlimited use and unrestricted

exposure will remain in the aquifer for a few years, five-year reviews will be conducted to ensure that the remedy continues to be protective of human health and the environment.

1.6 DATA CERTIFICATION CHECKLIST

The following information is included in the Decision Summary section (Section 2.0) of this ROD. Additional information can be found in the Administrative Record for this site.

Data Item	Location in Document
Contaminant of concern (COC) and its respective concentration.	Section 2.5.1
Baseline risk represented by the COC.	Section 2.7
Cleanup level established for the COC and the basis for this level.	Section 2.8
How source materials constituting principal threats will be addressed.	Section 2.2
Current and reasonable anticipated future land use assumptions and current and potential future beneficial use of groundwater used in the baseline risk assessment and the ROD.	Section 2.6
Potential land and groundwater use that will be available at the site as a result of the selected remedy.	Section 2.8
Estimated annual and total present value costs, discount rate, and the number of years over which the remedy cost estimate is projected.	Table 2-48 and Table 2-49 Section 2.11.3
Key factor(s) that led to selecting the remedy.	Sections 2.10.2, 2.12.3, 2.12.4

1.7 AUTHORIZING SIGNATURES

The foregoing represents the decision for final remedial action for EB, WA, and SD-5 groundwater by AFCEE and the EPA, with the concurrence of the MassDEP.

Approve and recommend for immediate implementation.

AIR FORCE CENTER FOR ENVIRONMENTAL EXCELLENCE

By: _____ Date: 14 August 2006

Paul A. Parker
Director

U.S. ENVIRONMENTAL PROTECTION AGENCY

By: _____ Date: 09/28/06

Susan Studlien
Director, Office of Site Remediation and Restoration

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2.0 DECISION SUMMARY

The following sections describe the Eastern Briarwood, Western Aquafarm, and SD-5 settings and potential risks, and the remedial action objectives (RAOs) and alternative evaluation for remediation of the SD-5 groundwater.

2.1 SITE NAME, LOCATION, AND BRIEF DESCRIPTION

The MMR is listed on the NPL as Otis Air National Guard/Camp Edwards in Falmouth, Massachusetts. The CERCLIS number for the MMR site is MA2570024487. In accordance with Executive Order 12580, the DOD is the lead agency for remedial actions at the MMR. The Commonwealth of Massachusetts chose not to be a signatory to the FFA. The MMR was formally added to the NPL in 1989. The FFA for the MMR site was signed in 1991 by the DOD, the EPA, and the U.S. Coast Guard (USCG)/Department of Transportation[1] (EPA et al. 2002). In 1995, the FFA was amended to add the U.S. Air Force as the lead agent for the cleanup at MMR. The FFA, as amended, requires the U.S. Air Force to implement CERCLA requirements at the MMR.

The MMR occupies approximately 22,000 acres on Cape Cod (Figure 2-1) and consists of several operating command units: the Air National Guard, the Army National Guard, the Air Force, the U.S. Coast Guard (USCG), and the Veterans Administration. Military training and maneuvers, military aircraft operations, and maintenance and support activities have resulted in past releases of hazardous materials at the MMR. EB, WA, and SD-5 are located in the southeast corner of the MMR (Figure 2-1 and Figure 2-2).

The MMR OUs being addressed in this ROD are listed as follows in the EPA database:

- OU ID 13, OU01A – SD5 NORTH GROUNDWATER PLUME
- OU ID 20, OU 01G – SD5 SOUTH GROUNDWATER PLUME

[1] In 2000, the FFA was amended to remove the USCG/U.S. Department of Transportation as a signatory to the FFA.

- OU ID 17, OU 01E – EASTERN BRIARWOOD GROUNDWATER
- OU ID 18, OU 01F – WESTERN AQUAFARM GROUNDWATER.

2.2 SITE HISTORY AND ENFORCEMENT ACTIVITIES

Military use at the MMR began in 1911. The most intense periods of activity occurred from 1940 to 1946 and 1955 to 1970. Sources of contamination resulting from a variety of military operations include former chemical spills, motor pools, landfills, fire training areas and drainage structures such as dry wells and drainage swales.

The MMR history follows a series of complex interactions between various federal agencies and the Commonwealth of Massachusetts. In 1940, the U.S. Army signed a 99-year lease with the Commonwealth of Massachusetts for the use of the MMR. The Army transferred this lease to the Air Force in 1953 for the Otis Air Force Base portion of the military reservation, and the Army maintained a sublease for the 14,000-acre area on the base known as Camp Edwards. In 1974, the Air Force licensed the Massachusetts Air National Guard to use Otis Air Force Base, and in 1975, the U.S. Army licensed the Massachusetts Army National Guard to use and occupy Camp Edwards. On 05 March 2002, a law was enacted that designated the northern 15,000 acres of the MMR as protected conservation land dedicated for the purposes of water supply and wildlife habitat, at the same time allowing military training that is compatible with the environmental protection of the land. In 2003, the Commonwealth of Massachusetts extended the lease with the National Guard until 2052.

Activities resulting in CERCLA actions are summarized below. In 1982, the DOD initiated the Installation Restoration Program (IRP) at the Otis Air National Guard Base (ANGB) area of the MMR. The IRP at the MMR is funded by the Defense Environmental Restoration Account. The NGB was responsible for implementing the IRP at the MMR. In 1986, the IRP was expanded to include all potential hazardous waste releases at MMR resulting only from practices that were discontinued before 1976. In 1989, the MMR was formally added to the NPL. An FFA among the NGB, the EPA, and the USCG was signed in 1991 and has since been amended (EPA et al. 2002). The FFA

provides a framework for EPA oversight and enforcement of the MMR investigations and cleanup activities and identifies a schedule for cleanup activities. A Community Relations Plan is included as an attachment to the FFA. In 1996, the EPA Region I Administrator requested that the DOD provide a new management structure for the MMR IRP. In response to that request, the U.S. Air Force assumed the lead role in the execution of the IRP and assigned AFCEE to manage the program. Under Amendment 2, additional enforceable milestones and the Plume Response Decision Criteria and Schedule were added to the FFA in April 1997. More recently, the USCG has been removed from its status as a party to the FFA (Amendment 3 to the FFA signed in February 2000). Amendment 4, signed in February 2000, added Section 7003 of the Resource Conservation and Recovery Act (RCRA) to the FFA in order to address contamination caused solely by petroleum releases that fall within the scope of the CERCLA "petroleum exclusion" described in the last sentence of CERCLA Section 101(14). Amendment 5 was signed in June 2002 and removed the CS-13 site from the list of Study Areas and Areas of Contamination contained in Section 5.24 of the FFA.

Wide varieties of investigations, removal actions, and remedial actions have been and are currently being conducted at the MMR.

Eastern Briarwood

Early environmental investigations were conducted in this area to evaluate the nature and distribution of contaminants at individual areas of concern, which were potential sources of contamination in the Eastern Briarwood area (i.e., Fuel Spill-25 [FS-25], Chemical Spill-14, Central Heating Plant, Weapons Storage Area, and USCG FS-1). Preliminary assessments began in 1983 and continued through preliminary studies, site inspections, and various remedial and hydrologic investigations into the spring of 1993. The results of these early investigations, as well as other background information, were used to scope the Southeast Region Groundwater Operable Unit (SERGOU) remedial investigation (RI), which was completed in 1994. One subset of the SERGOU was called southeast MMR groundwater, which was later identified as the Eastern Briarwood area (ANG 1994b). The SERGOU RI concluded that the source area for the Eastern Briarwood

groundwater contamination was the industrial area located within the southeastern portion of the MMR. Due to the low concentrations and lack of a pattern, it was determined that the contamination was related to occasional spills from normal operations and not from a sustained source. The power plant and the weapons storage area were identified as potential sources of these small releases. A Record of Decision for Interim Action (IROD) (ANG 1995a) presented the selected interim action (plume containment) for the Eastern Briarwood groundwater.

Initially, an interim response action to contain the Eastern Briarwood plume at the leading edge was developed that conceptually consisted of eight extraction wells and 16 injection wells on the MMR boundary. After review of the conceptual interim response action, it was determined that this remedy could not be implemented without a detrimental impact to the sensitive ecosystems, undesirable alterations in regional groundwater flow paths, and counterproductive spreading of the contamination. In 1996, a data gap investigation indicated contaminant concentrations were low (only TCE exceeded the maximum contaminant level [MCL] of 5.0 micrograms per liter [µg/L] with a maximum concentration of 5.9 µg/L) (ANG 1996). Based on the data gap investigation and potential negative effects of the conceptual remedial action, the approach for Eastern Briarwood was revised to long-term monitoring to ensure that no unacceptable toxicological risks develop from discharge of the groundwater contamination to the Quashnet River (AFCEE 1997).

In 1996, a long-term monitoring (LTM) program for the Eastern Briarwood area was initiated to assess contaminant trends and distributions. Between 1996 and 2005, 29 monitoring well screens at 13 different locations were installed in the Eastern Briarwood area. Sample collection in the Eastern Briarwood area from 1996 through 2004 included over 60 surface water samples, over 20 sediment samples, and over 750 groundwater samples.

In support of reaching a final ROD for Eastern Briarwood, a risk assessment was performed (AFCEE 2005b) using data collected from the LTM program and

supplemented by additional data collected specifically to support the risk assessment. The risk assessment evaluated potential risks from exposure to the groundwater and surface water in the Eastern Briarwood area.

Western Aquafarm

The Western Aquafarm was identified as a potential source of contamination during a 1986 expanded records search (ANG 1986). The Western Aquafarm consisted of six 25,000-gallon underground storage tanks (USTs) that were used in the 1950s and 1960s to store and transfer aviation gasoline (AVGAS) and Jet Propulsion Fuel-4. Fuel was transferred from the tanks by pumping water into the tanks to displace the fuel. To refill the tanks with fuel, the water was displaced and discharged into a 1-acre basin within the Central Drainage Swale (AFCEE 1996).

A site investigation (SI) was conducted in 1988 to further characterize the distribution of soil and groundwater contamination at the Western Aquafarm and other suspected source areas (ANG 1990). Fuel-related compounds (benzene, ethylbenzene, and xylenes) indicating AVGAS contamination were detected in soil and groundwater located downgradient of the Western Aquafarm. Extensive soil contamination was also detected at the Western Aquafarm during the interim and final remedial investigations conducted between 1989 (ANG 1992) and 1993 (AFCEE 1996).

As part of the MMR tank removal program, all six USTs and associated piping at the Western Aquafarm were removed in October 1994 (ANG 1995b). No evidence of leakage was observed in any of the tanks. Evidence of leakage associated with the piping and transfer support system was noted in conjunction with one tank. Approximately 450 cubic yards of contaminated soil were excavated and removed for thermal treatment.

As part of the SERGOU RI completed in 1994, a benzene plume was delineated from the Western Aquafarm to the base boundary. An IROD (ANG 1995a) presented the selected interim action (plume containment) for the Western Aquafarm groundwater.

Initially, an interim response action to contain the Western Aquafarm plume at the leading edge was developed that conceptually consisted of nine extraction wells, treatment of the contaminated water with granular activated carbon (GAC), and 18 injection wells on the MMR boundary. After review of the conceptual interim response action, it was determined that this remedy could not be implemented without a detrimental impact to the sensitive ecosystems, undesirable alterations in regional groundwater flow paths, and counterproductive spreading of the contamination. In 1996, a data gap investigation indicated contaminant concentrations were low. Based on the data gap investigation and potential negative effects of the conceptual remedial action, the approach for Western Aquafarm was revised in the *Strategic Plan* (AFCEE 1997) from the active leading edge remedial system previously presented in the IROD to LTM to ensure that no unacceptable toxicological risks develop in place of the active leading edge remedial system previously presented in the IROD.

