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G/FPR Remediation AOC 50 Devens, Massachusetts GSA Contract No. GS-10F-0266K Delivery Order No. DAKF11-01-F-

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Charles Castelluccio Project Manager

Manane Bullin fr

Peter Milionis Project Director

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Prepared by:

ARCADIS G&M, Inc. 175 Cabot Street Suite 400 Lowell Massachusetts 01854

Tel 978 937 9999 Fax 978 937 7555

Our Ref.:

MA000664

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1.0 INTRODUCTION

1.1 Purpose

The purpose of this Remedial Action Work Plan (RAWP) is to provide a description of the planned tasks, methodologies, objectives, and site cleanup goals associated with remediation at Area of Contamination (AOC) 50, Ayer, Massachusetts (Site). The results of the pre-design investigation work performed in April and May 2003 are presented in this RAWP. Also included in this plan is the land use control (LUC) plan.

The proposed remediation work for AOC 50 includes the installation of the enhanced reductive dechlorination (with solubilized inorganics controls) and in-well stripping wells and system components for the treatment of tetrachloroethene (PCE) and other constituents of concern at the Site. In addition, the soil vapor extraction (SVE) system will be restarted to determine if additional PCE mass can be recovered from the vadose zone in the Source Area. The contingency remedies of chemical oxidation in the North Plume Area and iron injection at the downgradient end of the last ERD transect are also presented in this RAWP.

This RAWP has been prepared for the U.S. Army in accordance with the final Record of Decision (ROD) for AOC 50 (ARCADIS 2004a). The proposed actions will reduce identified current and future risks associated with PCE and other constituents of concern at AOC 50 to acceptable levels. The proposed remedy is expected to provide a permanent, long-term solution for the Site.

1.2 Site Description and History

AOC 50 is located on the northeastern boundary of the former Moore Army Airfield (MAAF), within the former North Post portion of Devens RFTA, Ayer, Massachusetts (Figure 1). The AOC 50 Source Area (Figure 2) comprises less than 2 acres and surrounds Buildings 3803 (the former parachute shop), 3840 (the former parachute shakeout tower), 3824 (a gazebo), and 3801 (the former 10th Special Forces airplane parachute simulation building). Sources of groundwater contamination within AOC 50 include two World War II fueling systems, a drywell, and the PCE drum storage area; these sources are collectively referred to as the Source Area. Other potential sources of contamination may include a former cesspool and floor drain associated with Building 3840. Although these sources have been removed or decommissioned, groundwater underlying AOC 50 contains elevated concentrations of volatile organic compounds (VOCs) most notably PCE. The primary area of groundwater contamination at AOC 50 is referred to as the Southwest Plume, which extends from the Source Area approximately 3,000 feet downgradient to the Nashua River.

Fort Devens was established in 1917 as Camp Devens, a temporary training camp for soldiers from the New England area. In 1931, the camp became a permanent installation and was renamed Fort Devens. Throughout its history, Fort Devens served as a training and induction center for military personnel, and as a unit mobilization and demobilization site. All or portions of this function occurred during World Wars I and II, the Korean and Vietnam conflicts, and operations Desert Shield and Desert Storm.

Fort Devens was identified for cessation of operations and closure under Public Law 101-510, the Defense Base Realignment and Closure (BRAC) Act of 1990, and was officially closed in September 1996. Portions of the property formerly occupied by Fort Devens were retained by the Army for reserve forces training and renamed the Devens RFTA. Areas not retained as part of the Devens RFTA were transferred to new owners for reuse and redevelopment.

All but approximately 13 acres of the former MAAF (approximately 260 acres total) were transferred to Mass Development in 1997 for reuse. Currently, the airfield is closed to aircraft traffic and is used by the Massachusetts State Police for training and vehicle storage. The MAAF is zoned for Special Use II and Innovation and Technology Business. Under the Devens Reuse Plan (November 14, 1994), Special Use II includes a broad range of industrial, light industrial, office, and research and development uses. There are currently no plans for development of the MAAF, although the area can be developed if interested parties are identified. The Devens RFTA retained approximately 13 acres of the former airfield (including the AOC 50 Source Area) for vehicle storage and maintenance.

1.2.1 Fueling Systems

During World War II, two fueling systems were used in the area subsequently designated AOC 50; one system was used for fueling aircraft and trucks (System A), and the other for fueling trucks (System B). These systems were not used for refueling operations after the late 1940s (Biang, et al., 1992). The two separate fueling systems were filled by gasoline shipments on a Boston & Maine Railroad spur (which no longer exists) located adjacent to Fueling System B (Figure 2).

Releases of fuel associated with incidental spills at the former aircraft fuel pits, truckfill stands, and railroad fuel-delivery points were considered possible sources of contamination. Because the systems were approximately 50 years old, the underground storage tanks (USTs) were also considered possible continuing sources of releases. The potential for migration of contaminated groundwater to the Nashua River was a concern. At the time of the initial Site Investigation (SI) in 1992 (ABB, 1996), several fueling-system components were still visible in their original locations.

The Army removed all of these components in 1992. In addition, approximately 450 tons of contaminated soil was removed from under the oil/water separator, water-control pits, and three 25,000-gallon USTs. The excavation extended to a depth of approximately 18 ft below ground surface (bgs) due to the presence of water in the excavation. All excavations were backfilled to grade. Field screening results and post-excavation sample analyses are presented in the Remedial Investigation (RI) prepared by Harding Lawson Associates (HLA, 2000).

1.2.2 Drywell, Tetrachloroethene Drum Storage Area, and Cesspool

1.2.2.1 Drywell

In 1969, Building 3840 was constructed and attached, via an enclosed walkway, to Building 3803. In addition, two large sinks and a janitors' room were added to Building 3803. The design drawings for Building 3840 indicate that a floor drain was constructed in the center of the concrete floor. This floor drain, the additional sinks in Building 3803, and the roof drains for Building 3840 were piped to a drywell located approximately 20 ft northeast of Building 3840 (Figure 2). The concrete drywell was approximately 5 ft in diameter and 8 ft deep, with an open bottom and a cover on the top. This drywell received wash water, rainwater, and PCE waste associated with parachute cleaning activities.

The drywell near Building 3840 and associated piping were removed for the Army by Roy F. Weston Corporation between November and December 1996 (Weston 1997). The resulting excavation was approximately 9.5-ft deep and covered an area approximately 21 ft by 30 ft, equating to approximately 225 cubic yards (cy) of soil (in-place). Details regarding the removal activities are documented in a September 1997 report titled *Removal Action Report; Dry Well, Cesspool, and Fuel Oil Underground Storage Tank; Area of Contamination (AOC) 50, Moore Army Air Field, Devens, MA* (Weston, 1997).

In addition to the removal of the drywell, a 750-gallon fuel storage UST associated with the Building 3840 heating system was also removed. In connection with the tank removal, approximately 787 gallons of oil, water, and residual sludge were recovered from the tank and approximately 25 cy of contaminated soil were excavated. Solid and liquid wastes generated during removal of the drywell and fuel storage UST were taken off-site for proper treatment and disposal.

1.2.2.2 Tetrachloroethene Drum Storage Area

A PCE drum storage area east of Building 3801 was identified during field investigation activities completed in 1992. Historical records and interviews with former Fort Devens personnel indicate this area was used to store single drum quantities of PCE (HLA, 2000a). The PCE was used by Army personnel in Buildings 3803 and 3840 for spot cleaning of parachutes. Parachute cleaning was performed only as needed to maintain the integrity of the parachute material. Unused PCE was either reused or may have been washed down into the drywell system associated with Buildings 3803 and 3840. This information was supported by a review of the historic hazardous waste manifests, which did not include the removal of waste chlorinated solvents from AOC 50 (Mott, 1997). The use of this area for drum storage was discontinued in 1992. The length of time or total number of drums stored in this area of AOC 50 is unknown.

Based on the results of various field investigations, PCE was detected in vadose zone soils beneath the former drum storage area and was likely contributing to PCE impacts in groundwater. An interim removal action for PCE-contaminated soil at the former drum storage area was planned and implemented as a source-control measure while additional investigation activities were conducted across the Site. An *in-situ* soil vapor extraction (SVE) system was installed adjacent to the former drum storage area in December 1993 and January 1994. Five soil vapor extraction wells (SVE-1 through SVE-5) were installed, one in the center of the presumed PCE source and four on the periphery (Figure 2).

Operation of the SVE system began in February 1994 and continued through July 1996. Operation & Maintenance (O&M) data collected between February 1994 and July 1996 indicated that approximately 240 pounds (approximately 18 gallons) of PCE were successfully recovered in the vapor phase. Details regarding the installation, operation, and performance of the SVE system between February 1994 and July 1996 are documented in a November 1996 report titled *Summary Report, SVE Monitoring, AOC 50* (ABB, 1996b).

The SVE system was operated again for brief periods in December 1998, May and June 1999, and October and November 1999. The brief periods of SVE system operation after the 1996 shut down were conducted to evaluate the concentration of PCE in the soil vapor, under equilibrium conditions. In general, recovered vapor concentrations were either below the detection limits of a photoionization detector (PID), or after a brief peak observed when the system was restarted, quickly attenuated

within minutes. No appreciable mass of PCE was recovered during the brief periods of SVE operation between 1998 and 1999.

1.2.2.3 Cesspool

A cesspool associated with the bathroom in Building 3803 was identified on the site drawings; it appears to be the only septic system structure for either building. The concrete and rubble cesspool was approximately 10 ft in diameter and 9 ft deep with an open bottom and a cover on the top. The drywell and cesspool were investigated as potential contaminant sources for various volatile contaminants, including PCE detected in soil and groundwater during previous investigations.

The cesspool was removed concurrent with the drywell and UST associated with Building 3840. During the cesspool removal activities, a total of 25 cy of soil, sludge, and concrete were excavated and taken offsite for treatment and disposal.

2.0 RESULTS OF PRE-DESIGN INVESTIGATION WORK

The pre-design investigation activities are a key component of the Selected Remedy (Alternative 6) for the Site. Over the past 18 months extensive field investigations have been conducted at AOC 50 to further assess the nature and extent of PCE impacts at AOC 50.

2.1 Purpose

The purpose of the Pre-Design Investigation was to collect additional soil and groundwater quality, and hydrogeologic data to further define the extent of groundwater contamination at AOC 50. The installation of permanent monitoring and/or injection wells and soil and groundwater sampling activities were conducted at specific locations in the Source Area, Mid-Plume Area and Sentinel Well Area to provide supplemental data to support the remedial design.

2.2 Findings

This work involved the advancement of eleven soil borings via hollow stem auger/drive and wash drilling techniques in three specific areas of the Site: (1) Source Area, (2) Mid-Plume Area, and (3) Sentinel Well Area. Permanent monitoring wells and/or enhanced reductive dechlorination (ERD) injection wells were installed as part of this field investigation work. One SVE well was also installed as part of this work.

During the advancement of soil borings, subsurface samples were collected and screened for total VOCs using a photoionization detector (PID) and logged by an onsite ARCADIS scientist. Subsurface soil samples were initially collected in the Source Area at continuous two-foot intervals using split-spoon samplers until the water table was encountered. Once the water table was reached soil samples were collected at five-foot intervals to the desired total depth of the boring.

In addition, split-spoon samples were collected from borings advanced in the Mid-Plume Area and Sentinel Well Area at five-foot intervals below the water table in areas where the soils were not previously logged.

The approximate locations of the soil borings and permanent wells are shown on Figure 3. Table 1 presents a summary of the predesign investigation field program. The table presents the boring/well designation, purpose of installation, total depth, sampling description, well screen interval, PID range, analytical results, and general lithology.

The following sections provide a summary of the findings of the pre-design investigation for each specific area (i.e. Source Area, Mid-Plume, and Sentinel Well Area).

2.2.1 Source Area

2.2.1.1 Former Drywell Area

Two soil borings were advanced in the vicinity of the former drywell. These borings provide data to evaluate the potential for contamination in the intermediate and deep zones of the overburden aquifer at these locations.

- Well G6M-03-01X was installed on the north side of the former drywell. Continuous soil samples were collected to the water table and at five-foot intervals from the water table to refusal (approximately 76 ft below ground surface [bgs]). No PID readings were recorded above background in this well. The lithology consisted primarily of fine sand with a trace of coarse sand and silt. Unstratified till was encountered at 71 ft bgs. No soil samples were analyzed in the laboratory from this boring. PCE was detected in groundwater at a concentration of 4,100 micrograms per liter (µg/L) from the screened interval (50-70 ft bgs).
- Well G6M-03-02X was installed on the south side of the former drywell.
 Continuous soil samples were collected using split-spoon samplers to the

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water table and at five-foot intervals from the water table to approximately 46 ft bgs. No PID readings were recorded above background in this well. The lithology consisted of fine sands with minor amounts of silt and clay. A clayey silt layer was encountered at 44 ft bgs. PCE was not detected from laboratory analysis of the soil sample collected from 6 to 8 ft bgs. PCE was detected in groundwater at a concentration of 1,300 μ g/L from the screened interval (28 to 43 ft bgs).

A third boring was planned near the former dry well area. The boring was to be located in the former drain inside Building 3840 to determine if a potential source of PCE exists in this area. The boring could not be drilled at this time due to building access problems.

2.2.1.2 Former Drum Storage Area

Three soil borings were advanced on the east, north, and south sides of the former drum storage area.

- Well G6M-03-03X was installed on the south side of the drum storage area to assess groundwater quality in the deeper portion of the overburden aquifer. Continuous soil samples were collected to the water table and at five-foot intervals from the water table to approximately 91 ft bgs. The lithology consisted of very fine-to-fine grained sands with minor interfingering silt and clay lenses. Iron staining was common. A gray till was encountered at approximately 87 ft bgs. The highest PID reading was recorded in organic matter from the 0 to 2 ft interval and the soil sample from the 4 to 6 ft interval which was analyzed in the laboratory, had a PCE concentration of 1,600 μ g/kg. The groundwater sample collected from the screened interval (75 to 85 ft bgs) did not detect PCE above the laboratory detection limit (less than 2 μ g/L).
- Well G6M-03-04X was installed on the north side of the drum storage area in the shallow overburden to be used as a potential ERD injection point. Continuous soil samples were collected to the water table and thereafter at five-foot intervals to 30 ft bgs. The lithology consisted of poorly sorted very fine to coarse sand with some silt and clay lenses throughout the boring. The highest PID reading was recorded from the 14 to 16 ft interval. The groundwater sample collected from the screened interval (15 to 30 ft bgs) had a PCE concentration of 9,500 µg/L.

One SVE well (SVE-6) was installed on the east side of the drum storage area near Well G6M-94-18X. Continuous soil samples were collected to a total depth of 14 ft bgs. A maximum PID readings of 1.2 parts per million by volume (ppm_v) was recorded at 4 to 6 ft bgs. The lithology consisted of very fine-to-fine sands with minor amounts of silt. PCE was detected at a concentration of 100 µg/kg in the soil sample collected from 6 to 8 ft bgs. SVE-6 is screened from 3 to 13 ft bgs.

2.2.1.3 Former Cesspool Area

Two soil borings were advanced in the vicinity of the former cesspool area.

- Temporary Well SB-03-05A was installed on the north side of the former cesspool area in the shallow overburden to determine groundwater impact at the water table. Continuous soil samples were collected to 12 ft bgs. The lithology consisted of very fine-to-fine sand with some silt. No PID readings were recorded in soil above background levels. The groundwater sample collected from the screened interval (8 to 18 ft bgs) did not detect PCE above the laboratory detection limit (less than 2 µg/L).
- Well G6M-03-05X was installed on the south side of the former cesspool to serve as a possible monitoring/ERD injection point. Continuous soil samples were collected to 10 ft bgs and at 5-foot intervals to a total depth of 45 ft bgs (refusal) and the boring was advanced to 51 ft bgs. The lithology consisted of very fine to coarse sand with some silt and iron staining. Bedrock was encountered at 46 ft bgs. No PID readings were recorded above background levels. The soil sample collected from 8 to 10 ft bgs did not detect PCE above the laboratory detection limit (19 μ g/kg). The groundwater sample collected from the screened interval (35 to 45 ft bgs) detected PCE at a concentration of 6.1 μ g/L.

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2.2.2 Mid-Plume Area

One soil boring was advanced in the Mid-Plume Area in the proximity of existing Well G6M-92-07X.

Well G6M-03-07X was installed in the Mid-Plume Area to better delineate the extent of PCE impact in this area. Soil samples were collected at 5-foot intervals from 59 to 101 ft bgs. The lithology consisted of fine to medium grained sand with a lense of fine sand and silt at 69 to 71 ft bgs and silt and clay stringers at 84 ft bgs. The highest PID readings was recorded at 84 to 86 ft bgs. The groundwater sample collected from the screened interval (80 to 90 ft bgs) detected PCE at a concentration of 1,200 μ g/L.

2.2.3 Sentinel Well Area

Three soil borings were advanced between the Nashua River and the existing ERD injection well transect (IW-1 through IW-5). These wells were installed laterally across the groundwater plume to further delineate the extent of the PCE plume and will be used to monitor the presence of solubilized inorganics.

Well G6M-03-08X was installed at the southeast end of the Sentinel Well transect. Soil samples were generally collected at 5-foot intervals from the water table to total depth (59 to 151 ft bgs). The lithology consisted of fine to medium grained sand with trace of gravel and coarse sand with a greater percentage of silt with depth. The highest PID reading was at 129-131 ft bgs. The groundwater sample collected from the screened interval (125 to 140 ft bgs) detected PCE at a concentration of 750 µg/L.

Well G6M-03-09X was installed at the central portion of the Sentinel Well transect (between Wells G6M-03-08X and G6M-03-10X). Soil samples were generally collected at 5-foot intervals from 124 to 151 ft bgs. The lithology consisted of fine to medium sand with some coarse sand and silt. The highest PID reading in soil was between 139 and 141 ft bgs. The soil sample collected from the 59 to 61 ft bgs interval did not detect PCE above the laboratory detection limit (less than 20 μ g/kg). The groundwater sample collected from the screened interval (125 to 140 ft bgs) did not detect PCE above the laboratory detection limit (less than 2 μ g/L).