In 1996, an LTM program was initiated for the Western Aquafarm area to assess contaminant trends and distributions. The primary contaminants detected in the Western Aquafarm monitoring area are fuel-related compounds: ethylbenzene and total xylenes. Between 1996 and 2005, 12 monitoring well screens at six different locations were installed and over 270 groundwater samples were collected.

In support of reaching a final ROD for Western Aquafarm, a risk assessment was performed (AFCEE 2005b) using data collected from the LTM program and supplemented by additional data collected specifically to support the risk assessment. The risk assessment evaluated potential risks from exposure in the groundwater in the Western Aquafarm area.

SD-5

The SD-5 area of concern (AOC) was first identified as a potentially hazardous site during the Phase I records search for the MMR, which was completed in 1983 (ANG 1983). This study concluded that the Non-Destructive Inspection Laboratory (NDIL) site was a potential source of contamination. Test pits were excavated in the vicinity of the

NDIL during the initial IRP Phase II SI, and total organic halogens and lead were detected in the test pits and sludge from the NDIL leaching well (R.F. Weston 1985).

An expanded records search was conducted in 1986 to identify historical activities that had the potential to cause soil and groundwater contamination. This search identified the Western Aquafarm, Eastern Aquafarm, the Corrosion Control Shop, the Permanent Field Training Site hangar, and the FS-5 spill as possible contamination sources (ANG 1986) (Figure 2-2).

An SI was conducted in 1988 to further characterize the distribution of soil and groundwater at suspected source locations (ANG 1990). This investigation included inspecting stormwater drainpipes, conducting a soil gas survey, excavating test pits, and installing monitoring wells. Inspection of the drainpipes indicated that the top half of the joints in the larger stormwater drainpipes were commonly not grouted, which could have allowed water to pass into and out of the pipes. Chlorinated solvents were detected in shallow soil gas samples obtained in areas adjacent to the NDIL leaching well. Lead, 1,1-dichloroethene, and polycyclic aromatic hydrocarbons were detected in test pits located within the Central Drainage Swale. TCE was detected at concentrations exceeding the MCL in groundwater samples collected from a monitoring well located adjacent to the NDIL, and the NDIL was confirmed as a source of groundwater contamination.

An RI was completed to characterize the nature and extent of contamination in the SD-5 AOC. An interim RI presented data collected between 1989 and 1990 (ANG 1992), and a final RI incorporated supplemental data collected in 1993 (AFCEE 1996). These investigations focused primarily on the characterization of source areas and groundwater contamination in the northern portion of SD-5 (SD-5 North). The former NDIL leaching well was defined as the primary source of a chlorinated solvent groundwater plume that extended past the MMR base boundary. Soil contamination was also detected at the Western Aquafarm, the Corrosion Control Shop, the Eastern Aquafarm, and the Central Drainage Swale.

Several source removal activities occurred in the SD-5 AOC between 1990 and 1996. In November 1990, the Air National Guard (ANG) removed approximately 700 gallons of fluid from the NDIL leaching well, and four drainage structures at SD-5/FS-5 were removed in July 1996 as part of the MMR drainage structure removal program (DSRP). The NDIL leaching well and four other drainage structures associated with AOC SD-5 were removed during the DSRP. Between October 1994 and March 1995, during the MMR tank removal program, a total of 17 USTs, associated piping, and approximately 450 cubic yards of contaminated soil were removed from the Western and Eastern Aquafarms.

The SERGOU RI concluded that the primary potential sources of the SD-5 solvent plume were the NDIL leaching well, the Corrosion Control Shop, and sumps in Hangars 3122 and 3192. An IROD (ANG 1995a) presented the selected interim action (plume containment) for SD-5 groundwater.

The preliminary design for the interim response action for the SD-5 plume included 15 extraction wells, treatment of the contaminated water with GAC, and 30 injection wells. The 15 extraction wells were to be located along Hooppole Road, to contain the SD-5 plume at the leading edge, and the injection wells were to be located along the edge of Johns Pond downgradient of the extraction wells. After review of the conceptual interim response action, it was determined that this remedy could not be implemented without a detrimental impact to the sensitive ecosystems, undesirable alterations in regional groundwater flow paths, and counterproductive spreading of the contamination.

The approach to the revised plume containment strategy (AFCEE 1997) for SD-5 included a phased installation of an extraction well fence at the base boundary for the northern portion of the plume (which included 10 extraction wells, eight injection wells, and a treatment plant) and the development of a plume response strategy to reduce toxicological risks, with minimal ecological impacts in the southern portion of the SD-5 plume between Ashumet and Johns ponds.

In 1996, the SD-5 North remedial system was designed to maintain hydraulic control of the plume upgradient of the MMR boundary, which is defined as 100 percent capture of the groundwater flow within the area where TCE exceeds the MCL. The system consists of 10 closely spaced extraction wells, the Sandwich Road Treatment Facility (SRTF), and eight reinjection wells (Figure 2-2). The SD-5 North extraction, treatment, and reinjection (ETR) system began operation on 04 August 1997.

In December 1997, after evaluation of plume characterization data and conceptual remedial alternatives, the remedial program managers (RPMs) from AFCEE, the EPA, and the MassDEP determined that active groundwater remediation was required to remediate groundwater contamination in the SD-5 South plume. During the pre-design investigation for the SD-5 South plume, a separate plume of TCE was detected adjacent to the southern limit of the SD-5 South plume. Therefore, a phased design and construction approach was selected for the SD-5 South plume. Phase I addressed the axial (core) portion of the SD-5 South plume, and Phase II addressed the southernmost portion of the SD-5 South plume in the vicinity of Hooppole Road and the adjacent TCE plume (now known as the CS-10 Northern Lobe).

The SD-5 South axial system (Phase I) consisted of two recirculating wells, 28RW1101 and 28RW1102 (AFCEE 1999). Water treatment for the recirculating wells consisted of closed-loop air stripping of influent water within the wellhead vault, followed by filtration of the air stream by primary and secondary GAC units. Treatment systems were housed in below-grade vaults installed at each recirculating well location. This system began operation on 17 June 1999.

Phase II of the SD-5 South design addresses the southernmost portion of the SD-5 South plume in the vicinity of Hooppole Road (AFCEE 2000). This Phase II system consists of one extraction well in the SD-5 South plume, 28EW0015. The extracted groundwater was pumped to the SRTF for treatment, and the treated water was reinjected into the aquifer through the SD-5 North reinjection wells. The Phase II Hooppole Road extraction well system began operation on 22 January 2000.

The SD-5 treatment systems were turned off in 2003 (SD-5 South Phase I system and SD-5 North) and in 2004 (SD-5 South Phase II system). In November 2005, the SD-5 North and SD-5 South plume contours were eliminated because detections in SD-5 monitoring wells no longer defined a plume. In the SD-5 North area, the MCL exceedances of TCE were not consistently detected in monitoring wells and the contamination is not contiguous or extensive. In the SD-5 South area, there are MCL exceedances of TCE in two monitoring wells, but the contamination is likely not migrating very far downgradient and will more likely attenuate in place over time (AFCEE 2005a). Currently, an LTM program is being conducted to monitor SD-5 groundwater.

In support of reaching a final ROD for SD-5, a risk assessment was performed (AFCEE 2005b) using data collected from the system performance and ecological impact monitoring (SPEIM) program and the ongoing LTM program to characterize the groundwater contamination and assess potential risks from exposure to the groundwater and surface water in the SD-5 area.

2.3 COMMUNITY PARTICIPATION

The MMR IRP has a very robust community involvement program that provides many opportunities for the public to become involved in the investigation and decision-making process. Public meetings and poster board sessions are held, display ads are placed in newspapers to announce significant events and meetings, news releases are issued, tours of the sites and treatment facilities are conducted, neighborhood notices are distributed to notify people of events impacting their neighborhoods, and public notices of other kinds are issued.

In addition, several citizen teams advise the IRP and the regulatory agencies about the program. They include the Senior Management Board and the Plume Cleanup Team (PCT). These teams are made up of citizen volunteers and government representatives working together to resolve problems and complete the cleanup. All citizen team meetings are open to the public. Certain teams are decision-making teams. They include

the Management Review Group and the RPMs. Assumptions about reasonably anticipated future land use and potential beneficial uses of groundwater and surface water are regularly discussed by these teams.

The public has been kept up-to-date on the progress of the EB, WA, and SD-5 sites through various public and citizen team meetings and public notices. The following updates on the IROD to ROD process for sites addressed in this ROD were presented to the PCT:

11 September 2002: Overview of the *Draft Final Work Plan for the Process Leading to Final Groundwater Decisions for Eastern Briarwood, Western Aquafarm, Storm Drain-5, and Fuel Spill-12* (AFCEE 2002b).

10 September 2003: Overview of the SD-5 Risk Assessment and initial list of SD-5 feasibility study remedial alternatives.

12 November 2003: Revised list of SD-5 feasibility study remedial alternatives.

12 May 2004: Overview of the risk assessments for Eastern Briarwood and Western Aquafarm and the SD-5 feasibility study results.

13 July 2005: Proposed Plan for Eastern Briarwood, Western Aquafarm and SD-5 (AFCEE 2005c).

From 22 July to 20 August 2005, AFCEE held a 30-day comment period to obtain public comments on the remedies presented for the EB, WA, and SD-5 groundwater in a Proposed Plan (PP). A presentation of the EB, WA, SD-5 PP was made to the PCT on 13 July 2005, and AFCEE held a public meeting at the Mashpee Senior Center on 21 July 2005 to present the PP. At these meetings, representatives from AFCEE presented the PP and answered questions from the audience. On 18 August 2005, AFCEE held a public hearing at the Mashpee Senior Center to accept formal public comments on the PP. A transcript of the public hearing is provided in Appendix B. One

individual provided verbal comments at the public hearing. No written comments were received by AFCEE from any community group.

AFCEE published a display ad for the Public Information Meeting, public comment period, and public hearing for the EB, WA, SD-5 PP in the *Falmouth, Mashpee, Bourne,* and *Sandwich Enterprises* and in the *Cape Cod Times* on 15 July 2005. News releases for the Public Information Meeting, public comment period, and public hearing were circulated on 15 July 2005, and an additional news release for the public hearing was circulated on 10 August 2005. The PP was made available for public review at the main public libraries in Bourne, Falmouth, Mashpee, and Sandwich, Massachusetts and on the MMR website. The PP has also been made part of the Administrative Record available for public review at the AFCEE IRP office at the MMR and on the MMR website, http://www.mmr.org. Because the sole comment received during the public comment period simply expressed support for the proposed plan, neither a formal response nor a Responsiveness Summary is necessary.

2.4 SCOPE AND ROLE OF OPERABLE UNIT

The EB, WA, and SD-5 sites were organized into separate groundwater OUs. The source area operable units have been investigated and remediated where necessary for EB, WA, and SD-5; refer to Section 2.2. Soils in non-source areas are not impacted by groundwater contamination and there is no reason to believe that off base soil has been contaminated by base related activities. The OUs in this ROD only address groundwater contamination.

The EB, WA, and SD-5 groundwater OUs are within and downgradient of the southern industrial area of the MMR where, through the IRP, AFCEE is responsible for the cleanup of contamination from past military practices. The NGB is actively investigating and remediating soil and groundwater contamination in the northern portion of the base as part of the Impact Area Groundwater Study Program. The soil and groundwater contamination are attributable to training activities.

2.5 SITE CHARACTERISTICS

As described in Section 2.2, environmental data have been collected from these sites since the 1980s. This overview of the site characteristics will focus on current site conditions.

The EB, WA, and SD-5 sites are all located on a broad, flat, gently southward-sloping glacial outwash plain known as the Mashpee Pitted Plain (MPP) (Figure 2-1). The MPP consists of stratified outwash sand underlain by silty glaciolacustrine sediment, gravel, or basal till. The topography of the MPP gradually slopes from 70 feet mean sea level (ft msl) in the south to 140 ft msl in the north and is pocked with numerous kettle ponds. Moraines bound the MMR to the west and north.