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Well G6M-03-10X was installed at the northwest end of the Sentinel Well transect. Soil samples were generally collected at 5-foot intervals from 59 to 141 ft bgs. The lithology consisted of fine to medium sand with some silt and trace of coarse grained sand. A fine sandy silt was detected below 139 ft bgs. The highest PID reading in soil was measured between 64 to 66 ft bgs. The groundwater sample collected from the screened interval (120 to 135 ft bgs) detected PCE at a concentration of 15 μ g/L.

The sample core and well construction logs are presented in Appendix A. A summary of the laboratory analytical data is provided in Appendix B.

The wells installed as part of the pre-design investigation may be used for groundwater monitoring or as ERD injection wells based on the data collected to date.

2.3 Conclusions

2.3.1 Soil

The lithologic data collected as part of the pre-design investigation indicate that the soil in the area of the former drum storage area is more variable than other parts of the Site and includes more silt and clay stringers interbedded with fine to coarse sand. The silt and clay stringers are more pronounced at about 40 ft bgs and appear to have effectively restricted the downward migration of PCE. The till was encountered at approximately 87 ft bgs in the former drum storage area. The lithology in the former dry well and cesspool area are more continuous sands with lesser amounts of silt. The till was encountered at approximately 70 ft bgs in the former dry well area and bedrock was encountered at approximately 45 ft bgs in the former cesspool area.

The lithologic data collected in the Mid-Plume Area (G6M-03-07X) indicate a fining downward sequence with silt and clay stringers encountered at approximately 84 to 85 ft bgs. This is also the interval where the highest PID reading was recorded. The lithologic data in the Sentinel Well Area also indicate a general fining downward sequence with more silt encountered with depth and subsequent reductions in PID readings.

The soil analytical data collected as part of the pre-design investigation indicate that there may be limited residual PCE in the vadose zone or capillary fringe at the water table in the former drum storage area. This can be addressed through the reactivation of the SVE system and implementation of ERD in this area. There is no evidence to indicate that there is residual PCE impact in vadose zone soil that needs to be remediated at any other area of the Site.

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There was no evidence of dense nonaqueous phase liquid (DNAPL) observed in any soil sample collected as part of the pre-design investigation work or other work performed at the Site.

2.3.2 Groundwater

The new groundwater analytical data have been incorporated into the revised PCE plume map and presented on Figure 4. The most significant findings from the predesign investigation are that PCE impact in groundwater is limited to less than 40 ft bgs in the former drum storage area and concentration of PCE in the cesspool area is close to the MCL of 5 ppb. The groundwater in the former dry well area is impacted by PCE from the water table to 70 ft bgs with higher concentrations present at depth above a till layer. The concentrations of PCE detected in groundwater in the Source Area are not indicative of DNAPL.

The PCE analytical data in groundwater at the mid-plume location (Well G6M-03-07X) indicate that the extent and distribution of PCE is clearly delineated in this area with impact restricted to less than 90 ft bgs. The PCE analytical data in groundwater in the Sentinel Well Area indicate that the extent of impact is limited to less than 140 ft bgs and the plume is narrower than originally mapped; the extent of PCE in groundwater is shown on Figure 4. Wells G6M-03-09X and G6M-03-10X are both outside of the center line of the PCE plume.

3.0 SELECTED REMEDIAL ACTION ALTERNATIVE

The selected remedy for AOC 50 is Alternative 6: Soil Vapor Extraction, Enhanced Reductive Dechlorination (with inorganics controls), In-Well Stripping/Aerobic Bioremediation, Monitoring, and Institutional Controls. The following sections summarize the selection rationale, a description of remedial components, and expected outcome for Alternative 6. Changes in the selected remedy may occur as a result of new information and data collected during the design of the alternative.

3.1 Summary of the Rationale for Selection of Alternative 6

Alternative 6 provides the best balance among the candidate alternatives for AOC 50. Alternative 6 is protective of human health under current and anticipated future land use scenarios. Existing and proposed institutional controls will prevent unrestricted use. Alternative 6 is also protective of the environment, attains ARARs, offers longterm and short-term effectiveness, and is readily implementable at a reasonable cost.

3.1.1 Description of Alternative 6

Alternative 6 includes multiple components to reduce potential human-health and ecological risks associated with groundwater at AOC 50. The principal components of Alternative 6 consist of the following:

- Soil Vapor Extraction (SVE) in the Source Area;
- Enhanced Reductive Dechlorination (ERD) throughout the Site (with solubilized inorganics controls);
- In-Well Stripping (IWS) along the downgradient portion of the Southwest Plume;
- Chemical oxidation in the North Plume (contingency);
- Geochemical adjustments including iron injection (contingency);
- Long-term monitoring;
- Institutional Controls (ICs); and,
- Five-Year Site Reviews.

A description of the components of Remedial Alternative 6 and other related activities is provided below.

<u>Pre-Design Investigation Activities</u> – Over the past 18 months, the Army has undertaken extensive field investigation at AOC 50 to further assess the nature and extent of PCE impacts at AOC 50. A pilot test of the ERD technology was completed between December 2001 and July 2002, the results of which were documented in a report incorporated into the Final Feasibility (FS) Study (ARCADIS 2002a). Additional investigation activities have been conducted to support the remedial design (RD). A summary of the investigation activities is presented in Section 2 of this report. Additional activities will include the installation and testing of IWS and the testing of the SVE system. Work plans will be submitted for review prior to initiating testing.

<u>Application of SVE in the Source Area</u> – Based on the results of pre-design investigation, the existing SVE system formerly operated in the Source Area at AOC 50 will be refurbished and tested as part of the preferred alternative. The system will apply vacuum to wells completed within the unsaturated soils, capturing VOC mass in the vapor phase as soil gases are withdrawn. The soil gases extracted from the subsurface will be treated, if needed with activated carbon prior to being discharged to the atmosphere. The air emissions will be monitored according to Massachusetts Policy WSC 94-150. Operation of the SVE system in the Source Area will provide indirect

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remediation of groundwater impacts, if recoverable chlorinated VOC (CVOC) mass is present. Specifically, the capture of adsorbed phase mass potentially present in the vadose zone soils will be removed as a continuing source for groundwater contamination. One new SVE well was installed in the Source Area to supplement the existing SVE well network.

Enhanced Reductive Dechlorination (ERD) Implementation - This technology is implemented in-situ by stimulating microbial activity and significantly increasing rates of CVOC degradation. The microbial activity is stimulated through the injection of an organic carbon substrate. The areas in which this substrate is delivered become anaerobic and reducing due to the uptake of available electron acceptors to support respiration of the microbes promoting the environment required for the ERD process to take place. The preferred remedy will involve the installation of multiple injection wells in a series of transects or other spacing pattern to optimize the effectiveness of the system. A dilute solution of potable water and the organic carbon substrate (molasses or other) will be periodically injected into the formation through these wells to drive the groundwater environment to anaerobic and reducing conditions. The exact locations, spacing, and completion details of the injection wells/transects are specified in the RD. To optimize the design and further reduce the remedy duration, the design reflects the most up to date groundwater quality data and flow modeling. Following treatment of CVOCs to levels approaching Maximum Contaminant Levels (MCLs), a period of monitoring will occur prior to discontinuing injection of the organic carbon substrate to ensure that CVOC rebound does not occur.

Solubilized Inorganics Controls

As outlined in the Final Feasibility Study (ARCADIS 2002a) and confirmed during the ERD pilot test, inorganics including iron, manganese and arsenic are solubilized within the reducing zones created by ERD technology. Inorganics solubilized within the reducing IRZs are not expected to migrate beyond the boundary of reducing conditions, and are not expected to persist once the prevailing aerobic groundwater environment is restored. Outside of the zone of reducing conditions (i.e., under the naturally aerobic conditions present in the groundwater at AOC 50) the inorganic constituents will be oxidized and subsequently immobilized through precipitation and/or adsorption. However, it is recognized that a subsequent phase of remediation will be implemented should groundwater monitoring indicate that the inorganics have not attained remediation goals.

After the ERD remedy is completed within sections of the plume and injection transects are phased out (which is expected to be approximately 10 to 15 years based

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on the groundwater modeling prepared in the Feasibility Study (FS) and updated as part of the 60% remedial design), the inorganic data collected during the long-term monitoring will be evaluated to assess that adequate restoration of natural aerobic conditions and re-precipitation of inorganics have been achieved. If warranted, the reprecipitation of inorganics will be expedited through manipulation of aquifer chemistry or application of more effective treatment technologies along the length of the plume utilizing existing ERD injection wells as transects are phased out following the treatment of VOCs.

<u>In-Well Stripping (IWS) Well Transect</u> - Alternative 6 includes the installation of groundwater IWS wells in the downgradient portion of the Southwest Plume, upgradient of the Nashua River. The inlet (lower) screen interval of the IWS wells will be positioned to intercept the zone of highest CVOC concentrations, with the recharge (upper) screen interval positioned at the upper limit of the impacted zone (to prevent cross-contamination of unimpacted zones). The lower screen will also intercept the zone of highest potential solubilized inorganic compounds should this condition present itself. The IWS system will strip VOCs from the groundwater and will create aerobic conditions conducive to the precipitation of solubilized inorganic compounds. The location, spacing, and completion details of the IWS wells are specified in the RD.

<u>Sentinel Groundwater Monitoring Wells</u> – Monitoring wells will be placed in strategic locations between the Nashua River and the most downgradient ERD injection transect to serve as Sentinel Wells. The Sentinel Well network will consist of a series wells installed approximately 400 ft from the most downgradient ERD injection transect. These wells will be located horizontally and vertically across the plume to monitor groundwater quality including the possible presence of solubilized inorganics. The number of wells required to adequately monitor the residual plume and solubilized inorganics are discussed in Section 4.6.

Monitoring – Long-term monitoring will be performed to evaluate performance of the remedy and to confirm that concentrations of constituents of concern are reduced to remediation goals. During the initial phases of implementation, monitoring will be conducted more frequently. As the progress of the remedy is established, monitoring frequency and/or number of monitoring analytes will be reduced. Samples will primarily be analyzed for VOCs, with additional analyses including dissolved metals (arsenic, iron, lead, and manganese), nitrate, sulfate/sulfide, total organic carbon (TOC), methane, and dissolved gases (ethane and ethene), as appropriate. Field parameters (e.g., ORP, pH, dissolved oxygen, conductivity, turbidity, and temperature) will also be collected during sampling. Details of the monitoring are outlined in a long-term monitoring plan (LTMP) in Section 4.6 of this report.

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<u>Institutional Controls</u> – ICs will be implemented in each area of the plume (i.e., North, Source Area, and Southwest), shown on Figure 5, through formal negotiations during the preparation of this document and the remedial design with the different entities that own the properties overlying these areas. ICs are necessary to restrict land and groundwater use at the Site to prevent unacceptable risk for the duration of the remedy. The ICs to be implemented in each area are outlined in the Land Use Control Plan in Section 4.7 of this report.

<u>5-Year Site Reviews</u> – Under CERCLA 121c, any remedial action that results in contaminants remaining on-site at concentrations greater than those allowing unrestricted use must be reviewed at least once every 5 years. During 5-year site reviews, an assessment is made of whether the implemented remedy continues to be protective of human health and the environment or whether the implementation of additional remedial action is appropriate. Additional details regarding the five-year review are in Section 4.7.3.6 of this report.

CONTINGENCIES

North Plume

As outlined in the FS, the primary method of groundwater remediation for the low levels of CVOCs observed in the North Plume area will be the application of ERD in the AOC 50 Source Area. The application of ERD will reduce the concentrations of CVOCs in the Source Area, thus limiting the potential for possible future migration of CVOCs off-site to the north. Groundwater analytical data from January 2004 indicates that only one well on the Merrimack Warehouse property (G6M-96-24B) exceeds the EPA primary drinking water standard of 5 ug/L. The PCE concentration detected in this well in January 2004 was 11 ug/L. This is currently the only well in the North Plume to have detectable concentrations of PCE. The proposed contingency remedy associated with the North Plume will consist of two components:

<u>Monitoring Program</u> - Selected monitoring wells in the North Plume will be monitored on an annual basis for the presence of CVOCs and inorganics when ERD is implemented in the Source Area. Well G6M-96-24B will be sampled on a quarterly basis as noted in Section 4.6.

<u>Remedy Implementation</u> - In the event that PCE or its daughter products exceed their respective MCLs in the North Plume one year after ERD implementation in the Source Area, a direct application of *in-situ* chemical oxidation will be utilized to treat the CVOCs in the North Plume. The treatments would continue periodically (i.e., annually), if needed based on groundwater monitoring results.

Inorganic Compounds

As outlined in the Final FS (ARCADIS 2002a), inorganic compounds such as iron, manganese or arsenic can be solubilized within the reducing zones created by ERD Inorganic compounds solubilized within the reduced zone are not technology. expected to migrate beyond the boundary of reducing conditions. Oxidizing aerobic groundwater conditions will be restored through a combination of natural processes and by aeration at the IWS wells. Outside of the zone of reducing conditions (i.e., under the naturally aerobic conditions present in the groundwater at AOC 50) and in the area of the IWS wells, it is expected the inorganic constituents will be oxidized and subsequently immobilized through precipitation and/or adsorption processes. The dominant process is expected to be co-precipitation with oxidized iron. Despite this expectation, it is recognized that a contingency must be available should groundwater monitoring indicate that there is an iron deficiency in the IWS treatment area (i.e., towards the Nashua River) that may preclude the effective immobilization of dissolved arsenic. The proposed contingency remedy associated with inorganic compounds will consist of two components:

> <u>Monitoring Program</u> - The monitoring of the sentinel wells will be conducted on a regular basis to detect a deficiency of iron in the system and allow time for Remedy Implementation. The specific details of the monitoring program associated with the contingency remedy will be outlined in the LTMP (Section 4.6).

<u>Remedy Implementation</u> – Adjustments to the chemistry of the groundwater approaching the IWS system will be made as deemed necessary to facilitate the re-precipitation of arsenic to less mobile forms. Such adjustments may include but are not limited to the addition of ferrous iron. Geochemical adjustments would be performed on an as-needed basis to maintain the necessary aquifer conditions. Field parameter measurements and inorganic groundwater samples will be collected on a periodic basis to confirm the desired conditions, and the monitoring of the sentinel well network will be maintained to assure the success of the contingency remedy.

3.1.2 Expected Outcome of Alternative 6

The primary expected outcomes of the selected remedy are that: a) the groundwater at the Site (including the Source Area, the Southwest Plume, and the North Plume) will no longer present an unacceptable risk to future workers or residents via potable water ingestion and inhalation; b) the Site will be suitable for unrestricted land use; and c) groundwater will be suitable for potable purposes. Approximately 23 years are estimated as the amount of time necessary to achieve the goals consistent with unrestricted land use and potable use of groundwater for the entire Site (as noted in the remedial design prepared by ARCADIS). Portions of the Site (e.g. North Plume) may achieve the goals in a shorter period of time. Abating the unacceptable risk to benthic invertebrates via direct contact from discharge of groundwater to porewater of the Nashua River is also an expected outcome of the selected remedy. The low to moderate potential ecological effects will be mitigated by the remedy and goals consistent with long-term protection of benthic invertebrates. Another expected outcome of the selected remedy is that redevelopment in specified areas will be able to proceed once the remedy is Operating Properly and Successfully.

4.0 REMEDIAL ACTION DESCRIPTION

The proposed remedial action for AOC 50 is Alternative 6 from the Proposed Plan and ROD: Soil Vapor Extraction, Enhanced Reductive Dechlorination (with inorganics controls), In-Well Stripping/Aerobic Bioremediation, Monitoring, and Institutional Controls. A description of the remedial action is outline in Section 3.0. This section will provide more details into the approach and rationale for implementation of the major components of the remedy.

4.1 Mobilization/Site Preparation

4.1.1 Mobilization

There will likely be multiple mobilizations to the Site for installation of the remedial system. The major components of the system include the installation of ERD injection wells, IWS wells, and monitoring/contingency wells. The major construction components include the construction of the mixing and delivery system for the ERD reagent, installation of an electrical line and transformer in the IWS area, trenching of remedial lines, construction of the remedial building and components for the IWS system, and refurbishing the SVE system.

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The construction Quality Assurance Plan (QAP) will be discussed in Section 5 of this report and provides the controls necessary to assure quality construction of the remedial system. A copy of the construction QAP is included in Appendix C.

The revised Sampling and Analysis Plan (SAP) completed by ARCADIS (ARCADIS 2003a) details field sampling protocols and field screening and laboratory procedures for groundwater and soil sampling and waste characterization, if necessary. The SAP is discussed further in Section 5.0 on Quality Control. The revised SAP is a stand-alone document to be used with this RAWP and other pertinent documents during remedy implementation.

The Site Health and Safety Plan (HASP) completed by ARCADIS (ARCADIS 2004b) has been updated to include safety guidelines for the work to be performed during remedial system implementation and includes key personnel, personal protection, and construction safety. The HASP is a stand-alone document to be used with this RAWP and other pertinent documents during remedy implementation.

4.1.2 Site Preparation

Prior to drilling and trenching activities, Dig-Safe clearance will be obtained and coordinated with local utilities and property owners to insure worker safety and reduce the likelihood of damage to existing utilities.

If applicable, appropriate work zones shall be established to include at a minimum; exclusion, contamination reduction, and support zones. Construction cones and work signs will be posted as appropriate to prevent unauthorized access to work areas.

A drum/roll-off staging area will be designated in the Source Area for soil and groundwater that needs to be containerized for off-site disposal. The soil and groundwater detected at the Site to date has been designated as non-hazardous.

Health and safety equipment, including photoionization detector, fire extinguishers, first aid kit, eye wash station, and mobile communications will be available on the Site. Communications will be provided via mobile telephones.

Drilling rigs, backhoes, and delivery vehicles, or equivalent machinery will be mobilized to the Site for drilling, trenching, and construction activities. A decontamination pad is already in-place at the Site.