The single groundwater flow system that underlies western Cape Cod, including the MMR, is known as the Sagamore Lens. This sole-source aquifer is primarily unconfined and recharged by infiltration of precipitation. Groundwater flow is generally radial from the recharge area toward the ocean, which forms the lateral boundary of the aquifer on three sides; the Bass River in Yarmouth forms the eastern boundary of the Sagamore Lens. Flow direction within the aquifer is generally horizontal with stronger vertical gradients near surface water bodies. Ponds are generally an expression of the water table and are hydraulically connected with the aquifer. Water table elevations fluctuate from 1 to 4 feet per year. The aquifer thickness varies between 200 and 250 feet thick in the EB, WA, SD-5 area.

The sources of the EB, WA, and SD-5 groundwater contamination have been addressed under separate actions and, therefore, are not described in this section. A summary of source area actions by area is described in Section 2.2.

2.5.1 Conceptual Site Model

Western Aquafarm

The Western Aquafarm area is located in the southern portion of the MMR, generally west and southwest of the Otis ANGB runways (Figure 2-2). The contaminated soils were addressed in a previous source area action and, therefore, are not considered in the groundwater ROD for Western Aquafarm. The medium of concern in the Western Aquafarm area is groundwater. Figure 2-3 illustrates the conceptual site model for Western Aquafarm.

Fuel-related compounds, primarily ethylbenzene and total xylenes are present in the groundwater in the Western Aquafarm area. Historically, fuel contamination (ethylbenzene) was only detected above the MCL in monitoring well, 39MW0002 (Figure 2-2). Ethylbenzene has not been detected above the MCL of 700 µg/L in any monitoring well in this area since June 2001. The maximum ethylbenzene concentration detected in the Western Aquafarm area in 2004 was 550 µg/L (39MW0002) (AFCEE 2005d). Both 39MW0002 and 39MW0005A are located in the Landfill-2 source area (Figure 2-2).

Contamination in the Western Aquafarm area is not defined as a plume since concentrations are below the MCL. The current area of fuel detections extends from monitoring well 39MW0002 to monitoring well 39MW0005A (Figure 2-2). The area of fuel detections is approximately 600 feet long and 250 feet wide. The elevation of the fuel detections ranges from the water table at 39MW0002 (44 ft msl) to a few feet below the water table at 39MW0005A (36 ft msl). The water table is approximately 55 feet below the ground surface.

Concentrations of fuel contamination in the Western Aquafarm have decreased and are expected to continue to decrease because the source of this contamination has been removed. Potential fate and transport processes for fuel contamination include absorption, attenuation, dispersion, and biodegradation. The primary attenuation process

for fuel-related contamination is biodegradation. A zone of low dissolved oxygen concentrations (i.e., less than 1.0 milligram per liter dissolved oxygen), indicative of aerobic biodegradation, is present in the Western Aquafarm monitoring area, and contaminant concentrations are expected to continue to decrease with time. Groundwater flow trajectories indicate that groundwater from the Western Aquafarm area will discharge into the West Pond and bog system. Future impacts to the surface water and sediment in the West Pond and bog system are not expected because upgradient concentrations have decreased, and contamination will continue to degrade and is not expected to migrate.

Eastern Briarwood

The Eastern Briarwood area is located in the southeastern portion of the MMR (Figure 2-2). The sources of contamination were determined to be from occasional spills and not from a sustained source. The media of concern in the Eastern Briarwood area are groundwater, as well as surface water and sediment of the Quashnet River in the area where Eastern Briarwood groundwater is discharging to the river. Figure 2-4 illustrates the conceptual site model for Eastern Briarwood.

The primary contaminants in Eastern Briarwood groundwater are TCE and ethylene dibromide (EDB). Concentrations of TCE and EDB have decreased throughout the Eastern Briarwood area, and currently contamination in the Eastern Briarwood area is not defined as a plume since TCE and EDB concentrations only infrequently exceed the TCE MCL of 5 µg/L or the Massachusetts maximum contaminant level (MMCL) of 0.02 µg/L for EDB. TCE was not detected at concentrations above the MCL from December 2000 until December 2004 when a sample was collected with a concentration of 6.4 µg/L. EDB had not been detected at concentrations above the MMCL since September 2001. Other chlorinated solvents are occasionally detected at low concentrations in Eastern Briarwood groundwater, but have never been detected in the Quashnet River surface water.

Through natural attenuation processes including advection, attenuation, adsorption, dispersion, and biodegradation, TCE and EDB contamination within the Eastern Briarwood area have decreased. Low-level contamination currently present within the Eastern Briarwood area is expected to discharge into the Quashnet River and bog system. VOCs have not been detected in surface water samples collected from the Quashnet River or in groundwater samples collected from shallow drive points located along the Quashnet River (AFCEE 2002e). Therefore, it is anticipated that, upon interaction with the surface water, contamination will continue to be diluted to below detection levels.

The EDB contamination detected within the Eastern Briarwood area is located approximately 50 to 80 feet below the historical TCE plume and is considered to have originated from another source located further upgradient (AFCEE 2002e). Although this contamination is located deeper in the aquifer, groundwater modeling results indicate that the EDB-contaminated groundwater will also discharge into the Quashnet River and bog system. EDB has intermittently been detected in surface water samples collected from the Quashnet River and bog system, but EDB has not been detected in Eastern Briarwood monitoring wells located south of the Quashnet River. EDB concentrations have generally decreased. With no evident continuing source, concentrations are expected to continue to decrease over time through natural attenuation processes including advection, attenuation, dispersion, and biodegradation. EDB contamination will discharge into the Quashnet River and bog system, and concentrations will be diluted upon interaction with the surface water. There is a large flux of groundwater into this surface water system, and even though higher EDB concentrations have historically discharged into the surface water from the adjacent FS-1 plume, EDB has not been detected in the most downgradient surface water sampling locations (AFCEE 2002d).

SD-5

The media of concern associated with the SD-5 groundwater contamination includes groundwater, as well as surface water and sediment of Johns Pond in the area where SD-5 groundwater is discharging into the pond. The contaminated soils were addressed in a previous source area action (drainage removal, soil removal) and a separate ROD and,

therefore, are not considered in the groundwater ROD for SD-5. The COC in the areas of SD-5 North and SD-5 South groundwater contamination is TCE. Figure 2-5 illustrates the conceptual site model for the SD-5 area.

SD-5 North

The SD-5 plume was administratively separated into the SD-5 North plume and the SD-5 South plume when the SD-5 North treatment system was constructed (Figure 2-2). The historical SD-5 North plume has diminished and is no longer characterized as a plume due to the operation of the SD-5 North remedial system, but remnants of the SD-5 groundwater contamination still exist upgradient of the base boundary. TCE is the only chlorinated compound in the SD-5 North area that is detected at concentrations exceeding the MCL of 5 µg/L. In 2005, TCE was only detected above the MCL in two monitoring wells in the SD-5 North area (28MW0004 and 28MW0596, Figure 2-2) with a maximum concentration of 12.4 µg/L (28MW0004). The elevation of the TCE MCL exceedances ranges from the water table at 28MW0004 (approximately 55 ft msl) to approximately 30 feet below the water table at 28MW0596 (approximately 21 ft msl).

Although concentrations that exceed the MCL persist in the SD-5 North source area, transport modeling results indicate that no contamination reaches the SD-5 North extraction well fence at concentrations exceeding the MCL. Based on the history of TCE analytical results at SD-5 North, the source area contamination is degrading in place and any significant transport from its current location in concentrations above the MCL is unlikely (AFCEE 2002c).

SD-5 South

The SD-5 South area groundwater contamination COC is TCE. The source of contamination at SD-5 South has been removed with operation of the SD-5 North treatment system. The historical SD-5 South plume has diminished and is no longer characterized as a plume due to the operation of the SD-5 North and South remedial

systems, but remnants of groundwater contamination still exist in the SD-5 South area (Figure 2-2).

The SD-5 South area groundwater contamination consists of contamination above the TCE MCL identified in two monitoring wells. TCE is the only chlorinated compound in the SD-5 South area that is detected at concentrations exceeding the MCL of 5 µg/L. In 2005, TCE was only detected above the MCL in two monitoring wells in the SD-5 South area (28MW1132B and 28MW0035, Figure 2-2) with a maximum concentration of 39 µg/L (28MW0035B). Both of these monitoring wells are located in a low permeability silty sand layer, and it is expected that TCE concentrations at these locations will be more persistent since groundwater velocities through these units are slower than in the surrounding sandy portions of the aquifer. The groundwater contamination is located approximately 60 feet below the water table along the isthmus between Ashumet and Johns ponds and then rises and discharges into Johns Pond. The depth to the bottom of the pond ranges between 10 and 30 feet within the area where SD-5 groundwater contamination discharges. No plume-related VOCs have been detected above the reporting limit of 1 µg/L in any of the surface water samples collected in the SD-5 discharge area since monitoring of these locations began in 1999. Fourteen sampling rounds were conducted between 1999 and 2004.

Under ambient conditions, groundwater flow in the SD-5 area shifts from mainly south at the MMR boundary to southeast in the vicinity of Johns Pond and then discharges into Johns Pond.

The SD-5 groundwater COC, TCE, has a relatively high solubility and is present in the aquifer in a dissolved phase. Potential fate and transport processes for this contamination include groundwater transport by advection, attenuation, dispersion, and biodegradation. The contamination is migrating through the aquifer with no substantial retardation or volatilization.

The remaining mass discharges into Johns Pond and is diluted upon interaction with the surface water. It is anticipated that TCE concentrations within the SD-5 South area will be below the MCL by 2008 (AFCEE 2004).

2.5.2 Sampling Strategy

Groundwater samples were collected in the Eastern Briarwood and Western Aquafarm areas at prescribed frequencies (minimum of annual frequency) beginning in 1996 as part of an LTM program. Groundwater samples were collected in the SD-5 area at prescribed frequencies (minimum annual frequency) as part of the LTM and SPEIM programs initiated before the operation of the SRTF (1997). Surface water and sediment samples were collected in the Eastern Briarwood and SD-5 areas as part of investigative and LTM activities. All of these sampling programs were initiated as part of the interim remedy for EB, WA, and SD-5 groundwater and, thus, are ongoing until the final ROD is signed.

2.6 CURRENT AND POTENTIAL FUTURE SITE AND RESOURCE USES

This section discusses the current and reasonably anticipated future land uses and current and potential beneficial groundwater uses in the vicinity of EB, WA, and SD-5 contaminated groundwater, and presents the basis for future groundwater use assumptions.

2.6.1 Land Use

On-base, the Western Aquafarm and SD-5 contaminated groundwater are in industrial areas used by the U.S. Air Force (Figure 2-6). The off-base area south of the MMR boundary in the EB, WA, and SD-5 areas is primarily residential. The land surrounding the Quashnet River in the Eastern Briarwood area is conservation land. South of the base boundary in the Western Aquafarm area, there is some conservation land.

It is anticipated that the density of residential development south of the base boundary will not significantly increase over time. The land use for the on-base portion of the Western Aquafarm and SD-5 areas are also unlikely to change in the near future. The on-

base portions of the EB, WA, and SD-5 study areas are owned by the Commonwealth of Massachusetts and leased to the DOD for military use. Legislative approval is needed to designate this land to be used for non-military purposes.

2.6.2 Water Resource Use

There are no current groundwater uses at the EB, WA, and SD-5 areas. All of the residences in the area are connected to the municipal water supply. There are no residences or water supply wells in the Western Aquafarm and SD-5 areas on-base. The aquifer throughout upper Cape Cod, referred to as the Sagamore Lens, is generally highly transmissive and is a productive aquifer. Much of the aquifer within the Sagamore Lens has been designated by the MassDEP as a potentially productive aquifer for drinking water.