4.2 SVE System Implementation

SVE implementation will involve a review of the existing system plans, performing testing on the equipment and system components to be sure the system is operating properly, replacing and repairing damaged components, testing of existing SVE wells, and connecting and testing the newly installed SVE well. The overall effectiveness of the system will be determined during the testing period and will be based on the amount of mass that is recovered.

4.3 Full-Scale ERD System Construction

The full-scale ERD system design is based on pilot test data collected between December 2001 and July 2002 and recent ERD application and modeling data, which provide a more comprehensive delineation of the PCE plume. The major components of the system will be ERD injection wells (that will be aligned in transects or other spacing patterns so as to optimize the effectiveness of the system), and the reagent mixing and delivery system. In addition, this portion of the remedy includes a contingency for solubilized inorganics that includes geochemical adjustment injection points. These components are discussed briefly below, but are included in the RD.

4.3.1 Injection Well Installation

The ERD injection well network will consist of wells installed in transects or other spacing patterns so as to optimize treatment. The wells will be screened across the PCE impacted zones as determined from investigation and monitoring data collected at the Site.

A licensed driller will install the new ERD injection wells. Specifics of injection well construction are described in the RD. It is expected that the injection wells will be constructed of 2-inch diameter Schedule 40 polyvinyl chloride (PVC) casing and screen. The area between the well screen and the borehole will be backfilled with sand filter pack and sealed with bentonite. The balance of the annular space will then be filled with grout. Following completion, each of the new wells will be developed to remove fine material and ensure hydraulic communication with the surrounding aquifer. Drilling and well completion logs will be prepared.

In accordance with the May 1995 Project Operations Plan (POP) and the Waste Management/Minimization Plan (ARCADIS 2003c), drill cuttings and development water generated during the well installation activities will be screened using a PID. Consistent with the protocols outlined in these documents, materials for which the PID screening identified volatile organic vapor concentrations exceeding background levels will be containerized for off-site disposal.

4.3.2 Construction of Delivery System

ERD technology is based upon the injection of an easily degradable carbohydrate solution (e.g., molasses and potable water) into the groundwater to provide excess organic carbon and stimulate microbial activity, thereby supporting and enhancing the degradation of chlorinated volatile organic compounds (CVOCs) such as PCE.

During full-scale implementation, the ERD injections will be completed manually. The carbohydrate solution will be pre-mixed by Westway Trading Corporation at their terminal located in Albany, New York and will be delivered to AOC 50 in insulated tanker trucks. Westway standardizes the solution with potable water, and the tankers are dedicated to the delivery of molasses and other liquid carbohydrate products. Once on-site, the pre-mixed solution will be pumped directly from each tanker into the injection wells through a trailer-mounted distribution header. The distribution header will allow the solution to be injected in up to five wells, simultaneously. Field logs will be maintained for each injection event.

4.3.3 Inorganics Contingency

This contingency remedy as discussed in Section 3.1, will only be implemented if it is determined that adjustments to the chemistry of the groundwater 1) approaching the IWS system or 2) following reagent injection transect shut-down where it is deemed necessary to facilitate the re-precipitation of arsenic to less mobile forms. Such adjustments may include but are not limited to the addition of ferrous iron. Geochemical adjustments would be performed on an as-needed basis to maintain the necessary aquifer conditions. Field parameter measurements and inorganic groundwater samples will be collected on a periodic basis to confirm the desired conditions, and the monitoring of the Sentinel Well network will be maintained to assure the success of the contingency remedy. The major components of the proposed contingency remedy associated with inorganics consist of injection points and mixing and delivery systems.

4.3.3.1 Injection Point Installation

The injection point network will consist of points installed in a single transect downgradient of the Sentinel Wells and existing ERD injection well transects along the length of the plume. The points will be screened across the PCE impacted zones as determined from investigation and monitoring performed at the Site.

A licensed driller using hydraulic push, hollow-stem auger, drive and wash, or other appropriate drilling techniques will install the new injection points. The construction of the injection points are presented in the RD. Each injection point will be completed with an above-grade protective casing, if possible. Following completion, each of the new wells will be developed to remove fine material and ensure hydraulic communication with the surrounding aquifer. Drilling and completion logs will be prepared.

In accordance with the May 1995 POP, drill cuttings and development water generated during the injection point installation activities will be screened using a PID. Consistent with the protocol outlined in the POP, materials for which PID screening identified volatile organic vapor concentrations exceeding background levels will be containerized for off-site disposal.

4.3.3.2 Delivery System

It is anticipated that the iron reagent (or other geochemistry adjustments) that may be injected at the Site will be delivered in containers premixed so as to be able to inject the reagent directly at the wellhead using a centrifugal pump or equivalent. The concentration of iron reagent will be determined based on field parameter measurements and laboratory analytical results for inorganic groundwater samples collected on a periodic basis to confirm the desired conditions. Design details for the contingency remedy, including selection of the final criteria for implementing the supplemental injections would only be performed on an as-needed basis to maintain the necessary geochemistry.

4.4 IWS System Construction

The IWS system will be located between the most-downgradient ERD injection well transect and the Nashua River. Stripping action of the IWS system will reduce VOC concentrations in treated water, which is then recharged to the aquifer thus reducing the potential for future ecological risk. As ERD progresses in the upgradient portion of the plume, the concentration of VOCs entering the IWS treatment zone is expected to decrease, ultimately to levels that are below site cleanup levels. The actions of the IWS system also result in the oxygenation of groundwater. It is anticipated that natural processes will prevent the propagation of reducing conditions in groundwater more than approximately 200 feet downgradient of the last ERD injection wells (ARCADIS 2002a). In the event that dissolved metals propagate further than anticipated, the oxygenation of groundwater that were reduced in the upgradient ERD area, and prevent further propagation of the reduced zone.

The major components of the system will be IWS wells that will be aligned along a single transect and the equipment and associated components that will be used to operate the system. These components are discussed briefly below.

4.4.1 Well Installation

Based on available Site data and the groundwater model, it is assumed that the most effective arrangement of IWS wells will be a single row of wells, perpendicular to groundwater flow. Placement of the wells is presented in the RD and is dependent on several factors including effective radius, topography, placement of monitoring wells, and groundwater contaminant travel time. Monitoring wells and the recharge zone of the IWS wells will be used to evaluate IWS system performance. In order to facilitate access to these monitoring wells year round, it is necessary for them to be placed on relatively level ground on top of the bluff. The location and number of monitoring wells is presented in Section 4.6.

The IWS wells will be constructed such that the lower (inlet) well screen will intercept the zone of highest PCE concentration and inorganics should they migrate beyond the ERD treatment zone. The upper screen (recharge screen) will be placed at the upper limit of the impacted zone so as to prevent contamination of the shallower groundwater. The final design of the wells is presented in the RD. Wells installed during the pre-design implementation were six-inch diameter wells with a larger diameter casing used for the top ten feet of the well to improve air-water separation.

4.4.2 System Construction

The typical design of the IWS well is based on a combination of air lift pump design and air stripping design. In the application for this site, the pumping process has been simplified by using a standard well pump to move the groundwater from the lower screen through and out the top of the eductor pipe and subsequently back into the aquifer. The air stripping portion of the process has now been separated from the pumping process and is isolated in the last 20-foot portion of the eductor pipe as the pumped groundwater exits the eductor. The air stripping action is now more efficient as higher air:water flow ratios can be obtained due to the reduced air sparging pressures.

The well pumps are sized for pumping groundwater at 20 gpm (maximum) to the top of the eductor and for the elevation head and head loss due to friction through the piping. A venturi tube will be used to measure flow by the measurement of differential pressure across the venturi tube. The well pump will be controlled with a variable frequency drive (VFD) that will allow for selection of the flow rate by varying the

speed of the motor. The water level in the upper well screen will be monitored with a pressure transducer to slow the speed of the pumping rate in the case of a high water level in the upper well screen. The operation of the well pumps will be interlocked with the air stripping blower, with the well pumps operating only when there is air flow to the IWS well sparge pipe detected.

The air stripping operation of the IWS system will be powered by a positive displacement blower. The blower will provide a continuous flow of air at a volume and pressure of approximately 200 scfm at a pressure of 8 psig. The blower will be controlled using a programmable logic controller, which will allow automated control of the system and will be capable of shutting down the system in the event of a system alarm. Alarms will include low air flow, high pressure, high temperature, and over current of a system component.

It is anticipated that off-gas will be screened in the field using a PID, and samples will be collected according to Massachusetts Policy WSC 94-150 to verify that off-gas VOC concentrations do not exceed MADEP standards for untreated emissions. A Licensed Site Professional Opinion is attached in Appendix D indicating that a condition of No Significant Risk to health, welfare, safety, and the environment is attained for untreated air emissions.

4.5 North Plume Contingency Remedy

The North Plume contingency remedy, if needed, consists of the application of in-situ chemical oxidation (ISCO) in the event that PCE or its daughter products exceed their respective MCLs in the North Plume one year after ERD implementation in the Source Area. Injection points will be installed around the area of concern and a direct application of ISCO will be made into the injection points using a pump. The treatments would continue periodically (e.g., annually), if needed based on groundwater monitoring results. Details regarding the number of points and concentrations of chemical oxidant are presented in the RD.

4.6 LUC RAWP

4.6.1 Purpose

The purpose of the Land Use Control Plan (LUC RAWP) is to outline a plan for implementation of Land Use Controls (LUCs) necessary to restrict or prevent potential human exposure to groundwater contaminants at the Site until the property can be used for unlimited exposure and unrestricted use. In addition, the plan must protect the integrity and effectiveness of the selected remedy and provide access to maintain the remedy.

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The inspections and reporting requirements described in this plan will be effective upon concurrence of the Remedial Design (RD) and LUC RAWP by the USEPA and the MADEP in accordance with their respective legal authorities.

4.6.2 Performance Objectives

LUCs will be implemented in each area of the plume (i.e. North, Source Area, and Southwest), through formal negotiations following regulatory approval of the LUC RAWP between the U.S. Army and the different entities that own the properties overlying these areas. LUCs in the form of institutional controls (ICs), such as deed restrictions, are necessary to restrict land and groundwater use at the Site to prevent unacceptable risk for the duration of the remedy. In addition, the plan must protect the integrity and effectiveness of the selected remedy and provide access to maintain the remedy. The objectives for each area are discussed below and summarized in LUC Layering Table 2.

4.6.2.1 North Plume

The objectives of the LUCs in the North Plume include:

- protecting potential residential receptors from ingesting contaminated groundwater
- restricting groundwater pumping to avoid drawing the contaminated groundwater from the Source Area
- limiting construction in specified areas over the contaminated groundwater that would interfere with the operation of the remedy
- providing access to the site for monitoring/remediation

Within 60 days of approval of this document, the Army will initiate negotiations for 1) necessary access (to maintain remedial systems and provide access for groundwater monitoring) and 2) land-use control measures (restricting groundwater withdrawal and protecting the integrity of existing and proposed wells with the property owners (Merrimack Warehouse and GFI Ayer, LLC) to prevent exposure to groundwater and to protect the remedy. The Army will obtain easements or other binding legal instruments containing the LUCs to meet the objectives outlined above. In addition, a secondary layer of LUCs for this portion of the plume will include, local permitting (including building and well), and Planning Board reviews with the Town of Ayer. The Town of Ayer Subdivision Control Regulations require subdividers located within 400 feet of public water and/or sewer systems to connect to the systems. This will restrict the installation of wells used for pumping

groundwater and will allow Army input to restrict construction that would interfere with the operation of the remedy (and monitoring). The Army will work with the Town of Ayer to ensure conformance with the LUCs. State well regulations will also restrict the pumping of groundwater from the North Plume.

These LUCs shall be maintained until the hazardous substances in the soil and groundwater beneath have been reduced to levels that allow for unlimited exposure and unrestricted use. The Army will implement, monitor, report on, and enforce these restrictions. The LUCs will cover the limits of the Merrimack Warehouse and GFI Ayer, LLC properties as shown on Figure 5.

4.6.2.2 Source Area

The objectives of the LUCs in the Source Area include:

- protecting potential residential and commercial/industrial receptors from ingesting contaminated groundwater
- protecting commercial/industrial workers from inhaling vapors released from groundwater used as "open" process water
- preventing potential construction/occupation of residential dwellings, schools/child care facilities and inhalation of vapors released from groundwater to indoor air
- restricting groundwater pumping and stormwater discharge/recharge to avoid drawing the contaminated groundwater from the Source Area
- limiting construction in specified areas over the contaminated groundwater that would interfere with the operation of the remedy
- reserving access to the site for monitoring/remediation

To meet the objectives outlined above, the LUCs for this portion of the plume will include existing zoning and lease terms (1996 Lease of Furtherance of Conveyance) between the Army and MassDevelopment that address these objectives. Existing zoning in the Source Area includes Special Use II and Innovation and Technology Business which includes; environmental, full and small scale office, light industrial, industrial, research and development, health care, academic/institutional/civic, municipal, small scale retail, group residences, and incubator (as outlined in the November 18, 1994 Devens By-Laws). The 1996 Lease of Furtherance of Conveyance restricts the use of groundwater, limits building construction, and interference of the remedy as outlined in the lease (Appendix E). In addition, restrictions on land-use including; no residential dwellings or schools/child care facilities, no pumping or use

of groundwater, modifications to stormwater discharge limited to existing municipal infrastructure, no new building construction. and Army site access for monitoring/remediation will also be incorporated into the Transfer deed prior to conveyance of the property to MassDevelopment. Site development activities including soil excavation and modifications to stormwater discharge are subject to prior approval and soil management/safety planning.

The FOST and transfer deed for the Source Area (Parcel A.5) will incorporate the ICs in the Environmental Protection Provisions. The transfer documents shall be executed in accordance with all applicable requirements, to include the Army's residual liabilities and responsibilities under CERCLA, as well as the transferee's obligations to maintain and enforce LUCs. The Army remains ultimately responsible for ensuring that remedy Performance Objectives are met, while the transferee will assist the Army to the extent possible and will be responsible for complying with the deed and deed notice.

Following transfer of the property to MassDevelopment, the Army will work closely with MassDevelopment and the Devens Enterprise Commission (DEC) to ensure a smooth transfer and continued conformance with the LUCs. The DEC acts as the local regulatory agency within the former Fort Devens and MassDevelopment acts as the Local Redevelopment Authority. In the event that the DEC is no longer the local land use agency, the Army will coordinate with the new governing entity for all LUC zoning layers that are required to be incorporated into the zoning by-laws.

In order to allow development over the Source Area of the plume and to insure that the objectives of the LUCs are met, a formal review and approval process will be implemented through MassDevelopment and the DEC (and its successor) in cooperation with the BCT. The formal process will be incorporated into the DEC regulations.

The formal review process will include an engineering demonstration by the party, that the proposal will protect the integrity and effectiveness of the selected remedy and provide access to maintain the remedy and prevent unacceptable risk for the duration of the remedy. The engineering demonstration will include technical justification commensurate with industry/government standards including Stormwater Management Plans and will include a formal presentation before the DEC and BCT. Following the presentation and submission of the technical justification, the DEC and BCT will have 30 days to review the submittal and provide comments and an additional 30 days to approve or deny the request after responses to comments have been received.

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These restrictions shall be implemented, monitored, reported on, and enforced by the Army with input from MassDevelopment and the DEC and shall be maintained until the concentration of hazardous substances in the soil and groundwater beneath have been reduced to levels that allow for unlimited exposure and unrestricted use. The LUCs will cover the Parcel A.5 as shown on Figure 5.

4.6.2.3 Southwest Plume

The objectives of the LUCs in the Southwest Plume include:

- protecting potential residential and commercial/industrial receptors from ingesting contaminated groundwater
- restricting groundwater pumping and stormwater discharge/recharge to avoid drawing the contaminated groundwater away from the limits of the plume
- limiting construction in specified areas over the contaminated groundwater that would interfere with the operation of the remedy
- providing access to the site for monitoring/remediation

To meet the objectives outlined above, legal agreements between the Army, Mass Development, and the US Fish and Wildlife Service will be used as the primary layer of LUCs for this portion of the plume. Legal agreements between the Army and Mass Development incorporated by the DEC (into the Unified Permit) and the US Fish and Wildlife Service (Memorandum of Agreement (MOA)) managed as part of the Oxbow Refuge are already in place. These legal agreements restrict activities that would interfere with the operation of the remedy including the construction of structures, groundwater withdrawal for any purpose, stormwater discharge/recharge, and provide for Army access to the properties during the operation of the remedy to install and maintain monitoring wells and treatment systems. The LUC will be recorded at the Registry of Deeds. The LUC will be incorporated into the Army F&WS MOA.

A secondary layer of LUCs will include; Planning Board Reviews, Building Permits, and restricting the potable use of groundwater through public and private well regulations.

In order to allow development over the MassDevelopment Southwest plume parcel and to insure that the objectives of the LUCs are met, a formal review and approval process will be implemented through MassDevelopment and the DEC (and its successor) in

cooperation with the BCT. In the event that the DEC is no longer the local land use agency, the Army will coordinate with the new governing entity for all LUC zoning layers that are required to be incorporated into the zoning by-laws.

The formal process will be incorporated into the DEC regulations. Areas that are restricted and will require a formal review and approval by the BCT, with review by the DEC to insure compliance with the LUCs include; the area overlying the Southwest Plume boundary for building construction and the entire limits of the Southwest Plume LUC Area for stormwater discharge/recharge. No groundwater withdrawal or injection will be allowed for any purpose within the entire limits of the Southwest Plume LUC Area until the concentration of hazardous substances in the soil and groundwater beneath have been reduced to levels that allow for unlimited exposure and unrestricted use. The plume and LUC limits are shown on Figure 5.

The formal review process will include an engineering demonstration by the party, that the proposal will protect the integrity and effectiveness of the selected remedy and provide access to maintain the remedy and prevent unacceptable risk for the duration of the remedy. The engineering demonstration will include technical justification commensurate with industry/government standards including Stormwater Management Plans and hydrologic/mounding studies and will include a formal presentation before the DEC and BCT. Following the presentation and submission of the technical justification, the BCT will have 30 days to review the submittal and provide comments and an additional 30 days to approve or deny the request after responses to comments have been received from the applicant. Presumptive approval will occur after this time period.

The LUC boundaries and restrictions will be incorporated into separate legal recordable documents and referenced in the property deeds. The Army will work closely with MassDevelopment and the DEC and US Fish and Wildlife Service to ensure conformance with the LUCs. The LUCs for the Southwest Plume will be implemented, monitored, reported on, and enforced by the Army with input from MassDevelopment and the DEC and the US Fish and Wildlife Service and shall be maintained until the concentration of hazardous substances in the soil and groundwater beneath have been reduced to levels that allow for unlimited exposure and unrestricted use. Any such agreement shall be undertaken and executed in accordance with all applicable CERCLA requirements, to include the Army's residual liability and responsibilities under CERCLA. The Army remains ultimately responsible for remedy integrity. The LUCs will cover the areas shown on Figure 5.

During the five-year review process, validation of the plan will help to ensure that the LUC mechanisms are still in place and are effective at meeting the objectives.

4.6.3 Implementation Actions

Upon concurrence of the RD and LUC RAWP by the USEPA and MADEP in accordance with their respective legal authorities, the Army will undertake implementation actions to confirm compliance with LUC objectives. The Army will require, through appropriate provisions, that MassDevelopment and the DEC and its subsequent transferees cooperate in continuing implementation actions to ensure that future users of the Site are meeting the LUC performance objectives. The Army will notify the EPA and MADEP of changes in LUC management responsibility.

The following LUC implementation actions will be undertaken by the Army in order to ensure that the LUC performance objectives are met and maintained.

4.6.3.1 LUC RAWP

The purpose of this LUC RAWP is to ensure site-specific LUCs are compiled into one comprehensive location for both pre-transfer use by the installation and post-transfer use by the property owners/users. Within 30-days of receiving USEPA and MADEP concurrence of the RD and LUC RAWP, in accordance with their respective legal authorities, the Army will undertake the following specific actions:

- Send a copy of the LUC RAWP to the Devens, Chief Engineer for incorporation into the Devens Real Property Master Plan, 1999.
- Send a copy of the LUC RAWP to the Town of Ayer
- Send a copy of the LUC RAWP to the Ayer/Nashoba Board of Health with a letter requesting that no permit(s) for wells be issued for the Merrimack Warehouse and GFI Ayer, LLC properties, other than to the Army for the installation of any wells for the treatment or monitoring of groundwater beneath the Site
- Send a copy of the LUC RAWP to the Town of Ayer Planning Commission and the DEC
- Place the LUC RAWP in the central Army repository and the local repositories in Ayer, Harvard, Shirley, and Lancaster

• Implement the provisions of the Devens Communications Plan and ensure that periodic follow-up occurs in accordance with the Plan; the AOC 50 LUCs Layering Strategy are summarized in Table 2

4.6.3.2 Site Inspection

Upon concurrence of the RD and LUC RAWP by the USEPA and MADEP in accordance with their respective legal authorities, annual physical inspections of the Site will be made to confirm continued compliance with LUC objectives and to ensure that future users of the Site are meeting the LUC performance objectives.

After inspection personnel have contacted the property owner in writing to provide a LUC RAWP questionnaire and remediation status updates, a physical on-site inspection of the property will be made to determine compliance with the LUCs. The physical on-site inspection will be conducted annually and shall include examination for evidence that the property is being used for acceptable land uses and that no groundwater extraction wells have been installed on the premises.

The Army will be conducting inspections on the North Plume, the Army with assistance from MassDevelopment and the DEC will be conducting inspections on the Source Area properties, and the Army with assistance from the MassDevelopment and DEC and US Fish and Wildlife Service will be conducting inspections on their respective portions of the Southwest Plume.

4.6.3.3 Interview

Inspection personnel will contact the property owner, its manager or designee with knowledge of the "day-to-day" activities of the property to make arrangements to review compliance with LUCs. As part of the interview, the inspector will inquire about the following:

- 1. The owner's familiarity regarding land use controls imposed upon the property and documentation of these controls;
- 2. Sources of water used at the property; and
- 3. Proposed plans for property sale, future development, construction or demolition activities at the Site.

4.6.3.4 Reporting

Upon concurrence of the RD and LUC RAWP by the USEPA and MADEP in accordance with their respective legal authorities, an annual LUC compliance report will be provided to the USEPA, MADEP, and Devens Document Distribution list for the Site by the Army. In addition, should any deficiency(ies) be found during the annual inspection, a written explanation will be prepared indicating the deficiency and what efforts or measures have or will be undertaken to correct the deficiency and a schedule to correct the deficiency. If there is to be a transfer of responsibility, the Army will notify EPA and MADEP and parties affected, of the shift in LUC management responsibilities.

The frequencies of inspections and reporting may be adjusted upon concurrence of the regulatory agencies based upon inspection results for the first year, in accordance with their respective legal authorities. Proposed changes in inspection and reporting frequency will be recommended in the annual report for regulatory review and concurrence prior to implementation.

Annual reports will be submitted to the Base Realignment and Closure (BRAC) distribution list, which includes USEPA, MADEP, land owners affected by the LUC RAWP and Restoration Advisory Board (RAB) members and the local communities. The annual report will include a summary of the interviews and physical site inspections with notification of breaches to the LUC RAWP, and corrective actions necessary as a result of changes in site conditions or land use, and proposed changes to inspection and reporting frequency. The annual report will also address whether the use restrictions and controls referenced in this Plan were communicated in the deed(s) and other legal instruments, whether the owners and state and local agencies were notified of the use restrictions and controls affecting the property, and whether use of the property has conformed with such restrictions and controls.

4.6.3.5 Five-Year Site Reviews

Under CERCLA 121(c), any remedial action that results in contaminants remaining on-site at concentrations greater than those allowing unrestricted use must be reviewed at least once every 5 years. During the 5-year site reviews, an assessment is made of whether the implemented remedy and LUCs continue to be protective of human health and the environment or whether implementation of additional remedial action or changes to the LUCs are appropriate. Consistent with guidance in OSWER Directive 9355.7-02A, the USEPA has recommended that 5-year reviews for Devens RFTA sites be performed simultaneously and reported in a single document. The first 5-year review for Devens RFTA site was performed in 2000. Public meetings will be held

coincident with these 5-year site reviews to help keep the public informed of site status including its general condition, remaining contaminant concentrations, and protectiveness of the remedial action.

4.6.3.6 LUC Changes/Property Conveyance

The Army, USEPA and the MADEP will be notified 60 days in advance of any proposed land use control, implementation actions, or land use changes that may be inconsistent with the LUCs or selected remedy. The notice, shall describe the mechanism by which LUCs will be changed to be protective or the prohibited land use will be prevented. The LUCs, implementation actions, or land uses shall not be modified or terminated without the prior written approval of the Army, EPA, and the MADEP.

During the time between the concurrence of the RAWP and deeding of the property, equivalent restrictions are being implemented by lease terms, which are no less restrictive than the use restrictions and controls described above and in the AOC 50 ROD. These lease terms shall remain in place until the property is transferred by deed, at which time they will be superseded by the institutional controls described in the AOC 50 ROD.

Concurrent with the transfer of fee title from the Army to transferee, information regarding the environmental use restrictions and controls will be communicated in writing to the property owners and to appropriate state and local agencies to ensure such agencies can factor such conditions into their oversight and decision-making activities regarding the property. The Army will provide a copy of the executed deed or transfer assembly to the EPA and MADEP. The transfer documentation, such as the Findings of Suitability to Transfer (FOST), shall describe the mechanisms by which LUCs will continue to be implemented, maintained, inspected, reported on, and enforced, as well as the assumption of specific duties to be undertaken by the transferee and the new property owner. The Army further agrees to provide EPA, MADEP, and affected parties with similar notice, within the same time frames as to federal-to federal transfer of property, if applicable. In accordance with the transfer agreement, the transferee will bear any cost associated with interference with the remedy and or modifications to LUC's, which necessitate additional cleanup. Furthermore, prior to seeking approval from EPA and MADEP the recipient of the property must notify and obtain approval from the Army of any proposals for a land use change at a site inconsistent with the use restrictions and assumptions described in the ROD agreement.
4.6.3.7 Deed Restrictions

The Army will circulate the FOST of the property to be transferred, but before executing the deed for conveyance, a copy including Environmental Protection Conditions will be provided to the property owner, USEPA and MADEP so they may have the opportunity, before document execution, to review and concur in accordance with their legal authorities. In addition, the deed restrictions will be recorded with the chain of title for the transferred property. It is agreed that the provisions in the deed will:

- Be consistent with the essential restrictions and controls specified in the FOST;
- Be consistent with state real property law and be made to run with the land so that they shall be binding on subsequent owners of the property, unless or until each LUC is released, and shall include a legal description of the property where the LUCs are to be implemented;
- When the property is transferred outside of federal ownership, consistent with state real property law, Army shall provide that, upon transfer, MADEP be granted a property interest in the parcel(s) at issue, providing the State with post-transfer enforcement rights to address transferee(s) or user(s) violations of LUCs imposed as part of Army's CERCLA remedy;
- Provide that the Army shall not significantly modify or release any LUC without prior EPA and MADEP concurrence, in accordance with their respective legal authorities;
- Contain a reservation of access to the property for the Army, EPA, MADEP, and their respective officials, agents, employees, contractors, and subcontractors for purposes consistent with the Army Installation Restoration Program (IRP) or the Federal Facilities Agreement (FFA).

4.6.3.8 Notification

Prior to transfer of a property, should the Army discover activity on a property inconsistent with the LUC performance objectives, the Army shall notify the USEPA and MADEP with 72 hours of such discovery. The board of health, property owner, and DEC will also be notified. Activities that are inconsistent with the IC objectives or use restrictions, or other actions that may interfere with the effectiveness of the ICs will be addressed by the Army, property owner, local board of health and the DEC, or Fish and Wildlife Service (depending on the portion of the Site) as soon as practicable, but

in no case will the process be initiated later than 10 working days after becoming aware of the breach. The EPA and the MADEP will be informed regarding how the breach has or will be addressed within 10 working days of sending EPA and the MADEP notification of the breach or inconsistent activity. Where the property has been transferred, the Army, USEPA, and MADEP will work together with the new owner of the property to correct the problem(s) discovered. The transfer or other appropriate documents shall provide that, post-transfer, the new property owners will be responsible for providing notification to the appropriate regulators, Army and/or local government representatives, reporting LUC problems, deficiencies or violations, so any issues can be resolved quickly. This reporting requirement does not preclude the Army, USEPA, or MADEP from taking immediate action pursuant to CERCLA authorities to prevent any perceived risks to human health or the environment.

4.6.3.9 LUC Enforcement

Should the LUC reflected in this LUC RAWP fail, the Army, USEPA, and MADEP will work together to ensure that appropriate actions are taken to reestablish its protectiveness. These actions may range from informal resolutions with the owner or violator, to the institution of judicial action under the auspices of State property law or CERCLA. Alternatively, should the circumstances warrant, the Army, USEPA, and MADEP could choose to exercise its response authorities under CERCLA then seek cost recovery. Should the Army become aware that a user of the property has violated any LUC requirement where a local agency may have independent jurisdiction (local regulations and permits), the Army or future owner will notify the agencies of such violations and work cooperatively with them to re-achieve owner/user compliance with the LUC.

4.6.3.10 Termination of LUCs

When the Army determines with the USEPA and MADEP that one or more of the LUCs are no longer needed for protection of human health and the environment, the Army will provide to the owner, a release for recordation with the deed (if applicable) pertaining to the Site and will also advise the Town of Ayer Board of Health and Planning Commission and the DEC of that action.

4.6.3.11 LUC Responsibilities

• The Army will implement, monitor, report on, and enforce the LUC restrictions in the North Plume (Merrimack Warehouse and GFI Ayer, LLC) until the LUCs are no longer necessary in this area of the Site.

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- The Army, with the assistance from MassDevelopment and the DEC will implement, monitor, report on, and enforce the LUC restrictions in the Source Area until the LUCs are no longer necessary in this area of the Site.
- The Army with assistance from the DEC and the US Fish and Wildlife Service will implement, monitor, report on, and enforce the LUC restrictions in their respective portions of the Southwest Plume until the LUCs are no longer necessary in this area of the Site.

4.7 Waste Management Plan

The Waste Management Plan (ARCADIS 2003c) provides guidance on the management of wastes created during remedial actions performed at the Site. It sets procedures for managing wastes and incorporates current U.S. Army, United States Environmental Protection Agency (USEPA), Occupational Safety and Health Administration (OSHA), and state and local requirements regarding the management of wastes as they relate to pollution prevention and worker safety during remedial actions conducted at the Site. The Waste Management Plan was prepared by ARCADIS and is a stand-alone document (ARCADIS 2003).

Purge water, decontamination water and soil cuttings generated during the implementation of the remedy will be containerized if field screening with a PID reveals total VOC concentrations above background levels, as described in Section 4.1 of the POP (ABB, 1995). The drums will be stored in Building 3824, the gazebo. Each drum/roll-off will be labeled with the date, associated well identification, and the substance contained within.

Groundwater and decontamination water characterized by PID readings above background may be disposed off-site or run through an on-site carbon filtration system. Purge water, identified for off-site disposal, will be transported to an approved facility.

Soil cuttings with PID readings above background levels will be sampled to determine appropriate characterization. Final disposal requirements will be dictated by the analytical results and associated regulatory requirements. Soils characterized as hazardous waste will be disposed in an approved RCRA-compliant disposal unit. Non-hazardous waste will be transported and disposed off-site at an approved facility.

4.8 Demobilization

Once drilling activities and Site construction activities are completed and IDW are staged on-site or have been appropriately disposed off-site, ARCADIS and their subcontractors will demobilize personnel and equipment from the Site.

5.0 QUALITY CONTROL

During construction activities, a Construction Quality Assurance Plan (QAP) will be followed to assure that the work being performed adheres to the industry standard of quality and workmanship. In addition, drilling and sampling activities performed, as part of the remedial action will follow a Construction QAP and Sampling and Analysis Plan (SAP). Furthermore, IDW managed as part of the remedial action, will be managed under the Waste Management/Minimization Plan. Field documentation records will be prepared during activities and maintained by ARCADIS. These records will document quality control activities performed as part of the remedial action. A summary of the quality assurance documents is provided below.

5.1 Construction QAP

The Construction QAP will ensure that the installation of the remedial action meets or exceeds design criteria, plans and specifications as outlined in the RD. The Construction QAP outlines project organization and responsibilities and general and specific construction quality assurance procedures for system construction and implementation. A copy of the Construction QAP is included in Appendix C.

5.2 Sampling and Analysis Plan

The SAP is designed to provide guidance to field personnel while performing sampling and data gathering activities at the Site resulting from the implementation of the remedial action activities and the scope-of-work outlined in the *Proposal for Guaranteed/Fixed Price Remediation of Area of Contamination (AOC) 50, Devens, Massachusetts* (ARCADIS, August 2001). The Revised SAP was prepared by ARCADIS in 2003 (ARCADIS 2003a).

6.0 PROJECT SCHEDULE

The project schedule is organized by the tasks outlined in Section 4.0 of this work plan. The project schedule has been prepared based on the anticipated number of weeks required for completion of each task and gives a relative sequence of implementation. Some tasks may overlap or occur concurrently, other tasks may be partially or totally

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completed during pre-design activities, some tasks may require multiple mobilizations or contractors to complete, and still others (contingency remedies) may not be implemented for several years, if at all. The project schedule will be updated as necessary, as the period of remedy implementation approaches. The general project schedule is presented on Figure 6.

7.0 PROJECT PERSONNEL

The key personnel applicable to the work to be performed under this remedial action work plan include; Peter Milionis who is the Project Director, Charles Castelluccio who is the Project Manager/ Quality Assurance/Quality Control Officer, Dave Falatko who serves as the Project Engineer, Brian Therriault as the Construction Supervisor/Site Quality Control Officer, Andy Robinson as the Drilling Supervisor/Site Safety and Health Officer, and field sampling and oversight personnel as needed. Drilling and equipment operators will be provided on an as-needed basis.