Surface water bodies, which are fed by groundwater, provide recreational use. Johns Pond is used for fishing, swimming, and boating. The Quashnet River is used for fishing.

AFCEE has developed a working relationship with the water commissioners of the four surrounding towns to ensure that future development of the groundwater resource is coordinated with groundwater monitoring and remediation at the MMR.

2.7 SUMMARY OF SITE RISKS

The risk assessments estimate the risks posed by the present EB, WA, and SD-5 groundwater contamination. They provide the basis for taking action and identify the contaminants and exposure pathways that need to be addressed. The technical approach of the risk assessments is detailed in the *Final Work Plan for the Process Leading to Final Groundwater Decisions for Eastern Briarwood, Western Aquafarm, Storm Drain-5, and Fuel Spill-12* (AFCEE 2002a). This section of the ROD summarizes the results of the human health risk assessment for Eastern Briarwood, Western Aquafarm, and SD-5, and the ecological baseline risk assessments and COC selection for Eastern Briarwood and SD-5 groundwater contamination; these results are presented in two documents (AFCEE 2005b and 2004). An ecological baseline risk assessment was not conducted for

Western Aquafarm because groundwater contamination associated with Western Aquafarm is not discharging into any surface water bodies; therefore, there is no ecological exposure to Western Aquafarm groundwater contamination. The risk assessments evaluated the human health risks from exposure to contaminated groundwater in the EB, WA, and SD-5 areas. Potential impacts to human health from exposure to surface water and sediment in the Quashnet River in the area of Eastern Briarwood groundwater discharge and exposure to surface water in Johns Pond in the area of SD-5 groundwater discharge were also evaluated. The potential impacts to wildlife from exposure to surface water and sediment were evaluated for the Quashnet River in the area into which Eastern Briarwood groundwater is discharging, and for Johns Pond in the area into which SD-5 groundwater is discharging. The results of these risk assessments form the basis for the selected remedies, which are no further action for Eastern Briarwood and Western Aquafarm and LTM for SD-5.

2.7.1 Summary of the EB, WA, and SD-5 Human Health Risk Assessments

A complete description of the methods and results of the baseline human health risk assessment for Eastern Briarwood and Western Aquafarm is presented in the *Final Risk Assessment for Eastern Briarwood and Western Aquafarm* (AFCEE 2005b). The SD-5 risk assessment is Appendix A of the *Final Storm Drain-5 Groundwater Feasibility Study* (AFCEE 2004).

2.7.1.1 Identification of Chemicals of Potential Concern

The selection of chemicals of potential concern (COPCs) for inclusion in the quantitative human health risk calculations was typically based on three screening criteria:

- Frequency of detection,
- Compound concentration and toxicity, as compared to conservative risk and/or hazard-based concentrations,
- Essential nutrient status.

The concentration-toxicity screen was conducted by comparing site data with a series of federal and Massachusetts risk-based criteria. The maximum detected concentration was used in the concentration-toxicity screen.

For groundwater, the following screening criteria were used:

- EPA Region IX preliminary remedial goals (PRGs) for residential tap water (EPA 1999),
- EPA MCLs,
- Massachusetts drinking water standards and guidelines.

For surface water, the same groundwater screening criteria were used with the addition of the EPA recommended water quality criteria for human health consumption of water and organisms. For sediment, the Region IX PRGs for residential soil were used.

PRGs for non-carcinogens were modified (PRG was multiplied by 0.1) such that the PRGs were based on a non-cancer hazard quotient (HQ) of 0.1 (EPA 1995). PRGs for carcinogens were based on a cancer risk level of 1×10^{-6} and were not modified for the screening. When more than one criterion was available for a chemical (PRGs, MCLs, state standards, and guidelines), the lowest of the available criteria was used in the concentration-toxicity screen.

Subsets of the Eastern Briarwood and SD-5 areas were evaluated separately in the risk assessments, based on different environmental media, different land use, and different contamination sources. The Western Aquafarm area was addressed as a whole. Nine separate areas/media were evaluated for the EB, WA, and SD-5 human health risk assessments. Those nine areas/media and the tables presenting the screening process for identifying COPCs in each area are listed below:

- On-Base Eastern Briarwood Groundwater (Table 2-1)
- Off-Base Eastern Briarwood Groundwater Impacted by Chlorinated Solvents (Table 2-2)

- Off-Base Eastern Briarwood Groundwater Impacted by EDB (Table 2-3)
- Surface Water in the Quashnet River Where Eastern Briarwood Groundwater Discharges (Table 2-4)
- Sediment in the Quashnet River Where Eastern Briarwood Groundwater Discharges (Table 2-5)
- Western Aquafarm Groundwater (Table 2-6)
- On-Base SD-5 Groundwater (Table 2-7)
- Off-Base SD-5 Groundwater (Table 2-8)
- Surface Water in Johns Pond Where the SD-5 Groundwater Discharges (Table 2-9).

Table 2-1, Table 2-2, Table 2-3, Table 2-4, Table 2-5, Table 2-6, Table 2-7, Table 2-8, and Table 2-9 present the occurrence and distribution of compounds detected in EB, WA, and SD-5 areas. For each detected chemical, these tables include the minimum and maximum detected concentration, the data qualifiers associated with these concentrations, the location of the maximum detected concentration, the frequency of detection, and the range of detection limits. The "J" qualifier indicates an estimated concentration.

2.7.1.2 Exposure Assessment

The exposure assessment identified potential exposure routes for each site and impacted media, the pathways by which humans may be exposed to site contamination. Soil exposure pathways were not considered primarily because the source areas (soils) have been addressed by the IRP program as separate OUs. In addition, soil in non-source areas is not impacted by groundwater contamination. The only contamination at these sites is related to the migration of contaminants from the military base in groundwater and its emergence in surface water.

Currently, there is no exposure to contaminated groundwater in the EB, WA, and SD-5 areas. However, much of the aquifer has been designated by the MassDEP as a potentially productive aquifer for drinking water, and potential future exposure to groundwater in the EB, WA, and SD-5 areas was evaluated since it was assumed that residential use of groundwater could occur in the future. Potential exposure routes for

these individuals are ingestion and dermal contact. VOCs could also be inhaled during household use of water.

Groundwater from Eastern Briarwood discharges to the Quashnet River. Human receptors of concern evaluated for the Quashnet River were recreational waders (adult and child), cranberry workers, and fish consumers. Exposure routes for the recreational wader and cranberry worker included ingestion of surface water and sediment, dermal contact with surface water and sediment, and inhalation of vapors from surface water. Exposure through recreational fishing included ingestion of recreationally caught fish impacted by the bioaccumulation of contaminants from surface water.

Groundwater from SD-5 discharges to Johns Pond. Human receptors of concern for Johns Ponds were recreational swimmers (adult and child) and fish consumers. Exposure routes for the recreational swimmer included ingestion and dermal contact with surface water. Exposure through recreational fishing included ingestion of recreationally caught fish impacted by the bioaccumulation of contaminants from surface water. Since no COPCs were selected for surface water (maximum consistent concentrations were below screening criteria), recreational exposures to surface water in Johns Pond were not qualitatively or quantitatively evaluated.

The human health conceptual exposure models for the WA, EB, and SD-5 sites are illustrated in Figure 2-7, Figure 2-8, and Figure 2-9, respectively. After identifying which human receptors would be evaluated in the risk assessments, the exposure point concentrations (EPCs) for each receptor were determined. A representative EPC was calculated for each COPC.

For groundwater, the reasonable maximum exposure (RME) EPCs were the maximum detected concentrations. For surface water and sediment, the EPCs were the 95 percent upper confidence limit on the mean (UCL_{95}) unless the UCL_{95} exceeded the maximum concentration. When this was the case, the RME EPC was the maximum concentration. For metals that were selected based on both dissolved and total concentrations, the EPCs were selected as the higher of the total or dissolved concentration.

The EPCs for each area/media are presented in the tables listed below:

- On-Base Eastern Briarwood Groundwater (Table 2-10)
- Off-Base Eastern Briarwood Groundwater Impacted by Chlorinated Solvents (Table 2-11)
- Off-Base Eastern Briarwood Groundwater Impacted by EDB (Table 2-12)
- Surface Water in the Quashnet River Where Eastern Briarwood Groundwater Discharges (Table 2-13)
- Sediment in the Quashnet River Where Eastern Briarwood Groundwater Discharges (Table 2-14)
- Western Aquafarm Groundwater (Table 2-15)
- On-Base SD-5 Groundwater (Table 2-16)
- Off-Base SD-5 Groundwater (Table 2-17).

To quantitatively assess the potential carcinogenic risks and health hazards, daily intakes of the COPCs were calculated based on receptor-specific, site-specific, and chemical-specific exposure parameters. These exposure parameters may vary depending on the time frame, exposure medium, exposure point, and receptor population and age. Exposure assumptions and other parameters used in the chronic daily intake or dermal absorbed dose algorithms are presented for each receptor and exposure medium in the tables listed below:

- Future On-Base or Off-Base Adult Resident, Groundwater (Table 2-18)
- Future On-Base or Off-Base Child Resident, Groundwater (Table 2-19)
- Consumer of Fish, Quashnet River Surface Water (Table 2-20)
- Cranberry Bog Worker, Quashnet River Surface Water (Table 2-21)
- Adult Wader, Quashnet River Surface Water (Table 2-22)
- Child Wader, Quashnet River Surface Water (Table 2-23)
- Cranberry Bog Worker, Quashnet River Sediment (Table 2-24)
- Adult Wader, Quashnet River Sediment (Table 2-25)
- Child Wader, Quashnet River Sediment (Table 2-26).

All of the parameters used in the chronic daily intake and daily absorbed dose equations are presented in these tables except for some chemical-specific parameters (e.g., bioaccumulation factors for fish, dermal absorption factors, and other calculated parameters used in the daily absorbed dose calculations), which are presented in the *Final Risk Assessment for Eastern Briarwood and Western Aquafarm* (AFCEE 2005b) and in Appendix A of the *Final Storm Drain-5 Groundwater Feasibility Study* (AFCEE 2004).

2.7.1.3 Toxicity Assessment

At the time each risk assessment was prepared, toxicity values were obtained from EPA's most current versions of the Integrated Risk Information System (IRIS) or the Health Effects Assessment Summary Table (HEAST), which are databases containing toxicity values for use in quantitative risk assessment. Cancer and non-cancer toxicity factors for each of the COPCs evaluated in the risk assessments for EB, WA, and SD-5 are presented in the tables listed below:

- Oral/Dermal Non-Cancer Toxicity Factors (Table 2-27)
- Inhalation Non-Cancer Toxicity Factors (Table 2-28)
- Oral/Dermal Cancer Toxicity Factors (Table 2-29)
- Inhalation Cancer Toxicity Factors (Table 2-30).

2.7.1.4 Risk Characterization

For carcinogens, risks are generally expressed as the incremental probability of an individual developing cancer over a lifetime as a result of exposure to the carcinogen. Excess lifetime cancer risk is calculated from the following equation:

$$Risk = (CDI \text{ or } DAD) \times SF$$

Where

Risk = a unitless probability of an individual developing cancer
CDI = chronic daily intake (milligrams per kilogram per day [mg/kg-day])
DAD = dermally absorbed dose (mg/kg-day)
SF = slope factor $(mg/kg\text{-}day)^{-1}$

Carcinogenic risks are probabilities that usually are expressed in scientific notation (e.g., 1E-06). An excess lifetime cancer risk of 1E-06 indicates that an individual experiencing the RME theoretically has a 1 in 1,000,000 chance of developing cancer as a result of site-related exposure. This is referred to as an excess lifetime cancer risk because it would be in addition to the risk of cancer an individual faces from other causes such as exposure to too much solar radiation or radon. In accordance with the NCP, excess lifetime cancer risk estimates at EB, WA, and SD-5 are compared to EPA's target risk range for site-related exposures of E-04 to E-06 (EPA 1991b). For informational purposes, under the Massachusetts Contingency Plan (310 Code of Massachusetts Regulations [CMR] 40), sites where the risk is less than 1E-05 (one in 100,000) are considered to have attained a level of no significant risk.