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Well ID	Purpose	Total Depth of Boring (ft bgs)	Sampling Description	Screen Zone (ft bgs)	PID Range (ppm)	Depth of Highest PID Reading ⁽¹⁾ (ft bgs)	Ana Media	lytical Re Depth (ft bgs)	esults PCE (ppb)	General Lithology Description	Comments
G6M-03-01X	Characterize VOCs in soil and groundwater in the immediate area of the former drywell. Serve as a deep Monitoring and/or ERD injection location	76	Continuous samples collected to 10 ft bgs. Thereafter, samples collected at 5-foot intervals from 14 to 76 ft bgs	50-70	No PID greater than 0.0 ppm were recorded	NA	GW	50-70	4100	Relatively uniform fine to coarse sand with trace silt. Unstratified till observed at 71 ft bgs	Set screen above till layer
G6M-03-02X	Characterize VOCs in soil and groundwater in the immediate area of the former drywell. Serve as a monitoring location	46	Continuous samples collected to 8 ft bgs. Thereafter, samples collected at 5-foot intervals from 14 to 46 ft bgs.	28-43	No PID greater than 0.0 ppm were recorded	NA	Soil GW	6-8 `28-43	<24 1300	Relatively uniform fine sand with minor amounts of silt and clay	Clay layer encountered at approximately 44 ft bgs.
SVE-6 (SB-03-04B)	Characterize VOCs in soil in the immediate area of the former drum storage area. Serve as a SVE location	14	Continuous samples from land surface to 14 ft bgs	3-13	1.2	4-6	Soil	6-8	100	Relatively uniform fine sand with silt	Serve as SVE well location
G6M-03-03X	Characterize VOCs in soil and groundwater in the immediate area of the former drum storage area. Serve as a deep monitoring/injection location	91	Continuous samples collected to 8 ft bgs. Thereafter, samples collected at 5-foot intervals from 14 to 91 ft bgs.	75-85	0 - 756	0-2	Soil GW	4-6 75-85	1600 <2	Relatively uniform sand. Minor silt and clay lenses appear to interfinger at approximately 40 ft bgs.	Set screen above till (encountered at 87 ft bgs)

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Table 1. Summary of Pre-Design Well Installation Field Program, AOC 50, Devens, Massachusetts

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Well ID	Purpose	Total Depth of Boring (ft bgs)	Sampling Description	Screen Zone (ft bgs)	PID Range (ppm)	Depth of Highest PID Reading ⁽¹⁾ (ft bgs)	Ana Media	ytical Re Depth (ft bgs)	PCE (ppb)	General Lithology Description	Comments
G6M-03-04X (SB-03-04A)	Characterize VOCs in soil and groundwater in the immediate area of the former drum storage area. Serve as a shallow monitoring/ ERD injection location	31	Continuous samples collected to 8 ft bgs. Thereafter, samples collected at 5-foot intervals from 10 to 31 ft bgs.	15-30	0 - 247	14-16	GW	15-30	9500	Poorly sorted fine to coarse sand with some silt and clay lens throughout.	Reinforced concrete encountered at 6 ft bgs. Set screen above silt/clay lens
SB-03-05A (Temporary Well)	Characterize VOCs in soil and groundwater in the immediate area of the former cesspool area. Serve as possible shallow monitoring location	18 .	Continuous samples collected to bottom of boring (12 ft bgs)	8-18	No PID greater than 0.0 ppm were recorded	NA	GW	8-18	<2	Relatively uniform fine sand with some silt.	Temporary well location.
G6M-03-05X (SB-03-05B)	Characterize VOCs in soil and groundwater in the immediate area of the former cesspool area. Serve as possible monitoring/ERD location	51	Continuous samples collected to 10 ft bgs. Thereafter, samples collected at 5-foot intervals from 14 ft bgs to refusal (approximately 45 ft bgs).	35-45	No PID greater than 0.0 ppm were recorded	NA	Soil GW	8-10 35-45	<19 6.1	Relatively uniform fine sand with silt and coarse sand	Set screen above refusal (encountered at approximately 45 ft bgs).
G6M-03-07X	Further define the lateral extent of VOCs in groundwater in this area. Serve as a monitoring location.	101	Samples were collected from 59 - 101 ft bgs at 5-foot intervals	80-90	0.1 - 169	84-86	GW	80-90	1200	Relatively uniform fine to medium sand with lense of fine sand and silt at 69 -71 ft bgs. Silty clay encountered from 84- 84.6 ft bgs.	Set screen in deep aquifer at depth where highest PID is recorded

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Table 1. Summary of Pre-Design Well Installation Field Program, AOC 50, Devens, Massachusetts

Table 1. Summary of Pre-Design Well Installation Field Program, AOC 50, Devens, Massachusetts

Well ID	Purpose	Total Depth of Boring (ft bgs)	Sampling Description	Screen Zone (ft bgs)	PiD Range (ppm)	Depth of Highest PID Reading ⁽¹⁾ (ft bgs)	Ana Media	lytical Re Depth	PCE	General Lithology Description	Comments
G6M-03-08X	Monitoring downgradient of the ERD pilot test area. Serve as a sentinel monitoring location.	151	Samples collected from 4-6, 19-21, 39-41, and 59-61 ft bgs; and thereafter, at 5-foot intervals to 151 ft bgs.	125-140	0.6 - >1,100	Unsaturated - '39- 41 Saturated - '129- 131	GW	(ft bgs) 125-140	(ppb) 750	Relatively uniform fine to medium sand with trace gravel and coarse sand. Fine to medium sand with sand and silt beginning at 99 - 101 ft bgs	Sand and silt layer encountered at 149 - 151 ft bgs. Set screen at interval where highest saturated PID reading was recorded.
G6M-03-09X	Monitoring downgradient of the ERD pilot test area. Serve as a sentinel monitoring location.	151	Samples were collected from 49-51 ft bgs and 59-61; and thereafter, from 124 ft bgs to 151 ft bgs at five foot intervals.	125-140	0.3 - 247	139-141	Soil GW	59-61 125-140	<20 <2	Relatively uniform fine to medium sand (124 - 151 ft bgs)	No silt layer encountered. Set screen in highest PID
G6M-03-10X	Monitoring downgradient of the ERD pilot test area. Serve as a sentinel monitoring location.	. 141	Samples collected from 4-6, 19-21, 39-41, and 59-61 ft bgs; and thereafter, at 5-foot intervals to 141 ft bgs.	120-135	1.2 - 164	64-66	NA	NC	NC	Relatively uniform fine to medium sand with silt. Silt layer encountered at 139 ft bgs	Set screen above silt layer in highest PID

Notes:

Abbreviations:

bgs - below ground surface ERD - Enhance reductive dechlorination

ft - feet

NA - Not applicable

NC - Not collected ND - Not Detected

PID - Photoionization detector

PCE - Tetrachloroethylene

ppm - parts per million ppb - parts per billion

SVE - Soil vapor extraction

VOCs - Volatile organic compounds

Table 2. LUC Layering Table, AOC 50, Devens, Massachusetts.

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					F. LUC Layers	(Layering Mechanisms)		
Α.	B. Site	C. Media	D. Goals/Objectives	E. Restriction	1. Real	2. Governmental	3. Site	4.Other
Affected	Identifier	Affected			Property	Administrative	Controls	
Parcel					/Legal			
AOC 50	North	Ground	Prevent Consumption	No Extraction of	Legal	Negotiate with properties	Army Inspection	Notifications, Annual
	Plume	Water	of Ground Water and	Ground Water	Instrument	identified within 400 feet		Letters to Property
			Drawing of	for any Purpose		of Source		Owners
			Downgradient Plume					
			Prevent Consumption	No Extraction of	Well	No Private/ Public Wells;	Nashoba BOH/	Notifications, Annual
			of Ground Water and	Ground Water	Regulations;	Connect to Public Water	MADEP/ Town	Letters to Property
			Drawing of	for any Purpose	Subdivision;	Supply	of Ayer	Owners ; Nashoba
			Downgradient Plume		Building		Administer	BOH; MADEP;Town
					Permits		Regulations	of Ayer
			Maintain Site Access	Right of Entry	Easement or	Negotiate with properties	Army Inspection	Notifications, Annual
			for monitoring and	(ROE) to	Legal	identified within 400 feet		Letters to Property
			Remediation and	Sample;	Instrument	of Source		Owners
			Protect Integrity of	Construct Wells				
			Existing and	and/or Remedy				
			Wells/System	G6M-96-24P				
			Components	00IVI-70-24D				
			Components					

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Table 2. LUC Layering Table, AOC 50, Devens, Massachusetts.

					F. LUC Layers (Layering Mechanisms)		
A. Affected Parcel	B. Site Identifier	C. Media Affected	D. Goals/Objectives	E. Restriction	1. Real Property /Legal	2. Governmental Administrative	3. Site Controls	4.0ther
AOC 50	Source Area	Ground Water	Prevent Consumption of Ground Water; Inhalation of Vapors and Drawing of Plume	No Extraction of Ground Water for any Purpose and No Building Construction	1996 Lease of Furtherance of Conveyance (LIFC); Transfer Deed Environmental Protection Provisions	Enforce Lease Provisions; Incorporate Restriction in Findings of Suitability to Transfer (FOST)/Transfer Deed EPP	Army Inspection	Notifications, Annual Letters to Property Owners
			Prevent Drawing of Plume	New Storm Water Discharge Limited to existing Municipal Infrastructure	(EFP) LIFC; Transfer Deed EPP	Enforce Lease Provisions; Incorporate Restriction in FOST/Deed EPP	Army Inspection	Notifications, Annual Letters to Property Owners
		Soil	Prevent Exposure to Potentially Contaminated Soil	Excavations Subject to Soil Management Plans and HASP	LIFC; Transfer Deed EPP	Enforce Lease Provisions; Incorporate Restriction in FOST/Deed EPP	Army Inspection	Notifications, Annual Letters to Property Owners
		Air Quality	Prevent Exposure to Airborne COC by Daycare/School Age Children and Residents and excavation workers	No Daycare/ Schools or Residential Land Uses and Air Monitoring during	LIFC; Transfer Deed EPP	Enforce Lease Provisions; Incorporate Restriction in FOST/Deed EPP	Army Inspection	Notifications, Annual Letters to Property Owners

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					F. LUC Laye	rs (Layering Mechan	isms)	
A. Affected Parcel	B. Site Identifier	C. Media Affected	D. Goals/Objectives	E. Restriction	1. Real Property /Legal	2. Governmental Administrative	3. Site Controls	4.Other
AOC 50	Source Area	Air Quality	Maintain Site Access for Monitoring and Remediation and Protect Integrity of Remedy	ROE to Sample; No new Building Construction	LIFC; Transfer Deed EPP	Enforce Lease Provisions; Incorporate Restriction in FOST/Deed EPP	Army Inspection	Notifications, Annual Letters to Property Owners
			Notification and Review Process	Development Subject to Review by BCT	LIFC; Deed EPP	Enforce Lease Provisions; Incorporate Procedure in FOST/Deed EPP;DEC Permits	Army Inspection DEC Permits	Notifications, Annual Letters to Property Owners

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Table 2. LUC Layering Table, AOC 50, Devens, Massachusetts.

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					F. LUC Laye	rs (Layering Mechan	isms)	
A. Affected Parcel	B. Site Identifier	C. Media Affected	D. Goals/Objectives	E. Restriction	1. Real Property /Legal	2. Governmental Administrative	3. Site Controls	4.Other
AOC 50	South West Plume	Ground Water	Prevent Consumption of Ground Water and Drawing of Contaminated Groundwater Beyond Plume Limits	No Extraction of Ground Water for any Purpose	Deed Notice EPP	Incorporate Restrictions into Deed Notice; DEC Permits	Army Inspection DEC Permits	Notifications, Annual Letters to Property Owners
			Prevent Drawing of Plume	Stormwater Discharge or Recharge Subject to Approval of Stormwater Management Plan including Hydrogeologic/ Mounding Studies	Deed Notice EPP	Incorporate Restrictions into Deed Notice; DEC Permits	Army Inspection DEC Permits	Notifications, Annual Letters to Property Owners
	•		Limit Construction Over Plume and Protect Integrity of Remedy	Building Construction over Plume Subject to Approval	Deed Notice EPP	Incorporate Restrictions into Deed Notice; DEC Permits	Army Inspection DEC Permits	Notifications, Annual Letters to Property Owners
			Maintain Site Access for monitoring and Remediation	ROE to Sample; Construct Wells and/or Remedy	1996 Quitclaim Deed	Restate in Deed Notice	Army Inspection DEC Permits	Notifications, Annual Letters to Property Owners

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Table 2. LUC Layering Table, AOC 50, Devens, Massachusetts.

					F. LUC Laye	rs (Layering Mechan	isms)	
A. Affected Parcel	B. Site Identifier	C. Media Affected	D. Goals/Objectives	E. Restriction	1. Real Property /Legal	2. Governmental Administrative	3. Site Controls	4.Other
AOC 50	South West Plume	Ground Water	Notification and Review Process	Notification and Review Process	Deed Notice EPP	Incorporate Procedure into Deed Notice	Army Inspection DEC Permits	Notifications, Annual Letters to Property Owners
			Coordinate LUC's with F&WS	Restrictions Applicable to Southwest Plume	Memorandum Of Agreement (MOA)	Incorporate Restrictions Into MOA	Army/ F&WS Inspection	Annual Letter to F&WS
			Coordinate LUCs with Devens Real Property Management Plan (RPMP)	Restrictions Applicable to Southwest Plume	RPMP	Incorporate Restrictions Into Real Property Management Plan	Army Inspection	Annual Letter to F&WS
			Coordinate LUCs with Ayer for Source Area and Southwest Plume if Necessary	Restrictions Applicable to Source Area & Southwest Plume	Well Regulations; Subdivision; Building Permits	Coordinate with Town to Incorporate Restrictions into Zoning Overlay if Ayer assumes Jurisdiction over Airfield	Army Inspection Town Permits	Notifications, Annual Letters to Property Owners

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AOC 50	Project Number
FORT DEVENS, MASSACHUSETTS	MA000664.0007
	Date
	02/28/05
OF LAND-USE CONTROL	Figure
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LIMITS OF SOUTHWEST PLUME

Figure 6. Project Schedule, AOC 50, Devens, Massachusetts



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SB-03-01/

Boring/Well G6M-0)3-01X Project/No.	MA000664.004A	.0002 Pag	ge <u>1</u> of <u>2</u>
Site Location	AOC 50 - Ayer, MA	Drilling Started <u>4/8/</u>	Drilling 2003 Completed	4/9/2003
Total Depth Drilled	Hole 76Feet Diameter	4inches	Type of Sample/ Coring Device	Split Spoon
Length and Diameter of Coring Device	2' long, 2" diamete	کر	Sampling Interva	Continuous to W.T., then every 5 feet
Land-Surface Elev.	feet	Estimated	Datum	
Drilling Fluid Used	Water		Drilling Method	Drive and Wash
Drilling Contractor	Subsurface Drilling & Remedi	ation	Driller	JimHelperJohn
Prepared By	Diane Mosher		Hammer Ha 	ammer op30ins.

Sample #	Depth (ft bls)	Core Recovery (feet)	Blow counts per 6 Inches	PID (ppm)	Sample/Core Description	USCS
S-1	0-2	1.5	3/3/3/3	0.0.	Brown fine SAND, with some coarse sand and gravel at 0-2", loose, dry	SM
S-2	2-4	0.5	3/2/3/2	0.0	Brown coarse SAND, some fine sand with gravel. loose, dry	SM
S-3 .	4-6	1	2/3/4/3	0.0	Similar to S-2	SM
S-4	6-8	1	7/7/7/8	0.0	Similar to S-2, moist at approximately 8'	SM
S-5	8-10	1.5	7/5/5/6	0.0	Similar to S-2. saturated	SM
	14-16	0.5	4/4/7/7	0.0	Brown fine SAND, with coarse sand and trace silt, saturated	SP
<u>S-7</u>	19-21	0	4/5/5/6	0.0	No recovery	
S-8	24-26	1	5/8/7/8	0.0	Brown fine SAND, with silt, some iron staining at approximately 25 and 26 bgs	SM
S-9	29-31	0.8	6/7/8/9	0.0	Similar to S-8, trace iron stain at approximately 30' bgs	SM
S-10	34-36	1.3	7/7/10/11	0.0	Similar to S-8 with some coarse sand, some layer of iron color staining	SM
					throughout. dense	
S-11	39-41	2.0	. 5/4/2/2	0.0	Brown coarse SAND, with fine sand, no iron staining, less dense than above	SW

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ARCADIS G&M Sample/Core Log (Cont.d)

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Boring/Well		SB	-03-01/G6M-03-	01	Page 2 of	2	
F	repared by			Diane Mosher			
	Sample #	Depth (ft bis)	Core Recovery (inches)	Blow counts per 6 Inches	PID (ppm)	Sample/Core Description	USCS
	S-12	44-46	2.0	8/6/8/5	0.0	Brown fine SAND, some coarse sand, trace silt, dense	SM
							<u> </u>
	S-13	49-51	1.8	6/5/6/8	0.0	Brown fine SAND, some silt, dense	SM
		. 				· · · · · · · · · · · · · · · · · · ·	
	S-14	54-56	2.0	*/5/6/8	0.0	Brown fine SAND, some coarse sand, trace silt (iron staining to 55', possibly	<u>SM</u>
						from casing)	
. 	S-15	59-61	2.0	*/6/6/8	0.0	Similar to S-14 - no iron staining	SM
	S-16	64-66	1.8	6/5/7/8	0.0	Similar to S-15	SM
	S-17	69-71	0.5	13/60/44/63	0.0	TILL. some weathered rock at top & bottom of sample.	
	S-18	74-76	0.5	51/48/65/105	0.0	Weathered rocky, grey TILL, dense, rock/till in layers more consistently	
					<u> </u>	throughout the sample	
			·			Bottom of boring - 70 bgs	
						ino retusar encountered.	
		-				Notes:	
						1. "*" - weight of rod pushed first 6"	
					ļ	2. See well completion log for well construction details	
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Boring/Well SB-03-02/C	6M-03-02X_Project/No.	MA000664.00	4A.0002	Page	1	of	2 *
Site Location	AOC 50 - Aver, MA	Drilling Started	Drilling 4/10/2003 Completed		4/11/2	2003	
Total Depth Drilled	Hole 46Feet Diameter	4_inches	Type of Sample/ Coring Device		Split S	Spoon	
Length and Diameter of Coring Device	2' long, 2" diamete	er	Sampling I	nterval	Continuous t	to W.T., the	n every 5 ft
Land-Surface Elev.	feet	Estimated	Datum				
Drilling Fluid Used	Water		Drilling Me	hod	Driv	ve and Wa	sh
Drilling Contractor	Subsurface Drilling & Remediat	ion	DrillerJim		Helper_	John	
Prepared By	Diane Mosher		Hammer Weight140	Hamme Drop	ir <u>30</u>	ir	15.

Sample #	Depth (ft bls)	Core Recovery (inches)	Blow counts per 6 inches	PID (ppm)	Sample/Core Description	USCS
S-1	0-2	0.5	2/3/3/2	0.0	Brown fine to coarse SAND. some gravel. trace of silt. moist.	SM
				<u> </u>	dense	
<u>S-2</u>	2-4	1.0	1/2/3/3	0.0	Similar to S-1 to 3.0' bgs; then dry, dense.	SM
<u>S-3</u>	4-6	1.2	3/3/4/5	0.0	Fine SAND, with coarse sand and trace silt, dry, dense	SM
<u>S-4</u>	6-8	1.0	5/6/6/7	0.0	Similar to S-3, wet at approximately 8'	SM
S-5	8-10	1.2	4/5/5/5	0.0	Similar to S-3 to 9.0 ft bgs. then coarse SAND. with fine sand and trace	SP
					of silt, some gravel	
S-6	14-16	1.0	6/7/6/7	0.0	Fine SAND, with some coarse sand and silt	SM
S-7	19-21	Not recorded	6/5/6/7	0.0	Brown very fine to fine SAND, with silt, dense, saturated	SM
S-8	24-26	13"	10/7/9/7	0.0	Top 2.5" - Silty CLAY mod. plasticity	CL
}					Middle 7" - Coarse SAND with fine sand and trace of silt	SM
)					Bottom 3.5" - Fine SAND, with very fine sand, some silt, trace clay	SC
}					saturated, dense	
S-9	29-31	· 1.0	9/7/6/8	0.0	Top 3" - Very fine to fine SAND, some silt, dense	SM
j			ļ	<u> </u>	Bottom 7" - Very fine to fine SAND, some coarse sand and silt	
			<u> </u>		loose, saturated, iron stain at 5.25" to 5.50"	

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ARCADIS G&M Sample/Core Log (Cont.d)

)	Boring/Well		SB-03	-02/G6M-03-	02X	Page 2 of	2
	Prepared by		[Diane Mosher		_	
	Sample #	Depth (ft bls)	Core Recovery (inches)	Blow counts per 6 inches	PID (ppm)	Sample/Core Description	USCS
	S-10	34-36	۱.7	8/8/7/5	0.0	Very fine to fine SAND. some silt, loose, saturated.	SM
		39-41	3"	7/5/6/6	0.0	Little recovery. Similar to S-10. very thin clay layer at 2", layer	SM
						is 1/32" thick.	
)	S-12	44-46	20"	11/15/8/7	0.0	Top 3" - Clay silt layer. medium plasticity Bottom 17" - Similar to S-10	CL SM
						Bottom of boring - 46' bos	
						No refusal encountered	
.)	· · · · · · · · · · · · · · · · · · ·					NOTES:	
						1. Groundwater encountered at ~8' bgs 2. See well completion log for well construction details.	· · ·
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SB-03-03/G6	5M-03-03X	Project/No.		MA000664.004A.0002 Page 1 of	2
	AOC 50	- Ayer, MA		Drilling Drilling Started 4/16/2003 Completed 4/17/2013	
rilled _	91	Feet	Hole Diameter	Type of Sample/Coring <u>4</u> inches Device Split Spoon	
Length and Diameter of Coring Device		2' long,	2" diame	ter Sampling Interval Continuous to W.T.;	
- Elev.		feet		then every 5 ft Estimated Datum	
- Ised			Water	Drilling Method Drive and W	ash
-	Subsur	face Drilling &	. Remedia	tionDrillerJimHelperJohn	-
•		Diane Mos	sher	Hammer Hammer Weight <u>140</u> Drop <u>30</u>	ins.
Depth (ft bis)	Core Recovery (inches)	Blow counts per 6 inches	PID (ppm)	Sample/Core Description	USCS
0-2	12	2/5/8/7	756	Top 6" - Organic debris. rock. fine to coarse sand. dry.	
				Bottom 6" - Brown fine to coarse SAND, some gravel, dry	SW
		· · · · ·			
2-4	15	5/5/4/4	19.9	Brown fine to coarse SAND, some small gravel, trace of silt, dry	SW
				loose	
•	1.1	2/2/2/2	20.2		sw
4-6	14	5121212	20.2	Niddle 1" - Fine SAND trace of silt	SM
				Middle 2" - Similar to S-2	SW
				Middle 2" - Fine SAND, trace of silt and clay,	SM
				Bottom 1" - Similar to S-2. but dark brown in color. some iron staining.	sw
				· · · · · · · · · · · · · · · · · · ·	
6-8	15	3/4/5/6	16.4	Top 4" - Similar to S-2	SW
	 			Bottom 11" - Fine to very fine SAND w/ trace of slift & clay, wet at 10.5	5191
14-16	14	9/8/7/10	2.2	Top 1" - Clay SILT, slight plasticity	ML
				Bottom 13" - Brown fine to very fine SAND, some silt, trace of clay.	SM
		·		saturated, well sorted	
· · ·					
19-21	12	11/6/6/9	1.5	Similar to S-5	SM
24-26	12	8/11/10/15	0.5	Similar to S-5. Small clay layers at 9.5" and 10.75". Layers are	SC
	illed	AOC 50 AO	AOC 50 - Ayer, MA illed 91 Feet ameter 2' long, ce 2' long, Elev. feet Jsed	AOC 50 - Ayer, MA illed 91 Feet Diameter ameter 2' long, 2" diameter ce 2' long, 2" diameter Elev. feet	Drilling Mammer Drilling Drilling Drilling Drilling Drilling Drilling Drilling Drilling <thdrilling< th=""> <thdrilling< th=""> <th< td=""></th<></thdrilling<></thdrilling<>

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ARCADIS G&M Sample/Core Log (Cont.d)

Boring/Well

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SB-03-03/G6M-03-03X

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Prepared by	-	E	Diane Mosher		-	
Sample #	Depth (ft bis)	Core Recovery (inches)	Blow counts per 6 Inches	PID (ppm)	Sample/Core Description	USCS
S-8	29-31	13	8/9/14/14	4.4	Brown fine to very fine SAND, some coarse sand and silt, trace of clay.	SM
					brown silt. some iron staining	
		<u> </u>				
S-9	34-36	12	9/7/11/14	1.2	Similar to S-8.	SM
S-10	39-41	14	8/12/12/14	2.5	Brown fine to very fine SAND, some coarse sand and silt, well sorted,	SM
					some iron staining throughout.	
					· · · · · · · · · · · · · · · · · · ·	
S-11	44-46	23	5/12/12/14	1.2	Top 8" - Grey CLAY and SILT. some iron streaks with fine sands at 2" and	ML
					4.5"	
					Middle 6" - Fine to very fine SAND, w/ silt and clay stringers throughout	SM
					Bottom 9" - Grey CLAY and SILT	ML
S-12	49-51	15	12/15/15/22	0.5	Fine to very fine SAND, some silt, trace clay, iron staining at	SM
					approximately 49.3 - 49.9", well sorted.	
S-13	54-56	11	13/15/15/18	0.0	Similar to S-12, Iron staining 55.5' to 55.7' and 55.6' to 55.8'	SM
					· .	
S-14	59-61	8	12/15/22/25	0.5	Similar to S-12, little iron staining.	SM
S-15	64-66	10	18/23/33/34	1.3	Similar to S-12, some iron stain at 64.4' and at 64.9'.	SM
S-16	69-71	13	15/18/25/27	0.3	Similar to S-12	SM
S-17	74-76	13	13/14/17/21	0.0	Similar to S-12, some iron staining at 74.9' - 74'10".	SM
					·	
S-18	79-81	12	15/17/18/27	78.5	Similar to S-12, but only trace iron staining	SM
S-19	84-86	. 9	10/11/20/10	135	Similar to S-12, but grey in color.	SM
					(TILL at approximately 87')	

ARCADIS G&M		
Sample/Core	Log	(Cont.d)

Boring/Well

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SB-03-03/G6M-03-03X

Prepared by

Diane Mosher

Sample #	Depth (ft bls)	Core Recovery (inches)	Blow counts	PID (ppm)	Sample/Core Description	USCS
						<u> </u>
S-20	89-91	4	61-35-23-11	132	Grev TILL, consisting of gravels, very fine to fine sand, silt and clay	GM
					Bottom of boring 91' bgs	
					No refusal encountered	
					NOTES:	
					1. One 55-gallon drum of soil containerized	
		1			2. See well completion log for well construction details.	
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ite ocation		AOC 50) - Ayer. MA		Drilling Drilling Started 4/18/2003 Completed 4/18/2003	
-				Hole	Type of Sample/	
otal Depth D	rilled _	31	Feet	Diameter	4 inches Coring Device Split Spoon	<u>.</u>
ength and Di f Coring Dev	ameter ice _		2' long	. 2" diam	eter Sampling Interval Continuous to W.T., then every 5 ft	
and-Surface	Elev.		feet		Estimated Datum	
rilling Fluid l	Jsed			Water	Drilling Method Drive and Wa	ısh
orilling Contractor		Subsu	rface Drilling	& Remed	iation Driller Jim Helper	John
repared					Hammer Hammer	
y -		·	Diane Mo	sher	Weight 140 Drop 30	Ins.
		Core				
	Depth	Recovery	Blow counts	PID (ppm)	Sample/Core Description	USCS
Sample #	(π bis)	12	5/9/11/15	0.2	Surface debris to 2", then coarse SAND, with fine sand, some gravel	SP
3-1	0-2				trace of silt, dry, poorly sorted	
	2-4	4	100 for 5"	89.1	Coarse SAND, fine to very sand, some silt and clay.	SM
					gravel, dry, poorly sorted	·
					· · · · · · · · · · · · · · · · · · ·	ļ
S-3	4-6	4	3/4/4/refusal	1.2	Concrete, then fine to coarse SAND, trace of silt, poorly sorted	SP
		<u> </u>			Moved forward 4', moved 3 times, used augers to break through	<u> </u>
					reinforced concrete, broke through at 9 to 9.5'	
	ļ				· · · · · · · · · · · · · · · · · · ·	<u> </u>
S-4	10-12	4	1/2/4/4	1.1	Mostly slough concrete from breaking through the reinforced	<u>SM</u>
			· .		concrete. Brown fine to very fine SAND, some clay with a trace of silt.	<u> </u>
<u></u>					Saturated rock at 2 to 2.5". Poorly sorted, with some iron	+
				1	statning.	
c :	3,1.16	11	26/27/11/0	247	Top 1' - Fine to coarse SAND gravel, poorly sorted	SF
	14-10		201211117		Bottom 10" - Fine to very fine SAND, some coarse sand, trace silt and clay	SN
	1				small clay laver at 10°, saturated.	
				1		
S-6	19-21	12	11/12/11/9	9.7	Fine to very fine SAND, some clay, trace of silt, well sorted.	sc
					saturated	_
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ARCADIS GAM Sample/Core Log (Cont.d)

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Boring/Well		SB-03	-04A/G6M-03	-04X	- Page <u>2</u> of	2
Prepared by			Diane Mosher		· ·	
Sample #	Depth (ft bls)	Core Recovery (inches)	Blow counts per 6 Inches	PID (ppm)	Sample/Core Description	USCS
S-7	24-26	10	11/11/17/15	2.5	Similar to S-6	SC
S-8	29-31	12	12/9/15/19	0.0	Similar to S-6. some iron staining throughout	sc
						_
					Bottom of boring - 31' bgs	
					No bedrock refusal encountered	
					NOTES:	
					1. Approximatley 1/2 of 55-gallon drum of soil cuttings from drilling	
					containerized	
			· .		2. See well completion log for well construction details.	
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lite		AOC	50 - Aver. MA	<u> </u>	Drilling Drilling Started 4/14/2003 Completed 4/14/2003						
otal Depth D)rilled	18	Feet D	Hole Diameter	Type of Sample/ inches Coring Device Split Spoo	n					
Length and Diameter of Coring Device Land-Surface Elev.			2' lon	g, 2" diar	neter Sampling Interval Continuous to W.T	then every 5					
			feet		Estimated Datum						
Drilling Fluid	Used _			water	Drilling Method Hollow Stem Auger						
)riiling Contractor		Subs	surface Drillin	g & Rem	ediationDrillerJimHelperJohn						
Prepared By			Diane N	√losher	Hammer Hammer Weight <u>140</u> Drop <u>30</u>	ins.					
		•			· · · · · · · · · · · · · · · · · · ·						
Sample #	Depth (ft bis)	Core Recovery (inches)	Blow counts per 6 Inches	PID (ppm)	Sample/Core Description	USCS					
S-1	0-2	12	13/20/13/15	0.0	Top 4" - Gravel. coarse SAND. fine sand	SP					
					Middle 4" - gravelly SAND. rock						
					Bottom 4" - Brown coarse SAND, fine sand, gravel, dry, dense at rock						
					area						
S-2	2-4	15	15/13/12/11	0.0	Top 4" - Brown fine to coarse SAND, some silt, dry	SM					
					Bottom 11" - Light brown, fine to very fine SAND, some silt, dry						
S-3	4-6	15	10/10/10/11	0.0	Fine to very fine SAND. some silt.	SM					
S1	6-8	12	10/10/9/8	0.0	Similar to S-3, some iron staining at 6' to 6.25'	SM					
· ·											
S-5	8-10	14	9/8/8/8	0.0	Similar to S-3	SIVI					
S-6	10-12	NM	8/9/9/15	0.0	Similar to S-3. wet at 10"	SM					
· · ·		ļ									
 	ļ	<u> </u>			Bottom of Boring - 18 ft bgs						
				<u> </u>	No refusal encountered						
			+		NOTES:						
		+		1	1. Drill to 18 ft bgs to set a temporary well						
		-			2. Say well completion loss for well construction details						

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Boring/Well	SB-03-04	B/SVE-6	Project/No.		MA000664.004A.0002 Page 1	of1				
Site Location		AOC 50	- Ayer, MA	· · · · · · · · · · · · · · · · · · ·	Drilling Drilling Started 4/15/2003 Completed 4/1	5/2003				
Total Depth	Drilled _	14	Feet	Hole Diaı_	Type of Sample/ inches Coring DeviceSpl	it Spoon				
Length and Diameter of Coring Device			2' long	g, 2" diar	' diameter Sampling Interval Continuous					
Land-Surfac	e Elev.		feet [Estimated Datum					
Drilling Fluid	Used			Water	Drilling Method Ho	llow stem auger				
Drilling Contractor		Subsu	face Drilling	& Rem	ediation Driller Jim Help	er John				
Prepared By Dian				losher	Hammer Hammer Weight 140 Drop 30 ir					
					· · · · · ·					
Sample #	Depth (ft bls)	Core Recovery (inches)	Blow counts per 6 Inches	PID (ppm)	Sample/Core Description	USCS				
S-1	0-2	. 2	2/3/3/2	0.0	Loam, woody debris, rock, sand					
S-2	2-4	· 0	1/1/1/1		No recovery					
			1/4/4/4	1.7	First 91 Desug first to score SAND, some with and group house	SP				
<u>S-3</u>	4-6	13.5	1/4/4/4	1.2	Middle 2" - Fine to coarse SAND, some silt, iron staining					
					Bottom 3.5" - Similar to first 8"					
S-4	6-8	17	4/5/5/5	0.0.	Brown fine to very fine SAND, some silt, wet at 15	SM				
S-5	8-10	23	5/5/6/7	0.0	Similar to S-4, saturated, some iron staining throughout	SM				
S-6	10-12	24	7/6/6/7	0.0	Similar to S-4, with trace clay, iron staining	SM				
S-7	12-14	24	8/7/8/6	0.0	Similar to S-4	SM				
					Bottom of boring 14' bgs					
					No refusal encountered	······				
					NOTES:					
					1. One 55-gallon drum of soil containerized					
					2. See well completion log for well construction details.					

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S-7

S-8

19-21

24-26

Boring/Well	SB-03-05B/G	6M-03-05X	Project/No.		MA000664	1.004A.0002		Page	1	of	2
Site Location		AOC 50	- Ayer, MA		Drilling Started	4/14/2003	Drilling Completed		4/14/2	.003	
Total Depth I	Drilled	51	Feet	Hole Diameter	inches	Type of S Coring D	Sample/ vevice		Split S	poon	
Length and [of Coring De)iameter vice		2' long	g. 2" diam	eter		Sampling Interv	al <u>Conti</u>	nuous to W.	T., then ev	ery 5 ft
Land-Surface	e Elev.		feet [Estimated	Datum					<u>.</u>
Drilling Fluid	Used			Water			Drilling Method		Drive and Wash		
Drilling Contractor		Subsur	face Drilling	& Remed	iation		Driller	Jim	Helper	John	-
Prepared By			Diane Mo	osher			Hammer Weight	140	Hammer Drop	30	ins.
Sample #	Depth (ft bls)	Core Recovery (inches)	Blow counts per 6 Inches	PID (ppm)			Sample/Core Descrip	Dion			USCS
S-1	0-2	12	8/13/7/4	0.0	Top 5" - loam. co	oarse SAND, ro	ck at 2.5"-2.75", t	hen SAND) coarse.		SP
				 	Bottom 5" - Dark	t brown fine to	coarse SAND. sor	ne gravel.	slightly moi	st.	
S-2	2-4	14	4/4/7/7	0.0	Top 3" - Coarse	SAND, some fi	ne sand, trace silt.				SP
					Middle 9" - Fine to coarse SAND . dry						SP
					Bottom 2" - Fine	SAND and silt					SM
S-3	4-6	18	8/8/8/10	0.0	Fine to very fine	SAND. some i	ron staining, dry,	dense.	<u></u>		SM
S-4	6-8	15	8/9/10/10	0.0	Similar to S-3			······································			SM
S-5	8-10	18	8/10/10/8	0.0	Similar to S-3.	Saturated at 9 ft	bgs.				SM
		7	7/8/7/10		Brown fine to c	oarse SAND s	ome silt saturated			<u> </u>	SM

staining throughout

Similar to S-6, iron staining throughout.

Similar to S-6, iron staining at approximately 20'-20.4', saturated, loose.