Separate assumptions were used to calculate doses for adult and child residents, and then cancer risks for the adult and child were combined to represent total risks to off-site residents for a 30-year exposure period.

The potential for noncarcinogenic effects is evaluated by comparing an exposure level over a specified time period (e.g., lifetime) with a reference dose (RfD) derived for a similar exposure period. An RfD represents a level to which an individual may be exposed that is not expected to cause any deleterious effect. The ratio of exposure to toxicity, which is called a hazard quotient (HQ), is calculated as follows:

Non-cancer HQ= (CDI or DAD) / (RfD)

Where

CDI	= chronic daily intake (mg/kg-day)
DAD	= dermally absorbed dose (mg/kg-day)
RfD	= reference dose (mg/kg-day)

The hazard index (HI) is calculated by adding the HQs for all COCs that affect the same target organ (e.g., prostate) within a medium or across all media to which a given individual may reasonably be exposed. An HI less than 1 indicates that, based on all of the different contaminants and exposure routes, toxic noncarcinogenic effects are

unlikely. An HI greater than 1 indicates that site-related exposures may present a hazard to human health.

The tables listed below are the tables from the risk assessments that summarize the cancer and non-cancer risks to each receptor under the RME exposure scenario. Cancer and non-cancer risks that appear in these tables are limited to those for the COPCs that produced cancer or non-cancer risks at or near regulatory thresholds. Risks associated with COPCs that produced excess lifetime cancer risks less than 1E-06 or HQs less than 0.1 do not appear in these tables (EPA 1991b).

- Future Adult Resident, On-Base Eastern Briarwood Groundwater (Table 2-31)
- Future Child Resident, On-Base Eastern Briarwood Groundwater (Table 2-32)
- Future Adult Resident, Off-Base Eastern Briarwood Groundwater Impacted by Chlorinated Solvents (Table 2-33)
- Future Child Resident, Off-Base Eastern Briarwood Groundwater Impacted by Chlorinated Solvents (Table 2-34)
- Future Adult Resident, Off-Base Eastern Briarwood Groundwater Impacted by EDB (Table 2-35)
- Future Child Resident, Off-Base Eastern Briarwood Groundwater Impacted by EDB (Table 2-36)
- Consumer of Fish, Quashnet River (Table 2-37)
- Cranberry Bog Worker, Quashnet River (Table 2-38)
- Adult Wader, Quashnet River (Table 2-39)
- Child Wader, Quashnet River (Table 2-40)
- Future Adult Resident, Western Aquafarm Groundwater (Table 2-41)
- Future Child Resident, Western Aquafarm Groundwater (Table 2-42)
- Future Adult Resident, On-Base SD-5 Groundwater (Table 2-43)
- Future Child Resident, On-Base SD-5 Groundwater (Table 2-44)
- Future Adult Resident, Off-Base SD-5 Groundwater (Table 2-45)
- Future Child Resident, Off-Base SD-5 Groundwater (Table 2-46).

The cancer risk calculations indicated that future residential exposure to Eastern Briarwood groundwater on-base and Eastern Briarwood off-base EDB-impacted

groundwater may present an excess lifetime cancer risk within the acceptable federal range of E-04 to E-06. The potential RME carcinogenic risk levels for the future residential exposure pathways are 9E-05 for Eastern Briarwood groundwater on-base and 6E-05 for Eastern Briarwood off-base EDB-contaminated groundwater. The Eastern Briarwood off-base solvent-impacted groundwater may present an excess lifetime cancer risk greater than the federal target risk range of E-04 to E-06 with a potential RME carcinogenic risk level of 2E-04. The non-cancer hazard calculations indicated that residential exposure to impacted groundwater in the on-base Eastern Briarwood area and the off-base Eastern Briarwood solvent-impacted groundwater area may present an unacceptable non-cancer hazard (Table 2-47).

The cancer risk calculations for the Quashnet River cranberry bog worker exposed to surface water and sediment impacted by Eastern Briarwood groundwater did not exceed the federal risk thresholds. The potential RME carcinogenic risk levels for cranberry bog worker exposure pathways is 2E-07. Cranberry bog work related activities did not present an unacceptable non-cancer hazard (Table 2-38).

Calculations of potential risk due to fish consumption from the area of the Quashnet River impacted by Eastern Briarwood groundwater were within the federal target risk range. The potential RME carcinogenic risk levels for fish consumption is 2E-05. Fish consumption did not present an unacceptable non-cancer hazard (Table 2-37).

Calculations of potential risk due to recreational waders in the area of the Quashnet River impacted by Eastern Briarwood groundwater were at the low end of the federal target risk range. The potential RME carcinogenic risk level for recreational wading exposure pathways is 3E-06. Wading did not present an unacceptable non-cancer hazard (Table 2-39 and Table 2-40).

The Western Aquafarm groundwater cancer risk calculations indicated that future residential exposure may present an excess lifetime cancer risk that is greater than the federal target risk range with a potential RME carcinogenic risk level of 4E-04. The non-

cancer hazard calculations indicated that future residential exposure to Western Aquafarm groundwater may present an unacceptable non-cancer hazard (Table 2-47).

The cancer risk calculations in the risk assessment indicated that future residential exposure to SD-5 contaminated groundwater may present an excess lifetime cancer risk that is within the federal target risk range of E-04 to E-06 for SD-5 on-base groundwater and above the federal target risk range for SD-5 off-base groundwater. The potential RME carcinogenic risk levels for the future residential exposure pathways are 9E-04 for SD-5 groundwater on-base and 1E-03 for SD-5 groundwater off-base. The non-cancer hazard calculations indicated that future residential exposure to SD-5 on-base and off-base contaminated groundwater may present an unacceptable non-cancer hazard (Table 2-47).

Since maximum concentrations of the detected constituents were below screening criteria, there is no concern for potential risks or hazards associated with recreational exposures to Johns Pond through discharge of SD-5 groundwater.

2.7.1.5 Uncertainty Analysis and Human Health Risk Assessment Conclusions

There are uncertainties involved in the process of quantifying the risk for human receptors, and overall they make the risk assessment very conservative. Exposure assumptions, slope factors, and oral-to-dermal adjustment factors are all very conservative. In the RME groundwater assumptions, the maximum concentrations of contaminants detected in groundwater were conservatively assumed to be present in all groundwater throughout the area for the entire 30-year period (neglecting contaminant degradation or contaminant movement). The assumption was also made that human exposure remains constant over the lifetime of an individual when in fact, lifestyle changes due to age and actual residence time will alter the projected exposure duration. Even the assumption that the groundwater in these areas would be used for household purposes is a conservative assumption. In light of the conservatism that was built into many of the factors used in the risk assessment approach, the results should be considered to be significant overestimates of actual risk.

COPCs for which an RME was calculated to result in an excess lifetime cancer risk greater than one in a million or an HI greater than 1 are presented in Table 2-47. From this list, the COCs were identified based on a range of criteria. Several COPCs were eliminated from inclusion as COCs because they met one or more of the following criteria:

- The detection frequency of the COPC at the site is low.
- The COPC was not detected in more recent sampling rounds at the site. Five rounds of sampling have been conducted at SD-5 since the risk assessment was conducted, two rounds at Western Aquafarm and two rounds at Eastern Briarwood.
- Concentrations of the COPC have decreased with time such that current and future concentrations will not pose unacceptable risks.
- The COPC is present at the site at concentrations similar to background concentrations.
- The COPC is detected in a very limited part of the site and not migrating based on historical results from surrounding monitoring wells.
- The COPC is attributable to sampling or analytical contamination.
- Site-specific exposure assumptions used in the risk assessment were overly conservative considering the predicted persistence of the COPC and reasonably anticipated future land use.
- The COPC has a sporadic distribution and is not present in multiple samples from a similar area, so no contiguous area of groundwater contamination can be defined.
- The COPC is present only at concentrations below state and federal drinking water standards.

In consideration of these criteria, none of the COPCs for Eastern Briarwood and Western Aquafarm were identified as COCs. For SD-5 groundwater, only TCE was identified as a COC. The contaminant-specific evaluations are presented in the risk assessment reports (AFCEE 2005b and 2004). Some of the more significant COPCs associated with potential risk are discussed below.

The human health risk assessment indicated that the Eastern Briarwood groundwater contaminants TCE and tetrachloroethene (PCE) resulted in lifetime cancer risks of 1E-04 and 5E-05, respectively, which are within the acceptable federal range of E-04 to E-06.

The concentrations of PCE and TCE were below the state and federal MCLs, and after reviewing the conservative assumptions in the risk assessment, the EPA, MassDEP, and AFCEE concluded that the concentrations of TCE and PCE in Eastern Briarwood groundwater did not pose unacceptable human health risks. For example, the risk assessment conservatively assumed that future residents would be constantly exposed to the recently measured maximum concentration of TCE and PCE for a period of 30 years. This scenario is unrealistic because monitoring data collected since 1996 demonstrate that TCE and PCE concentrations in this area are decreasing with time and because there currently are no residences in this area and residential development in the near future is unlikely. Based on the review of the risk assessment for Eastern Briarwood and the spatial and temporal distribution of TCE and PCE in Eastern Briarwood groundwater, the EPA, MassDEP, and AFCEE concluded that no further action was warranted to be protective of human health and the environment.

For the Western Aquafarm risk assessment, xylenes were detected at concentrations less than the MCL of 10,000 µg/L, yet resulted in child and adult resident HQs of 54 and 18, respectively. Because the non-cancer HQs calculated for xylenes in 39MW0002 indicated the potential for unacceptable health risks, AFCEE, the EPA, and the MassDEP carefully considered the exposure assumptions used in the risk assessment and carefully evaluated the spatial and temporal distribution of xylenes in the Western Aquafarm area. Analysis of groundwater samples collected since 1996 from monitoring wells in the area indicates decreased concentrations of xylenes in all repeatedly monitored wells over time, and that the only place where problematic concentrations (those that might pose an unacceptable health risk) of xylenes persist is near monitoring well 39MW0002. Additionally, xylenes contamination is biodegrading faster than it is advecting; it is naturally attenuating (decreasing in volume and concentration) in its current position. Lastly, monitoring well 39MW0002 is located on MMR property, within a secure portion of the MMR, within 600 feet of an active runway, and within the AOC of the Landfill-2 source area. Because there is no potential current or future residential exposure to the remaining xylenes contamination at Western Aquafarm, the EPA, MassDEP, and AFCEE

agreed that no further action is warranted to be protective of human health and the environment.

The SD-5 risk assessment identified EDB as a potential health risk based on a concentration of 0.019 µg/L measured in March 2002. Current concentrations of EDB in SD-5 groundwater are below reporting limits. The highest concentrations of TCE and PCE used in the risk assessment calculations were 34 µg/L and 4.2 µg/L, respectively. These concentrations of TCE and PCE equated to excess lifetime cancer risks of 1E-03 and 6E-05, respectively, for the future residents under the RME scenario. Current (August 2005) maximum TCE and PCE concentrations in SD-5 groundwater are 39 and 3.8 µg/L, respectively. Based on the risk assessment and the current distribution of contamination in SD-5 groundwater, PCE and EDB are not COCs because the concentrations of these chemicals have dropped to very low levels. However, TCE is a COC in SD-5 groundwater because the current maximum concentrations exceed the MCL and could conceivably pose unacceptable human health risks to a future resident.