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SM

SM

5/3/2/3

3/1/3/3

16

20

0.0

0.0

ARCADIS GAM Sample/Core Log (Cont.d)

Boring/Well		SB-03-	05B/G6M-03-	05X	Page 2 of	2
Prepared by		Diane Mosher				
Sample #	Depth (ft bis)	Core Recovery (inches)	Blow counts per 6 Inches	PID (ppm)	Sample/Core Description	USCS
S-9	29-31	18	6/6/6/4	0.0	Brown line to very fine SAND, trace of silt, saturated, iron staining at	SM
					approximately 29.5 - 29.6'	
S-10	34-36	15	4/5/7/5	0.0	Similar to S-9. small iron stains at approximately 34.7' and at 34.8'	SM
S-11	39-41	20	4/3/3/6	0.0	Top 10" - Similar to S-9:	SM
					Bottom 11" - Fine to coarse SAND, trace silt, iron staining at 40' - 40.8'	SM
					· · · · · · · · · · · · · · · · · · ·	
S-12	44-46	9.5	40/34/100/3"	0.0	Weathered rock to 6" then a fine sand/till layer	
	46-51				Roller bit from 46' to 51' bags	
		<u> </u> .			Rock seam at 49.2 to 49.8 rock seam with iron staining	
					Patienal encountered at 45' https	
					Bottom of borehole - 51' bgs	
		-			NOTES:	
					1. See well completion log for well construction details.	
				-	· · · · · · · · · · · · · · · · · · ·	
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Boring/Well <u>G6M-0</u>	03-07X Project/No.	MA00)0664.004A	.0002	Page	of	2
Site			Drilling	Drilling	I		
Location	Devens, A	AOC 50	Started	4/21/2003 Compi	eted	4/23/2003	
				Type of Sampi	e/		
Total Depth Drilled	100 Feet	Hole Diameter 4	inches	Coring Device		Split Spoon	
Length and Diameter of Coring Device		2' long, 2" diameter		Sampl	ing Interval	~5feet	
Land-Surface Elev.	feet	Surveyed	Estimated	Datum		- <u>.</u>	
Drilling Fluid Used		Water		Drilling	Method	Drive and W	ash
Drilling Contractor	Subsurfac	e Drilling & Remediation		Driller Pl	nil Hel	per <u>Bra</u>	d
Prepared				Hammer	Hamm	er	
Ву		Deb Hornberger		Weight1	40 Drop	<u>30</u> ins.	

Sample #	Depth (ft bis)	Recovery (inches)	Blow counts per 6 Inches	PID (ppm)	Sample/Core Description	USCS
S-1	59-61	10	12/14/21/19 0.1 Top 6" brown,		SM	
					Bottom 4" brown, dense, fine SAND with medium sand	SM
		,				
S-2	64-66	12	18/23/30/26	0.2	Brown, very dense, fine to medium SAND	SM
S-3	69-71	14	13/19/21/19	0.1	Brown, dense, fine SAND & SILT, few layers (<2") of	SM
			·		fine sand, some medium sand	
S-4	74-76	14	17/19/39/41	0.1	Orange brown, very dense, fine to medium SAND,	SM
					trace silt	
S-5	79-81	12	19/23/25/24	76.4	Brown, dense, fine to medium SAND	SM
S-6	84-86	16	8/12/18/29	52.2	Top 4" brown to gray, very stiff, SILTY CLAY	ML
					Middle 2" alternating brown, medium dense, fine to	SC
	1				medium SAND and grey, very stiff, SILTY CLAY	
				169	Bottom 10" brown, medium dense, fine to medium SAND	SM
	*drille	rs indicat	e clay in cuttin	igs at ~	82 ft.	

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ARCADIS G&M Sample/Core Log (Cont.d)

Boring/Well

G6M-03-07X

Prepared by

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Deb Hornberger

		Core		-		
O a secola di	Depth	Recovery	Blow counts	(nnm)	Sample/Core Description	USCS
Sample #	(11.015)	(increa)		/Philip		
				_		
S-7	89-91	14	12/22/28/35	0.0	Brown, dense, fine to medium SAND	SM
S-8	94-96	12	not recorded	0.0	Brown, fine to medium SAND	SM
					· ·	
 S-9	99-101	16	26/26/24/27	0.0	Brown, dense, fine to medium SAND, few layers	SM
<u></u>					(<2" thick) of fine sand	
·					Bottom of boring - 100' bgs	
					No refusal encountered	
	ļ			ļ	NOTES:	
					1. See well completion log for well construction details.	
					2. Set well @ 90', see well construction log for details.	
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ARCADIS G&M Sample/Core Log

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Boring/WellG6M-	03-08X Project/No.	MA	.000664.00	4A.0002		Page 1	of	3
Site Location	Devens, AOC	50	Drilling Started	4/11/2003	Drilling Completed		4/16/2003	
Total Depth Drilled	150 Feet	Hole Diameter 4	inches	Type o Coring	f Sample/ Device		Split Spoor	n
Length and Diameter of Coring Device		2' long, 2" wide			Sampling in	terval	~5	feet
Land-Surface Elev.	feet	Surveyed	Estimated	Datum				
Drilling Fluid Used		Water			Drilling Meth		Drive and	Wash
Drilling Contractor	Driller	Phil	Helper	В	srad			
Prepared By	Deb	Hornberger		Hamm Weight	er t140	Hammer	30	ins.

Consola di	Depth	Core Recovery	Blow counts	PID (ppm)	Sample/Core Description	USCS
Sample #	4-6	12	6/7/5/8	0.6	Light brown, medium dense, fine to medium SAND	SM
					with coarse sand, trace gravel	
					Bottom 2" light brown, medium dense, fine to medium	SM
			·		SAND, trace coarse sand	
					· · · · · · · · · · · · · · · · · · ·	
S-2	19-21	12	18/15/18/24	278.0	Brown, dense, fine to coarse SAND, some angular	SM
					gravel	
<u>S-3</u>	39-41	6	10/8/9/10	565.0	Brown, medium dense, fine to coarse SAND few	SM
					subangular gravel	
		ļ	<u> </u>			
S-4	59-61	8	10/11/12/14	417.0	Brown, medium dense, fine to medium SAND with	SM
		<u> </u>	<u> </u>		coarse sand, trace gravel	
					·	· ·
S-5	64-66	10.	6/9/8/12	>1,100	Light brown, medium dense, fine to medium SAND,	SM
					trace coarse sand	
S-6	69-71	0	8/12/14/16		No recovery	
					······································	

ARCADIS G&M Sample/Core Log (Cont.d)

Boring/Well

G6M-03-08X

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Prepared by

Deb Hornberger

	Depth	Core Recovery	Blow counts	PID	Damala/Care Description	11808
Sample #	(ft bis)	(inches)	per 6 inches	(ppm)		0000 CM
S-7	74-76	12	11/11/15/18	4.0	Light brown, medium dense, fine to medium SAND	SIM
					trace coarse sand	
·			-			
S-8	79-81	12	8/12/10/16	4.6	Brown, medium dense, fine to medium SAND, some	SM
				·	coarse sand.	
S-9	84-86	0	3/8/12/14	<u> </u>	No recovery	
S-10	89-91	8	9/10/15/19	6.0	Light brown, medium dense, fine to medium SAND	SM
S-11	94-96	10	13/16/23/30	4.6	Brown, dense, fine to medium SAND	SM
S-12	99-101	8	8/15/17/17	6.7	Top 4" brown, dense. fine SAND, some silt,	ML
					Bottom 4" brown, dense, fine to medium SAND	SM
S-13	104-106	8	10/14/17/12	5.7	Top 2" light brown, dense fine SAND, some silt	ML
				•	Middle 5" brown, dense, fine to medium SAND	SM
					Bottom 1" light brown, dense, fine SAND, some silt	ML
					· · · · · · · · · · · · · · · · · · ·	<u> </u>
S-14	109-111	8	7/13/13/14	7.7	Top 3" light brown, medium dense, fine to medium	SM
					SAND trace silt	
	•,				Middle 2" light brown, medium dense, fine SAND, some silt	ML
					Bottom 3" light brown, medium dense, fine SAND with	SM
					medium sand	
S-15	114-110	6 6	14/14/14/16	7.6	Brown, fine to medium SAND, few coarse sand, trace silt	SM
S-16	119-12	1 6	5/6/6/8	9.0	Brown, medium dense, fine to coarse SAND, trace silt	SM

ARCADIS GEM Sample/Core Log (Cont.d)

Boring/Well

G6M-03-08X

Deb Hornberger

Prepared by

		Core				
	Depth	Recovery	Blow counts	PID		11000
Sample #	(ft bis)	(inches)	per 6 Inches	(ppm)	Sample/Core Description	
S-17	124-126	6	9/13/12/16	7.1	Brown, medium dense, fine to medium SAND with coarse	SM
				<u></u>	sand	
S-18	129-131	10	12/18/20/23	9.0	Top 4" brown, dense, fine to medium SAND, some	SM
				<u></u>	coarse sand	
					Bottom 6" alternating layers (~2") of brown. dense fine	
					SAND, few silt and brown, dense, fine to medium	
					SAND, trace coarse sand	
S-19	134-136	8	16/21/22/21	4.1	Alternating ~2" layers of brown. dense, fine to medium	SM
					SAND. few coarse sand and brown, dense. fine SAND and	
					SILT	
					·	
S-20	139-141	6	13/16/21/19	4.4	Brown, dense fine to medium SAND, trace coarse sand	SM
S-21	144-146	12	16/15/15/19	3.7	Brown, dense, fine to medium SAND, some coarse SAND	SM
					·	
S-22	149-151	12	13/21/26/27	3.6	Brown, dense, fine SAND & SILT	ML
					Bottom 2" brown, dense, fine SAND	·.
				·	Bottom of boring - 151' bgs	
					No refusal encountered	
					·	
					NOTES:	
					1. See well completion log for well construction details.	

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ARCADIS G&M Sample/Core Log

Boring/Well G6M-0	03-09X Project/No.	MA000664.004A.0)002F	Page 1	of2
Site Location	Devens, AOC 50	Drilling Started 4/17	Drilling /2003_Completed	4/1	18/2003
Total Depth Drilled	Hole 150 Feet Diameter	inches	Type of Sample/ Coring Device	Spl	it Spoon
Length and Diameter of Coring Device	2' long, 2" diam	eter	Sampling Inter	rval	5feet
Land-Surface Elev.	feetSurve	yed Estimated	Datum	· · · · · · · · · · · · · · · · · · ·	
Drilling Fluid Used	Water		Drilling Method	d <u>Dr</u>	ive and Wash
Drilling Contractor	Subsurface Drilling & Reme	diation	Driller Phil	Helper	Brad
Prepared By	Deb Hornberger		Hammer H _Weight <u>140</u> [Hammer Drop <u>3</u>	0ins.

Sample #	Depth (ft bls)	Core Recovery (inches)	Blow counts per 6 Inches	PiD (ppm)	Sample/Core Description	USCS
S-1	49-51	6	13/13/10/8	1.2	Brown, medium dense, fine to coarse SAND. few gravel	SM
S-2	59-61	8	Not Recorded	1.9	Brown, fine to coarse SAND, trace gravel	ŠM
			10/22/22/12			MI
- S-3	124-126	10	19/32/32/42	1.2	Bottom 5" brown, very dense, fine SAND, some sin	SM
					trace coarse sand	· · · ·
S-4	129-131	10.	19/29/30/34	0.9	Brown, very dense, fine to medium SAND, a few layers	SM
. • 		- <u></u>			(<1/4") of fine SAND, bottom 2" brown, very dense	
· · ·					fine SAND, some silt	
S-5	134-136	5 8	10/13/24/25	97	Brown, dense, fine to medium SAND, few coarse sand	SM
	_				toward bottom of sample	
s - S-6 s	139-14	ι <u>4</u>	17/20/34/30	247	Brown, very dense, fine to medium sand, gravel in tip	SM

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ARCADIS G&M Sample/Core Log (Cont.d)

Boring/Well

G6M-03-09X

Prepared by

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 Deb Hornberger

Core PID Recovery Blow counts Depth uscs Sample/Core Description (inches) per 6 Inches (ppm) Sample # (ft bis) SM 11/15/18/25 3.4 Brown, dense, fine to coarse SAND 144-146 8 S-7 . Brown, dense, fine to medium SAND, some coarse SM 15/18/21/21 0.3 149-151 10 S-8 sand . Bottom of boring - 151' bgs No refusal encountered NOTES: 1. See well completion log for well construction details. ۰.

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ARCADIS G&M Sample/Core Log

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1	Boring/Well G6	4-03-10X Project/No MA000	64.004A.0002	Page	_1 of	3
	Site Location	Devens, AOC 50	illing Drilling arted <u>4/8/2003</u> Completed		4/10/2003	
1	Total Depth Drilled	141 Feet Hole Diameter 4_i	Type of Sample/ ches Coring Device		Split Spoon	
	Length and Diamete	2' long, 2" diameter	Sampling l	nterval _	~5	feet
]	Land-Surface Elev.	feet Surveyed	stimated Datum			
Ì	Drilling Fluid Used	Water	Drilling Me	thod _	Drive and Wash	
Ì	Drilling Contractor	Subsurface Drilling & Remediation	Driller Phil	Helper	Brad	
1	Prepared By	Deb Hornberger	Hammer Weight <u>140</u>	Hamm Drop	er 30	ins.

Sample #	(ft bis)	(inches)	per 6 Inches	(ppm)	Sample/Core Description	USC
S-1	4-6	16	3/4/4/7	1.2	Brown, loose, fine to medium sand, some coarse SAND, trace silt	SN
S-2	19-21	8	17/14/11/11	8.9	Grey/brown, medium dense, fine to coarse SAND, with	Gì
					subangular gravel	
S-3	39-41	8	12/13/11/60	3	Grev, fine to coarse SAND, few subangular gravel	Sì
S-4	59-61	10	18/25/24/30	22	Light brown, dense, fine to medium SAND, some silt,	Si
					trace coarse sand	
S-5	64-66	12	14/22/28/31	164*	Light brown, dense, fine SAND, some medium sand & silt	S
S-6	69-71	12	15/20/26/30	42	Light brown, dense, fine SAND, some silt & medium	S
					sand, more medium sand towards bottom of sample	
S-7	74-76	0	12/12/19/21		No recovery	
S-8	79-81	0	14/16/18/24		No recovery	
5.0	84-86	8	8/13/19/20	4.3	Light brown, dense, fine to medium SAND, few silt	S

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ARCADIS G&M Sample/Core Log (Cont.d)

Boring/Well

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G6M-03-10X

Prepared by

Deb Hornberger

Sample #	Depth (ft bis)	Core Recovery (inches)	Blow counts per 6 Inches	PID (ppm)	Sample/Core Description	USCS
S-10	89-91	8	14/25/26/28	4.2	Top 3" light brown, very dense, fine to medium SAND, some silt	SM
					Bottom 5" light brown, fine sand with silt, trace medium sand	ML
S-11	94-96	10	19/23/23/26	6	Top 8" light brown, dense, SILT & fine SAND	ML
					Bottom 2" light brown, dense, fine to medium SAND, some silt	SM
S-12	99-101	10	15/21/22/31	6.9	Light brown. dense, fine to medium SAND, few silt	ŚM
S-13	104-106	8	23/24/28/25	5.7	Top 4" light brown, very dense, fine to medium SAND, some	SM
					coarse sand	
					Bottom 4" light brown, very dense, fine to medium SAND, trace silt	SM
·						
S-14	109-111	6.	19/21/27/33	6.2	Light brown, dense, fine to medium SAND, few silt, more fine sand	· SM
		<u> </u>			toward bottom 2"	_
					· · · · · · · · · · · · · · · · · · ·	
S-15	114-116	10	19/31/29/27	3.4	Light brown, very dense, fine to medium SAND, some silt	SM
	<u> </u>				·	
S-16	119-121	9	16/44/41/31	18.8	Top 3" light brown, very dense, fine to medium SAND, few silt	SM
					Middle 4" brown, very dense, fine to medium SAND, few coarse sand	
					Bottom 2" brown, very dense, fine to medium SAND, some silt	
S-17	124-126	6	17/21/34/36	29.7	Top 4" brown, very dense, fine to medium SAND, few coarse sand	SM
					Bottom 2" brown, very dense, fine SAND, some silt, trace medium	ML
					sand	
S-18	129-13	12	18/29/31/38	3.7	Top 6" brown, very dense, fine to medium SAND trace coarse sand	SM
					Bottom 6" brown, very dense, fine SAND and SILT	ML

3

of

Page 2

ARCADIS GRM Sample/Core Log (Cont.d)

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Boring/Well			G6M-03-10X		Page 3 of	3
Prepared by	y	D	eb Hornberge	r	-	
Sample #	Depth (ft bis)	Core Recovery (inches)	Blow counts per 6 Inches	PID (ppm)	Sample/Core Description	USCS
S-19	134-136	12	14/24/29/39	5.5	Brown, very dense, fine to medium SAND, trace coarse sand	SM
S-20	139-141	12	26/33/40/38	5.7	Brown, very dense, SILT, 2" of fine SAND, SILT again in tip	ML
	<u> </u>				Bottom of boring 141' bgs	
					No refusal	
					NOTES:	
					1. See well completion log for well construction details.	