2.7.2 Summary of the Eastern Briarwood and SD-5 Ecological Risk Assessments

The ecological risk assessment is a qualitative and/or quantitative evaluation of the potential impacts that Eastern Briarwood and SD-5 groundwater contaminants may have on wildlife species. An ecological baseline risk assessment was not conducted for Western Aquafarm because groundwater contamination associated with Western Aquafarm is not discharging into any surface water bodies and, therefore, there is no ecological exposure to Western Aquafarm groundwater contamination. The ecological risk assessments are presented in the *Final Risk Assessment for Eastern Briarwood and Western Aquafarm* (AFCEE 2005b) and the *Final Storm Drain-5 Groundwater Feasibility Study* (AFCEE 2004). Both ecological risk assessments evaluated potential impacts to representative aquatic (non-specific fish, amphibian larvae, and aquatic invertebrates) and semi-aquatic organisms (osprey, black-crowned night heron, raccoon, and eastern box turtle) that would use the Quashnet River and Johns Pond (Figure 2-10 and Figure 2-11). Terrestrial organisms were not included in the assessment because the

risk assessments focused on groundwater and surface water bodies that are potentially affected by contaminated groundwater.

The assessment of aquatic and benthic populations in Johns Pond identified several contaminants of potential ecological concern. However, when considering other factors such as laboratory contamination and background concentrations, only carbon disulfide and chloromethane in sediment were identified as a potential concern. The presence of VOCs in sediment may not represent a real risk to benthic organisms due to the strong propensity for VOCs to mix readily in the large volume of pond water and volatize to the atmosphere. In addition, these constituents are not associated with the source of the SD-5 groundwater contamination and are not known to be site-related. Consequently, there is no ecological concern to aquatic and benthic populations in Johns Pond associated with the SD-5 study area. The food web screening assessment identified no chemicals of potential ecological concern posing potential risk to the selected receptor species. No ecological constituents of concern were identified based on aquatic and benthic population assessment endpoints and the food web screening.

There is no ecological concern to aquatic and benthic populations in the Quashnet River associated with the Eastern Briarwood study area. In addition, the food web analysis determined that the selected receptor species are not expected to be at risk. There are no COCs for ecological receptors in the Quashnet River in the Eastern Briarwood study area.

2.8 REMEDIAL ACTION OBJECTIVES FOR SD-5 GROUNDWATER

Results of the human health and ecological risk assessment for SD-5 groundwater were considered in conjunction with expected current and future use of the aquifer to develop RAOs for the SD-5 groundwater OU. No further action is warranted for the Eastern Briarwood and Western Aquafarm groundwater OUs to be protective of human health and the environment; thus, RAOs were not developed for these sites.

There is no risk to ecological receptors. Therefore, the following RAOs for SD-5 groundwater were established to protect human health:

- Prevent or reduce exposure to on-base and off-base SD-5 groundwater with TCE concentrations greater that the MCL of 5 µg/L;
- Return useable groundwater to beneficial uses wherever practicable, within a time frame that is reasonable given the particular circumstances of the site.

For human health concerns, the only media/exposure pathway that presents a cancer risk and/or a non-cancer HI above the target values is the future potential on-base or off-base residential exposure to groundwater. This hypothetical scenario assumes that a drinking water well is installed within the area of SD-5 groundwater contamination. A summary of the human health total non-cancer HIs and cancer risks for the SD-5 study area indicates that TCE increases risk and hazards associated with exposure to groundwater to an unacceptable level for human health. Therefore, in order to achieve the RAOs, the existing on-base and off-base LUCs must be maintained.

2.9 DESCRIPTION OF SD-5 ALTERNATIVES

Three alternatives were considered for the SD-5 groundwater action: (1) No Action, (2) Land Use Controls and Long-Term Monitoring, and (3) Construction, Operation, Maintenance, and Monitoring of a New SD-5 ETR System.

A component common to Alternatives 2 and 3 is LUCs. Several LUCs protect area residents from exposure to SD-5 TCE groundwater contamination. The safety of all public water supplies within Massachusetts is currently regulated by the Commonwealth. Residents and workers on the MMR receive their water from the base water supply system that has well head treatment. Additionally, in 1998 the Mashpee Board of Health adopted a moratorium on groundwater wells, which states that existing and future residential wells located in documented or anticipated areas of MMR groundwater contamination as defined by the Board of Health are restricted from use for any purpose. This moratorium reduces human exposure to TCE groundwater contamination in the SD-5 area.

2.9.1 Alternative 1 – No Action

The no-action alternative is required by the NCP (40 *Code of Federal Regulations* [CFR] 300.430[e][6]) to provide a baseline condition if no remedial action is taken. Under this alternative, no monitoring would be performed to assess the predicted natural attenuation of the SD-5 groundwater contamination. TCE concentrations would eventually reach the cleanup levels through natural attenuation processes, but there would be no monitoring data to demonstrate that this was happening. Human health would remain protected by virtue of existing LUCs to the extent to which they were heeded. AFCEE would not check the adherence to LUCs under Alternative 1.

2.9.2 Alternative 2 – Land Use Controls Long-Term Monitoring

No active remediation would occur with this alternative. However, unlike Alternative 1, this alternative would provide for continued chemical monitoring of the monitoring wells in the surrounding network (as described below). Because the remedial system components that were installed as part of the interim remedy for the SD-5 plume have all been shut down, this alternative represents the current program (status quo). Continued monitoring and reporting would provide for

- Tracking attenuation of SD-5 groundwater contamination;
- Determining when TCE concentrations have decreased to below the MCL; and
- Supporting ongoing modeling.

Monitoring results would provide data that could be used to update the conceptualization of the groundwater contamination. The data would be valuable for confirming attenuation of groundwater contamination or detecting deviations from predicted behavior. Groundwater monitoring will continue for two years after the TCE cleanup level (5 µg/L) is met to verify that the heterogeneities in the groundwater system are accounted for when determining if the restoration goal has been met. Monitoring results would be periodically reported in technical update meetings and would be reported formally in periodic reports. In addition, CERCLA reviews would be performed every five years, as required. A residual risk assessment and/or an evaluation of the technical and economic feasibility of additional remediation to approach or achieve background concentrations would be conducted if deemed necessary.

Monitoring would involve periodic testing of groundwater for VOCs to measure the natural attenuation of the groundwater contamination. Only TCE in groundwater needs be examined under the RAO. This alternative also includes LUCs that would prevent future human exposure to the groundwater contamination in the SD-5 area until cleanup levels are met.

2.9.3 Alternative 3 – Construction, Operation, Maintenance, and Monitoring of a New SD-5 ETR System

This alternative would provide for active treatment of the SD-5 groundwater contamination with the construction and operation of one new extraction well in the area of remaining TCE contamination in SD-5 South. The goal of the active remediation would be to expedite aquifer restoration. The new extraction well would be located between monitoring well 28MW0035B and Johns Pond and would be tied into the existing Hooppole Road pipeline for treatment at the SRTF and reinjection through the Chemical Spill-10 and SD-5 reinjection wells. This alternative would also provide for chemical and hydraulic monitoring as long as active remediation continued. Additional action may be taken if monitoring data indicate the remedial system is not performing as designed.

Groundwater monitoring would continue for two years after the TCE cleanup level is met. Monitoring results would be periodically reported in technical update meetings and would be reported formally in annual reports. In addition, CERCLA reviews would be performed every five years, as required. A residual risk assessment would be conducted if deemed necessary. This alternative also includes LUCs that would prevent future human exposure to the groundwater contamination in the SD-5 area until cleanup levels are met.

2.9.4 Common Elements and Distinguishing Features of the Alternatives

Alternatives 1 and 2 do not actively treat the SD-5 groundwater contamination. Under both Alternatives 1 and 2, cleanup levels of the SD-5 groundwater contamination would be reached through natural attenuation, and groundwater modeling predicts that TCE

concentrations would decrease to below the MCL by approximately 2008. Under Alternatives 2 and 3, TCE concentrations would be routinely measured, allowing for a check on modeling assumptions and verification of natural attenuation. Alternative 3 would actively treat the SD-5 South groundwater contamination by extracting groundwater via a new extraction well, and treating and reinjecting the water through existing facilities. Existing on-base and off-base LUCs would remain under all three alternatives.

ARAR waivers would not be required with any of the SD-5 groundwater alternatives. Refer to the *Final Storm Drain-5 Groundwater Feasibility Study* (AFCEE 2004) for a complete listing of ARARs for each alternative and how individual alternatives would comply with them. ARARs for the selected alternative are discussed in Section 2.12.2 of this document.

Alternatives 2 and 3 rely on techniques and technologies that have been proven and employed at the MMR since 1997. Significant residual risk would not remain with any of the alternatives; however, with Alternative 1 the level of residual risk could not be confirmed.

For Alternative 3, it was assumed that the new extraction well would begin operation in the spring of 2006 and would operate for approximately a year and a half. Based on modeling predictions, contaminant concentrations would be reduced below the cleanup level by approximately 2008 under Alternatives 1 and 2 and by approximately 2007 under Alternative 3. The estimated costs for Alternatives 2 and 3 are presented in Table 2-48.

2.9.5 Expected Outcomes of the Alternatives

Groundwater modeling indicates concentrations will decrease below cleanup levels under Alternatives 1 and 2 by approximately 2008 and under Alternative 3 by approximately 2007. All of the alternatives include LUCs, which will prevent the hypothetical scenario of residential exposure to contaminated groundwater.

2.10 COMPARATIVE ANALYSIS OF SD-5 ALTERNATIVES

The following sections summarize the comparative analysis of SD-5 groundwater Alternatives 1, 2, and 3 presented in the *Final Storm Drain-5 Feasibility Study* (AFCEE 2004).

2.10.1 Criteria for Detailed Analysis of Alternatives

The NCP (40 CFR, Part 300) presents nine criteria for analyzing the acceptability of a given alternative. These nine criteria are categorized as threshold criteria, primary balancing criteria, and modifying criteria.

2.10.1.1 Threshold Criteria

There are two threshold criteria: overall protection of human health and the environment, and compliance with ARARs. Threshold criteria represent the minimum requirements that each alternative must meet to be eligible for selection.

Overall Protection of Human Health and the Environment This criterion assesses the overall effectiveness of an alternative and focuses on whether that alternative achieves adequate protection and risk reduction, elimination, or control. The assessment of overall protection draws on assessments conducted under other evaluation criteria, especially long-term effectiveness and permanence, short-term effectiveness, and compliance with ARARs.

Compliance with ARARs Each alternative is assessed to determine whether it complies with ARARs under federal and state laws. Section 121(d) of CERCLA requires that remedial actions at CERCLA sites attain legally applicable or relevant and appropriate federal and state requirements, standards, criteria, and limitations, unless such ARARs are waived under CERCLA Section 121(d)(4). Appendix C of the *Final Storm Drain-5 Feasibility Study* (AFCEE 2004) outlines ARARs for all the SD-5 alternatives. Section 2.12.2 discusses ARARs for the selected remedy for the SD-5 groundwater.

2.10.1.2 Primary Balancing Criteria

The five primary balancing criteria are (1) long-term effectiveness and permanence, (2) reduction of toxicity, mobility or volume through treatment, (3) short-term effectiveness, (4) implementability, and (5) cost. Primary balancing criteria form the basis for comparing alternatives in light of site-specific conditions.

Long-Term Effectiveness and Permanence Each alternative is assessed for its long-term effectiveness and the permanence of the solution. This criterion assesses the destruction or removal of contaminants, the magnitude of residual risks remaining at the conclusion of remedial activities, and the adequacy and reliability of controls to be used to manage residual risk.

Reduction of Toxicity, Mobility, or Volume Through Treatment Section 121 (Cleanup Standards) of CERCLA states a preference for remedial actions that employ treatment that permanently and significantly reduces the volume, toxicity, or mobility of contaminants as the primary element of the action. This criterion addresses the capacity of the alternative to reduce the principle risks through destruction of contaminants, reduction in the total mass of contaminants, irreversible reduction in contaminant mobility, or reduction in the total volume of contaminated media.

Short-Term Effectiveness This criterion addresses the effects of the alternative during construction and operational phases until remedial objectives are met. Each alternative is evaluated with respect to its (potentially negative) effects on community health, worker safety, and environmental quality during the course of remedial actions. This criterion also addresses the time required by each alternative until remedial objectives are achieved.

Implementability The implementability criterion is used to assess the technical and administrative feasibility of implementing an alternative. Technical issues include the reliability of the technology under consideration, potential construction difficulties, and the availability of required services, materials, and equipment (preferably from multiple

sources). Administrative issues include permitting and access for construction and monitoring.

Cost Costs associated with carrying out an alternative are based on current (present day) information escalated at a rate of 5 percent until year zero; after year zero, costs are discounted at a rate of 2.1 percent (per OMB Circular A-94 [OMB 2004]). It is assumed that costs are incurred at the beginning of each year and that the expected useful project life is five years, to allow for two additional years of monitoring beyond the estimated date of reaching the TCE MCL in groundwater. Cost estimates included in this document are intended for comparative purposes only. The accuracy of the estimates are between –30 and +50 percent.

2.10.1.3 Modifying Criteria

There are two modifying criteria: state acceptance and community acceptance.

State Acceptance State acceptance evaluates the technical and administrative issues and concerns of the state, specifically the MassDEP.

Community Acceptance Community acceptance evaluates the issues and concerns that the public may have regarding each of the alternatives. A summary of the public comments received during the public comment period on the Proposed Plan for Groundwater at Eastern Briarwood, Western Aquafarm, and Storm Drain-5 (AFCEE 2005c), along with AFCEE's responses, are provided in Section 3.0, Responsiveness Summary, of this ROD.

2.10.2 Comparison of SD-5 Groundwater Alternatives

Alternatives 1, 2, and 3 were evaluated against the nine NCP criteria. The following sections present the evaluation.

2.10.2.1 Overall Protection of Human Health and the Environment

The alternatives that include LUCs (2 and 3) provide additional control of exposure to the contaminated groundwater and reduction in risk to human health beyond that which is already achieved by the existing residential connections to the municipal water supply. Alternatives 2 and 3 also provide monitoring, which allows for confirmation that the alternative meets the RAOs. Based on modeling predictions, contaminant concentrations are predicted to decrease below the cleanup levels by approximately 2008 under Alternative 2 and by approximately 2007 under Alternative 3.

2.10.2.2 Compliance with ARARs

All the alternatives are compliant with ARARs. The point at which chemical-specific ARARs are met would not be known under Alternative 1 since monitoring would not be performed. Construction under Alternative 3 will be designed to meet location-specific ARARs. All treatment and monitoring activities will be performed in accordance with action-specific ARARs.

2.10.2.3 Long-Term Effectiveness and Permanence

All current and potential future risks would remain under all three alternatives. However, with the Mashpee Board of Health moratorium in place, there are no additional exposure controls necessary. Alternatives 2 and 3 provide for long-term management with the monitoring program, which would provide information to confirm the natural attenuation was progressing as predicted. Alternative 3 provides for active removal of the remaining portion of the SD-5 groundwater contamination with proven technology. Modeling indicates that active groundwater treatment (Alternative 3) would reduce the TCE contamination to below the MCL in the SD-5 South area by approximately 2007, compared to approximately 2008 for Alternatives 1 and 2.

2.10.2.4 Reduction of Toxicity, Mobility, or Volume Through Treatment

Alternative 3 satisfies EPA's preference that active treatment be a principle element in site remediation. Contaminants are permanently removed from the aquifer. Regeneration of the carbon used in the SRTF ultimately destroys the contaminants. Approximately 0.058 kilograms (2 ounces) of TCE will be treated.

2.10.2.5 Short-Term Effectiveness

Alternative 1 has the least impact on workers, the community, and the environment since it does not require any monitoring, construction, or maintenance activities. Alternative 3 has the greatest impact since it involves the construction and operation of a new ETR system.

Since monitoring is already being conducted under an LTM program, there would be no new risks posed to the community, the workers, or the environment as a result of this activity under Alternatives 2 and 3. For Alternative 2, it is assumed that no additional monitoring wells are required; however, if changes in the future trajectory of groundwater contamination resulted in a requirement for additional monitoring wells, the risks associated with that work is considered low and would be easily controlled through training, safety procedures and medical monitoring.

Alternative 3 poses environmental impacts in the form of site preparation (clearing and grading) for the extraction and monitoring wells and access road; excavation for the well vault; additional vehicle traffic in the neighborhood and at the site; and increased sound levels associated with operation of the ETR system, as well as increased electrical demand.

2.10.2.6 Implementability

Technical implementability concerns arise for Alternative 3 only. There may be technical feasibility concerns with respect to ideally locating the proposed extraction well

and associated monitoring wells. Additionally, roads would probably be temporarily closed and traffic rerouted during well installation.

Under Alternatives 2 and 3, administrative implementability concerns include coordination with other agencies for technical update meetings, RPM meetings, and active communication on all issues of concern. Long-term access agreements with private landowners and well permits are an administrative implementability concern for Alternative 3 where extraction and monitoring wells are being constructed, and could be a concern with Alternative 2 if new monitoring wells are required in the future.

2.10.2.7 Cost

As expected, estimated costs increase with an increase in the degree of activity. Alternative 1 has no costs associated with it so as to serve as a baseline scenario. Alternative 2 is LTM only and has a present value cost of $0.5 million (M). Alternative 3 adds active treatment to LTM and has a present value cost of $1.9M.

2.10.2.8 State Acceptance

The MassDEP has expressed its support for Alternative 2.

2.10.2.9 Community Acceptance

A Proposed Plan (AFCEE 2005c) was presented to the public in the public meeting held 21 July 2005, and a public hearing was held on 18 August 2005. Appendix B of that document contains the transcript of the public hearing. Because the only comment received during the public comment period (a verbal statement at the public hearing) supported the Proposed Plan, no Responsiveness Summary was necessary.

2.11 SELECTED REMEDY FOR THE SD-5 GROUNDWATER OPERABLE UNIT

Based on the Administrative Record for the SD-5 site and the evaluation of comments received by interested parties during the public comment period, AFCEE has selected Alternative 2 as the remedy for the SD-5 groundwater OU.

2.11.1 Summary of the Rationale for the Selected Remedy

The selected remedy is Alternative 2, which consists of LTM with LUCs. A full description of the preferred remedy is provided below. The selected remedy provides a means of verifying the natural attenuation of the groundwater contamination through monitoring, is protective of human health through implementation of LUCs, does not have any significant implementability concerns, and has minor impacts on worker safety, the community, and the environment. The preferred remedy was selected over the other alternatives because it is expected to achieve the RAOs in a reasonable time frame (three years) and is cost-effective.

2.11.2 Detailed Description of Selected Remedy

AFCEE has developed a monitoring plan for the SD-5 groundwater OU that will include data from a network of monitoring wells. The monitoring wells will be sampled periodically for VOCs. Periodic monitoring results will be reported in a letter report. Periodic evaluation of all analytical results will include tracking the natural attenuation of the SD-5 groundwater contamination. The monitoring plan itself will be reviewed annually for adequate coverage of the area and optimization. Monitoring will continue for two years beyond the time at which TCE concentrations decrease below the MCL. CERCLA five-year reviews will be performed to evaluate remedy appropriateness and site status for as long as hazardous substances remain above unrestricted use levels in the groundwater. A residual risk assessment and/or an evaluation of the technical and economic feasibility of additional remediation to approach or achieve background concentrations would be conducted if deemed necessary.

The SD-5 contaminated groundwater currently poses an unacceptable risk to human health if used for drinking water purposes. The SD-5 contaminated groundwater is located in the central part of the MMR cantonment area, and a portion of the SD-5 contaminated groundwater has migrated past the MMR boundary into the neighboring town of Mashpee. Therefore, administrative and/or legal controls that minimize the potential for human exposure to contamination by limiting land or resource use, known as "land use controls" (LUCs), must be established for this area of concern to avoid the risk of exposure to groundwater from the SD-5 area. These LUCs are needed both on-base and off-base, within the town of Mashpee, until the groundwater from the SD-5 contaminated groundwater no longer poses an unacceptable risk.

The performance objectives of the LUCs are:

- Prevent access to or use of the groundwater from the SD-5 contaminated groundwater until the groundwater no longer poses an unacceptable risk;
- Maintain the integrity of the current or future remedial or monitoring system such as treatment systems and monitoring wells.

The LUCs will encompass the area including the SD-5 contaminated groundwater (Figure 2-12) and surrounding areas to prevent a risk from exposure to contaminated groundwater. The on-base area of concern is controlled and operated by the U.S. Air Force, which leases this land from the Commonwealth of Massachusetts. It is expected that these entities will operate and own, respectively, the area of concern and the surrounding area for the duration of this ROD. As a result, the Air Force will coordinate with the Commonwealth of Massachusetts as it fulfills its responsibility to establish, monitor, maintain and report on the LUCs for this site.

Each LUC will be maintained until either (1) the concentrations of TCE in the groundwater are at such a level to allow unrestricted use and exposure, or (2) the Air Force, with the prior approval of EPA and MassDEP, modifies or terminates the LUC in question.

The Air Force is responsible for ensuring that the following two LUCs are established, monitored, maintained, and reported on as part of this final remedy to ensure protection of human health and the environment in accordance with CERCLA and the NCP for the duration of the final remedy selected in this ROD. In the event that the Town of Mashpee fails to promptly enforce the first LUC or the Commonwealth of Massachusetts fails to promptly enforce the second LUC, the Air Force will act in accordance with the third to last paragraph in this section. For purposes of the preceding sentence, "promptly enforce" means if the violation or potential violation is imminent or on-going, enforce to prevent or terminate the violation within 10 days from the enforcing agency's (i.e. the Town or the Commonwealth) discovery of the violation or potential violation; otherwise, enforce as soon as possible.

(1) To better protect the public health and welfare of its citizens, the Mashpee Board of Health, adopted a moratorium on private drinking water wells on April 23, 1998, amended July 29, 1999, in the town of Mashpee. The moratorium, as amended, applies to existing wells and potential future wells, and restricts any and all uses of groundwater. The areas where well use is excluded are defined by the Mashpee Board of Health, and include documented areas of contamination and anticipated areas of contamination from the SD-5 contaminated groundwater. To assist the Mashpee Board of Health in the implementation of this LUC, the Air Force will meet with the Board of Health on an annual basis, or more frequently if needed, to provide and discuss plume maps that document the current and projected location of the SD-5 contaminated groundwater within the town of Mashpee. While Figure 2-12 shows the current area of LUCs in the town, the Mashpee Board of Health may modify the areas where well use is excluded, and this LUC will apply to such areas even if they differ from the area shown in Figure 2-12.

(2) In addition to the Board of Health regulation, which generally applies to small water supply wells, existing LUCs also prevent the possible creation of a large potable water supply well. The MassDEP administers a permitting process for any new drinking water supply wells in Massachusetts that propose to service more than 25 customers or exceed a withdrawal rate of 100,000 gallons per day. This permitting process, which serves to regulate the use of the SD-5 contaminated groundwater for any withdrawals of groundwater for drinking water purposes, constitutes an additional LUC for this final remedy. This LUC applies to both on-base and off-base portions of SD-5.

Additionally, the Air Force is responsible for ensuring that the following LUCs are established, monitored, maintained, reported on and enforced as part of this final remedy to ensure protection of human health and the environment in accordance with CERCLA and the NCP for the duration of this final remedy selected in this ROD.

(1) For the on-base area of concern, a prohibition on new drinking water wells serving 25 or fewer customers has been established and placed on file with the planning and facilities offices for the Massachusetts Air and Army National Guard and United States Coast Guard (major tenants at the Massachusetts Military Reservation). The prohibition will be applied to future land use planning per Air National Guard Instruction (ANGI) 32-1003, Facilities Board, Army National Guard Regulation 210-20, Real Property Development Planning for the Army National Guard, and Commandant Instruction Manual 11010.14, Shore Facility Project Development Manual.

(2) For the on-base area of concern, the Air National Guard has administrative processes and procedures that require approval for all projects involving construction or digging/subsurface soil disturbance, currently set forth in ANGI 32-1001, Operations Management. This procedure is a requirement of the Army National Guard and the United States Coast Guard by the Air National Guard through Installation Support Agreements. The Air National Guard requires a completed AF Form 103, Base Civil Engineer Work Clearance Request (also known as the base digging permit), prior to allowing any construction, digging or subsurface soil disturbance activity. All such permits are forwarded to the Installation Restoration Program for concurrence before issuance. An AF Form 103 will not be processed without a Dig Safe permit number (see next paragraph).

(3) The Dig Safe program implemented in Massachusetts provides an added layer of protection to prevent the installation of water supply wells in the SD-5 area and to protect monitoring wells and the treatment system's infrastructure. This program requires, by law, anyone conducting digging activities (e.g., well drilling) to request clearance through the Dig Safe network. The Air Force at the MMR is a member utility of Dig Safe. The SD-5 contaminated groundwater is encompassed by a geographical area identified by the Air Force as a notification region within the Dig Safe program. Through the Dig Safe process, the Air Force will be electronically notified at least 72 hours prior to any digging within this area. The notification will include the name of the party contemplating, and the nature of, the digging activity. The Air Force will review each notification and if the digging activity is intended to provide a previously unknown water supply well, the Air Force will immediately notify the project sponsor (of the well drilling), the EPA, the Mashpee Board of Health and the MassDEP, in order to curtail the digging activity. If the Dig Safe notification indicates proposed work near monitoring wells or treatment system infrastructure, the Air Force will mark its components to prevent damage due to excavation. This LUC applies to both on-base and off-base portions of SD-5. The extent of the Air Force's enforcement of this LUC does not address off-base parties failing to file a dig Safe request nor Dig Safe improperly processing a notification, but if such incidents do occur, the Air Force is responsible for ensuring remedy integrity and, if necessary, repairing damage caused by third parties to the remedial system infrastructure or monitoring wells.

Monitoring of the environmental use restrictions and controls will be conducted annually by the Air Force. The monitoring results will be included in a separate report or as a section of another environmental report, if appropriate, and provided to the EPA and MassDEP for informational purposes. The annual monitoring reports will be used in preparation of the five-year review to evaluate the effectiveness of the final remedy.

The annual monitoring report, submitted to the regulatory agencies by the Air Force, will evaluate the status of the LUCs and how any LUC deficiencies or inconsistent uses have been addressed. The annual evaluation will address (i) whether the use restrictions and controls referenced above were effectively communicated, (ii) whether the operator, owner and state and local agencies were notified of the use restrictions and controls affecting the property, and (iii) whether use of the property has conformed with such restrictions and controls and, in the event of any violations, summarize what actions have been taken to address the violations.

The Air Force shall notify the EPA and MassDEP 45 days in advance of any proposed land use changes that would be inconsistent with the LUC objectives or the final remedy. If the Air Force discovers a proposed or ongoing activity that would be or is inconsistent with the LUC objectives or use restrictions, or any other action (or failure to act) that may interfere with the effectiveness of the LUCs, it will address this activity or action as soon as practicable, but in no case will the process be initiated later than 10 days after the Air Force becomes aware of this breach. The Air Force will notify the EPA and MassDEP as soon as practicable, but no later than 10 days after the discovery of any activity that is inconsistent with the LUC objectives or use restrictions, or any other action that may interfere with the effectiveness of the LUCs. The Air Force will notify the EPA and MassDEP regarding how the Air Force has addressed or will address the breach within 10 days of sending the EPA and MassDEP notification of the breach.

The Air Force will provide notice to the EPA and MassDEP at least six months prior to relinquishing the lease to the SD-5 area so the EPA and MassDEP can be involved in discussions to ensure that appropriate provisions are included in the transfer terms or conveyance documents to maintain effective LUCs. If it is not possible for the Air Force to notify the EPA and MassDEP at least six months prior to any transfer or sale, then the Air Force will notify the EPA and MassDEP as soon as possible, but no later than 60 days prior to the transfer or sale of any property, subject to LUCs.

Respecting use restrictions and LUCs identified and selected for this ROD, the Air Force shall not modify or terminate LUCs, implementation actions, or modify land use without approval by the EPA and MassDEP. The Air Force, in coordination with other agencies using or controlling the SD-5 area, shall seek prior concurrence before taking any anticipated action that may disrupt the effectiveness of the LUCs or any action that may alter or negate the need for LUCs.

2.11.3 Cost Estimate for the Selected Remedy

The cost estimate for Alternative 2 is provided in Table 2-48 and Table 2-49. The information for the cost estimate is based on the best available information regarding the anticipated scope of the remedial alternative. Changes in the cost elements may change based on changes in the SD-5 LTM program. This is an order-of-magnitude engineering cost estimate that is expected to be within +50 percent to –30 percent of the actual project cost.

The cost comes from the LTM program and periodic reporting. It is assumed that existing monitoring wells provide adequate coverage of the subject area; therefore, no capital costs for additional wells are estimated at this time. For cost-estimating purposes, it is assumed that the monitoring program would be similar to the chemical monitoring that already exists under the SPEIM program instituted in 2003, and that hydraulic monitoring, interpretation, and reporting would not be necessary. In addition, only groundwater samples would be analyzed, and analysis would be for VOCs only. Surface

water samples and water level measurements would not be required to monitor the area of groundwater contamination and natural attenuation. It is also assumed that the monitoring program would reduce in effort over time due to stabilization of the system operations and, thus, the reduction in frequency of sample collection. Costs include equipment, personnel, laboratory analyses, investigation-derived materials, maintenance, and data interpretation and reporting. Based on the changes in the magnitude of the SPEIM program in recent years, it is assumed that at two years into the project lifetime, the monitoring program will be reduced by 36 percent; and after four years, the monitoring program will be reduced by 59 percent (from the initial proposed monitoring program). It is assumed that concentrations will decrease to below MCLs by 2008 and monitoring would continue to 2010. The monitoring results are assumed to be reported informally at technical update meetings and formally in technical reports. Other reporting is assumed to be one CERCLA five-year review and one residual risk assessment, which will be performed when concentrations decrease below the MCL.

Capital, annual and periodic costs generated in the cost estimates and used in the present value calculations have been escalated from the time the cost estimate was prepared (December 2003) to the start of the base year (June 2005). This is assumed to be March 2006; thus, an escalation of 1.5 years at a rate of 5 percent has been used. A discount rate of 2.1 percent was used for all present value calculations per EPA guidance (EPA 2000) and Office Management and Budget Circular A-94, revised February 2004 (OMB 2004).

2.11.4 Estimated Outcomes of the Selected Remedy

Alternative 2 provides for protection of human health through implementation of LUCs. The groundwater model indicates that concentrations will decrease below the MCL by 2008, at which time the groundwater will be useable as a source of drinking water.

2.12 STATUTORY DETERMINATIONS

Under CERCLA Section 121, selected remedies must be protective of human health and the environment, comply with ARARs (unless a waiver is justified), be cost-effective,

and use permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable. In addition, CERCLA includes a preference for remedies that employ treatment that permanently and significantly reduces the volume, toxicity, or mobility of hazardous wastes as a principal element. The following sections discuss how the selected remedy meets these statutory requirements.

2.12.1 Protection of Human Health and the Environment

The selected remedy will protect human health and the environment through LUCs and monitoring of the contaminated groundwater to insure contaminant concentrations are dissipating to below the MCL, as predicted by the groundwater model. Monitoring and LUCs will prevent residential exposure to the SD-5 North and South areas. There are no short-term threats associated with the selected remedy that cannot be readily controlled.

2.12.2 Compliance with Applicable or Relevant and Appropriate Requirements

The selected remedy of long-term monitoring of the SD-5 groundwater complies with all chemical-, location-, and action-specific ARARs. Refer to Table 2-50, Table 2-51, and Table 2-52 for a listing of these ARARs.

2.12.3 Cost-Effectiveness

In AFCEE's judgment, the selected remedy for SD-5 groundwater is cost-effective. The overall effectiveness of the selected remedy was determined to be proportional to its costs and, hence, to represent a reasonable value for the money to be spent.

The cost-effectiveness of the SD-5 remedy was evaluated based on the data currently available for the SD-5 groundwater and the following considerations: (1) the contaminated groundwater is naturally attenuating and is predicted to dissipate to less than the MCL by 2008; (2) long-term monitoring is the lowest cost alternative that still maintains protection of human health.

2.12.4 Utilization of Permanent Solutions and Alternative Treatment Technologies to the Maximum Extent Practicable

The selected remedy for SD-5 groundwater provides the best balance of trade-offs among the alternatives considered in the feasibility study. Alternative 2 represents the maximum extent to which permanent solutions and treatment can be practicably utilized at the site because active remediation (Alternative 3) is not cost-effective, would not significantly expedite aquifer restoration or contaminant mobility, and may not be technically implementable. Based on the evaluation criteria and the statutory mandates, AFCEE finds Alternative 2 to be the most appropriate solution for SD-5 groundwater. The monitoring and controls included in Alternative 2 will demonstrate compliance with ARARs and protectiveness of human health and the environment. Alternative 2 will satisfy the criteria for long-term effectiveness and permanence by allowing natural attenuation to reduce contaminant concentrations to acceptable levels. The selected remedy does not present any significant short-term risks. There are no special implementability issues that make the selected remedy unacceptable.

2.12.5 Preference for Treatment as a Principal Element

The selected remedy does not treat the contamination present in the SD-5 North and South areas. Although the statutory preference is for remedies that employ treatment as a principal element, active treatment was not selected as the remedy because active treatment was predicted to decrease the aquifer restoration by only approximately six months. The costs associated with the active treatment alternative were disproportionately high for the predicted improvement in aquifer restoration time. Additionally, it is anticipated that there would be implementability challenges with building and operating the groundwater extraction system components in Alternative 3, and active remediation would effect no reduction in human or ecological health risks.

2.12.6 Five-Year Review Requirements

Five-year statutory reviews will be performed for the SD-5 groundwater, according to Section 121(c) of CERCLA and NCP Section 300.430(f)(4)(ii), which requires such

reviews in those instances where the remedy results in any hazardous substances, pollutants, or contaminants remaining at the site in excess of levels that allow for unlimited use and unrestricted exposure. The purpose of the five-year reviews is to revisit the appropriateness of the remedy in providing adequate protection of human health and the environment. The five-year review for the SD-5 groundwater OU will be part of the five-year reviews conducted for the CERCLA IRP sites on the MMR.

2.13 DOCUMENTATION OF NO SIGNIFICANT CHANGES

The Proposed Plan for the Groundwater at Eastern Briarwood, Western Aquafarm, and Storm Drain-5 (AFCEE 2005c) was released for public comment in July 2005. The Proposed Plan identified the following alternatives as components of AFCEE's preferred alternative:

- Eastern Briarwood: No further action.
- Western Aquafarm: No further action.
- Storm Drain-5: Land Use Controls and Long-Term Monitoring.

AFCEE, the EPA, and the MassDEP considered the one verbal comment received during the public comment period. Upon review of this comment, it was determined that no significant changes to the remedies, as they were originally identified in the Proposed Plan, were necessary.

3.0 RESPONSIVENESS SUMMARY

Because the only comment received during the public comment period (a verbal statement at the public hearing) supported the Proposed Plan, no Responsiveness Summary was necessary.

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FIGURES

TABLES

APPENDIX A

MassDEP Concurrence Letter

APPENDIX B

Transcript of Public Hearing

APPENDIX C

Town of Mashpee Board of Health
Public Water Supply Requirements