2. Drill cuttings drummed

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G:\A_Pricts\Fort Devens\AOC 50\Logs\SampleCoreLogs G6M-03-01X thru G6M-03-11X.xls-G6M-03-10X

ARCADIS G&M Sample/Core Log

oring/Well	G6M-0	3-11X	Project/No.		MA000664.0006	Page i	of	3
lite ocation		Deve	ens, AOC 50		Drilling Drilling Started 5/12/2003 Comp) leted	5/13/2003	
otal Depth D	rilled	147	Feet D	Hole Diameter	Type of Samp 4inches Coring Device	le/	Split Spoon	
ength and D	iameter ice		2' long	g, 2" dian	eter Samp	ling Interval5 f	t from 80'-147'	feet
and-Surface.	Elev.		feet]	Estimated Datum			
Drilling Fluid	Jsed .	<u></u>			Drillin	g Method	Hollow Stem A	uger
Drilling Contractor			Dragin Dri	lling, Inc	Driller M	ike Helper	Steve, N	lick
Prepared ` By			Deb Hor	nberger	Hammer Weight	Hammer Drop	•	ins.
Sample #	Depth (ft bls)	Core Recovery (inches)	Blow counts per 6 Inches	PID (ppm)	Sample/C	ore Description		US
S-1	80-82	8	7/8/10/13	0.0	Top 2" medium dense, fine to med	ium SAND		SI
					Bottom 6" brown, fine to medium	SAND with coarse	e sand	
S-2	85-87	12	9/10/12/12	0.0	Top 2" brown, medium dense, fine	to medium SANI)	Sì
					Middle 4" brown, fine SAND, trac	e silt		
					Bottom 6" brown, fine to medium	SAND		
S-3	87-89	24	8/9/14/15	0.0	Top 14" brown. medium dense, fii	ne to medium SAN	1D	S
					Bottom 10" brown, medium dense	. fine to coarse SA	ND.	
					trace gravel			
<u>S-4</u>	89-91	18	12/13/15/17	0.0	Brown, medium dense, fine to coa	arse SAND, trace g	gravel	<u> </u>
S-5	91-93	20	9/12/13/13	0.0	Top 10" brown. fine to medium S	AND, trace coarse	e sand	S
				ļ	Middle 6" brown, fine SAND, so	me silt & medium	sand	
				ļ	Bottom 4" brown, fine SAND &	SILT		<u> </u>

ARCADIS G&M Sample/Core Log (Cont.d)

Deb Hornberger

Boring/Well G6M-03-11X Page 2 of

3

Prepared by

Core PID Depth Recovery Blow counts (ppm) Sample/Core Description USCS per 6 Inches (inches) Sample # (ft bis) Top 10" brown, dense, fine to medium SAND SM 15/17/18/21 0.0 93-95 24 S-6 Bottom 14" brown, dense, SILT & fine SAND ML 7/9/10/10 0.3 Top 12" brown, medium dense, fine SAND & SILT ML 20 S-7 95-97 Bottom 8" brown, medium dense, fine to medium SAND, SM trace silt Brown, medium dense, alternating ~2" layers of fine to ML 97-99 8/10/13/14 3.8 S-8 20 medium SAND and fine SAND & SILT 7.7 Brown, fine to medium SAND, trace fine SAND layers SM 99-101 20 Not Recorded S-9 (<1" thick) SM Brown, medium dense, fine to medium SAND, trace fine S-10 101-103 20 10/10/11/16 3.7 SAND & SILT layers (<1" thick) SM 1.5 Brown, medium dense, fine to medium SAND, trace fine 103-105 18 9/12/13/15 S-11 SAND & SILT layers (<1" thick) SM 2.2 Brown, fine to medium SAND, trace silt S-12 105-107 18 Not Recorded ... SM 2.3 Similar to S-12 107-109 S-13 16 Not Recorded SM 3.6 Similar to S-12 S-14 109-111 16 Not Recorded SM 6.8 Brown, fine to medium SAND, few fine sand layers S-15 111-113 20 Not Recorded (<l" thick)

ARCADIS G&M Sample/Core Log (Cont.d)

oring/Well	-	(G6M-03-11X		Page 3 of	3
repared by	-	D	eb Hornberge	r	_ · · · ·	
Sample #	Depth (ft bls)	Core Recovery (inches)	Blow counts per 6 Inches	PID (ppm)	Sample/Core Description	USCS
S-16	113-115	20	Not Recorded	0.0	Top 10" brown, fine to medium SAND, few fine sand	SM
					layers (<1" thick)	
					Bottom 10" brown, fine to coarse SAND, more fine to	
					medium sand in bottom 4"	
					* boulder @ 118-119'	
						·
S-17	130-132	20	Not Recorded	4.8	Top 12" brown, fine to medium SAND. some coarse sand	SM
	150 155		· ·		Bottom 8" brown, clayey SILT, few fine sand	ML
C 19	135-137	18	Not Recorded	2.1	Top 12" grey-brown, CLAY	CL
3-10	155-157	10			Bottom 6" brown, fine SAND, some med sand	ML
	137-139	16	11/17/23/25	0.0	Top 14" brown, dense, clayey SILT, few fine sand layers	ML
					Bottom 2" grey, dense, SILT, trace fine sand	ML
	1					
S-20	139-141	12	Not Recorded	0.0	Grey, SILT & fine SAND, trace clay	ML
	1					
S-21	141-143	20	Not Recorded	0.0	Grey. SILT, some clayey silt & fine sand	ML
	143-14	5 20	Not Recorded	0.0	Grey, clayey SILT, trace fine sand	ML
5-23	145-14	7 20	Not Recorded	0.0	Similar to S-22	ML
	140-14	, <u> </u>				
				<u> </u>	Bottom of Boring 147 ft bgs	
			-		No refusal encountered	
				1		
	-			1	NOTES:	
<u> </u>					* Drill cuttings above 80' are 0.0 ppm.	

	Well Construction Log (Unconsolidated)
	↓ LAND SURFACE
	4 inch diameter dritted hole
	Well casing, <u>2</u> inch diameter, Schedule 40 PVC
	Backfill
	3-94 lbs bags Portland Grout Cement/Bentonite Grout (20:1)
	46 ft"
	Bentonite slurry 49_ft [*] x pellets
, - , . , .	ft*
	Well Screen. <u>2</u> Sched 40 PVC, 20
	Gravel Pack
	Formation Collaspse
	70 ft ⁻
	Macauria Roist is
	Top of Well Casing Unless Otherwise Noted.
	WELLCSTR IW-1 lhru G6M-03-10X.XLS/G6M-03-01X.xls 10/16/2003

Project	MA000664.0	004A	Well	G6M-03-01
Town/City	Ayer			
County	Middlese	x	State	MA
Permit No.				
Land-Surface	Elevation and C	atum:		
		feet	🗌 Sur	veyed
			🔲 Est	imated
Installation Da	ite(s)	4/8/	03 - 4/9/03	3
Drilling Metho	d	Driv	e & Wash	I
Drilling Contra	actor Su	hsurface D	rillina & Ri	emediation
			Mintor	
Unilling Fluid			vvater	<u> </u>
Development	Equipment Tec	hnique(s) a	and Date(s	3)
Grunfos Pum	p (Rediflow 2)+	N68		
Surge & pum	p	<u> </u>		
4/21/2003				
Fluid Loss D	uring Drilling	<u>1</u>	75	gailons
Water Remo	ved During Dev	elopment	275	gallons
Static Depth	to Water		fee	t below M.P.
Pumping De	pth to Water		fee	et below M.P.
Pumping Du	ration2	. <u>5</u> ho	urs	
Yield		gpm .	Da	ite4/21/20
Specific Cap	acity	gp	om/ft	
Weli Purpos	e Monito	. groundwa	ter quality	
	<u></u>	<u> </u>		
Remarks_	Bottom	of boreho	e (from 72	2' - 76') is
plugged wit	h bentonite pelli	ets		
Prepared b	v	Γ	Diane Mos	her

Well Construction Log (Unconsolidated)



WELLCSTR IW-1 thru G6M-03-10X.XLS/G6M-03-02X.xls 10/16/2003

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Well Construction Log (Unconsolidated)			
· · · · · · · · · · · · · · · · · · ·	Project MA	4000664.004A	Well <u>G6M-03-03X</u>
	Town/City	Ayer	
	County	Middlesex	State MA
4 inch diameter	Permit No.	<u></u>	
drilled hole	Land-Surface Elevat	ion and Datum:	
		feet	Surveyed
Well casing,			Estimated
inch diameter,	Installation Date(s)	4/16/0	3 - 4/18/03
Sched 40 PVC	Drilling Method	Driv	e & wash
Backfill	•		
X Grout 4-25 lb bags Portland	_ Drilling Contractor	Subsurface Dr	illing & Remediation
	Drilling Fluid		Water
Bentonite	Development Equip	ment lechnique(s) a	nd Date(s)
74 ft ⁺ X pellets	Whaler pump		
	Surge & pump		
	4/21/2003		<u></u>
	Fluid Loss During D	Drilling7	5gallons
	Water Removed Du	uring Development	<u>195</u> gallons
	Static Depth to Wat	ter	feet below M.P.
Well Screen. 2 inch diameter	Pumping Depth to \	Water	feet below M.P.
Sched 40 PVC 20 slot	Pumping Duration	hou	Irs
	Yield	gpm	Date
	Specific Capacity	יםם	π/ft
		JP	
	Well Purpose	Monitor groundwat	er quality
			······································
85 ft*	· ····································	······································	
89 ft"	Remarks	Borehole is plugge	d with bentonite
	from 86-89' bgs.		
Measuring Point is	<u></u>		
Top of Well Casing Unless Otherwise Noted.			
 Depth Below Land Surface 	······		
	Prepared by	D	iane Mosher

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Well Construction Log (Unconsolidated)			
「」 不 ft	Project M.	A000664.004A	Well G6M-03-04X
V LAND SURFACE	Town/City	Ayer	
	County	Middlesex	State MA
inch diameter	Permit No.		
drilled hole	Land-Surface Eleva	tion and Datum:	
		feet	Surveyed
Well casing,			Estimated
inch diameter,	Installation Date(s)	4/1	8/2003
Sched 40 PVC	Drilling Method	Drive & wash fr	om 10' bgs - 30' bgs
Backfill	Ĵ	hollow stem auger fro	om land surface to 10' bgs
X Grout 3-25 lbs of Portland	Drilling Contractor	Subsurface Dr	Illing & Remediation
	Drilling Fluid		Water
11 11			
	Dovolopment Equin	mont Technique(r) a	nd Date(s)
Bentonite	Development Edah	inent rechnique(s) a	iu Dale(s) .
14ft* X pellets	Whaler pump		
	Surge & pump		
	4/21/2003		
	Fluid Loss During [Drilling 50	gallons
15 ft*	Water Removed D	uring Development	82gailons
	Static Depth to Wa	ter	feet below M.P.
Well Screen. 2 inch diameter	Pumping Depth to	Water	feet below M.P.
Sched. 40 PVC 20 _ slot	Pumping Duration	hou	Irs
	Yield	gpm	Date
Gravel Pack	Specific Capacity	gpr	n/ft
Sand Pack			
Formation Collaspse	Well Purpose	Monitor groundwate	er quality
	······		
<u>30</u> ft*	Remarks		
<u>31</u> ft*			
		· · · · · · · · · · · · · · · · · · ·	
Measuring Point is Top of Well Casing Unless Otherwise Noted.			
* Denth Below Land Surface			
	Prepared by	D	ane Mosher

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Well Construction Log (Unconsolidated)

不 ft	Project MA000664.004A Well G6M-03-05B
V LAND SURFACE	Town/CityAyer
1	County Middlesex State MA
drilled hole	Permit No.
	Land-Surface Elevation and Datum:
	feet Surveyed
Well casing,	Estimated
2 inch diameter,	Installation Date(s) 4/15/2003
Sched 40 PVC	Drilling Method Hollow stem auger
/ Backfill	
Grout	Drilling Contractor Subsurface Drilling & Remediation
	Drilling Fluid None
3 fi *	
<u> </u>	Development Equipment Technique(a) and Date(a)
Bentonite	Development Equipment Technique(s) and Date(s)
6 ft* Xineliets	4/16/2003
	Pailar
	Dallei
0 4*	Fluid Loss During Drilling 0 gallons
u	Water Removed During Development5_gallons
	Static Depth to Water 14.72 feet below M.P.
Well Screen.	Pumping Denth to Water N/A feet below M.P.
Sched. 40 PVC ,	
	Pumping Duration <u>N/A</u> hours
	Yield <u>N/A</u> gpm Date <u>4/16/2003</u>
Gravel Pack	Specific Capacity <u>N/A</u> gpm/ft
Sand Pack	
<u>18</u> ft*	Pomerke
18 ft ⁻	
Measuring Point is	· · · · · · · · · · · · · · · · · · ·
Unless Otherwise Noted.	
Unless Otherwise Noted. • Depth Below Land Surface	

Il Construction Log				
□ <u></u> ★ #	Project M	A000664.004A	Well	G6M-03-05X
V LAND SURFACE	Town/City	Aver		
	County	Middlesex	State	MA
4 inch diameter	Permit No.			
drilled hole	Land-Surface Eleva	tion and Datum:	· · · · ·	
		feet	□ Sur	veved
				imated
2 inch diameter.	Installation Date(s)	. 4/14/0)3 - 4/15/0	3
Sched 40 PVC		Di		
Backfill		DIN	e a wash	···
Grout 3-25 lbs of Portland	Drilling Contractor	Subsurface Dr	rilling & Re	emediation
	Drilling Fluid		Water	
			valu:	
4 <u>31</u> ft*				
	Development Equip	oment Technique(s) ar	nd Date(s)	
A 34 ft* X peliets	Whaler			
	Pump & surge			
	4/21/2003			
35 ft*	Fluid Loss During [Drilling1	75	gallons
	Water Removed D	uring Development	228	gallons
	Static Depth to Wa	ter	fee	t below M.P.
Well Screen. 2 inch diameter	Pumping Depth to	Water	fee	t below M.P.
Sched. 40 PVC , 20 slot	Pumping Duration	3 ho	urs .	
	Yield	aom	Da	te 4/21/2003
	i	3F	- 17)	
	Specinc Capacity	gp	11/17	
Sand Pack				
Formation Collaspse	Well Purpose	Monitoring well		
	V	Vell installed in Boring	SB-03-05	B
	Remarks	Borehole collapses	from 45-5	1' bgs after
<u> </u>	pulling back casin	g and is plugged with	bentonite	to 46' bgs.
Measuring Point is	·			<u></u>
Top of Well Casing Unless Otherwise Noted.	<u></u>			· · · · · · · · · · · · · · · · ·
* Depth Below Land Surface		·····		
	Prepared by	D	iane Mosh	er

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不tt	Project	MA000664.004A	Well	SVE - 6
V LAND SURFACE	Town/City	Ayer		
	County	Middlesex	State	MA
11.5 inch diameter	Permit No.			
	Land-Surface Elev	ation and Datum:		
	<u></u>	feet	🔲 Sur	veyed
Well casing,			🗌 Est	imated
4 inch diameter,	Installation Date(s))4	/15/2003	
Sched 40 PVC	Drilling Method	Hollo	w stem aug	ier
Backfill				
Grout	Drilling Contractor	Subsurface [Drilling & Re	emediation
XBentonite	Drilling Fluid		None	
	•			
	<u> </u>	· · · · · · · · · · · · · · · · · · ·	1.5-1-1-1	
Bentonite slurry	Development Equ	ipment lechnique(s) a	and Date(s)	
 2 #∗ ⊠nellets	Whater			
	Surge & pump			
	4/21/2003			· · · · · · · · · · · · · · · · · · ·
0 <i>f</i> /r	Fluid Loss During	Drilling	0	galions
II	Water Removed	During Development	26	gallons
\checkmark	Static Depth to W	/ater	fee	t below M.F
Well Screen.	Pumping Depth to	o Water	fee	t below M.F
Sched. 40 PVC , 20 slot				
	Pumping Duration	n <u>0.5</u> h	ours	
	Yield	<u>~ 1</u> gpm	Da	ite <u>4/21/2</u>
Gravel Pack	Specific Capacity	/g	ıpm/ft	
Sand Pack				
	wen ruipuse			
<u>13</u> ft"				
<u>13</u> ft*				
	<u></u>	<u>*</u> **_*		
Measuring Point is				
Unless Otherwise Noted.	i			
* Depth Below Land Surface	<u> </u>			
	Prepared by		Diane Most	лег

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Well Construction Log (Unconsolidated)		·	•
CT 不tt	Proiect N	1A000664.004A	Well G6M-03-07X
V LAND SURFACE	Town/City	Ayer	
	County	Middlesex	State MA
4 inch diameter	Permit No.		· · · · · · · · · · · · · · · · · · ·
drilled hole	Land-Surface Eleva	ation and Datum:	
		feet	Surveyed
Well casing,			Estimated
inch diameter,	Installation Date(s)	4/21/	03 - 4/23/03
/ /	Drilling Method	Dri	ve & wash
Backfill	ũ	<u> </u>	<u></u>
Grout Portland Cement	Drilling Contractor	Subsurface D	rilling & Remediation
~70 gals.	Drilling Fluid		Water
75 ft*	•		
	Development Equi	oment Technique/s)	and Date(s)
Bentonite slurry	Development Equi	pinent, recrimque(s),	
<u>78</u> ft* ⊠pellets	Grunfos Pump	. <u>.</u>	· · · · · · · · · · · · · · · · · · ·
	Pump and Surge		
	5/12/2003		
	Fluid Loss During	Drilling	200 gallons
drilled hole Land-Surface Elevation and Datur Well casing,	Juring Development	galions	
	Static Depth to Wa	ater	feet below M.P.
Well Screen.	Pumping Depth to	Water	feet below M.P.
Sch. 40 PVC slot	Pumping Duration	1.5ho	ours
	Yield	- 2 gpm	Date <u>5/12/2003</u>
	Specific Capacity	9F	om/ft
			· ·
	Well Purpose	Monitoring well	
	Wein'r dipose	Montoning wear	. <u> </u>
	·		<u></u>
⊟ <u>90</u> t *	Remarks	· · · · · · · · · · · · · · · · · · ·	
100 ft"		· · ·	
Manual a Data in			
Measuring Point is Top of Well Casing	·····		
Depth Below Land Surface			a
	Prepared by	D	eb Hornberger

Well Construction Log (Unconsolidated)	,			
行 不tt	Project N	1A000664.004A	Well	G6M-03-08X
V LAND SURFACE	Town/City	Ayer		
	County	Middlesex	State	MA
4 inch diameter	Permit No.			
drilled hole	Land-Surface Eleva	tion and Datum:		
		feet	🗖 Sur	veved
Well casing			Est	imated
2 inch diameter	Installation Date(s)	4/11/	<u></u> 03 - 4/16/0	3
Sch. 40 PVC			· · · ·	
/ // Backfill	Drilling Method		/e & wasn	
X Grout Portland Cement	Drilling Contractor	Subsurface D	rilling & Re	mediation
~150 gals.	Drilling Fluid		Water	
120 ft*	drilling water in tub	= 0.0 ppm	····	<u></u>
<u> </u>	Development Fruit			
Bentonite Slurry	Development Equip	ment lechnique(s) ai	na Date(s)	
123 ft ⁻ Xpellets	Whaler pump 4/24/	03		
<u>125</u> ft* Well Screen. <u>2</u> inch diameter <u>Sch. 40 PVC</u> , <u>20</u> slot Gravel Pack X Sand Pack	Fluid Loss During D Water Removed Du Static Depth to Wa Pumping Depth to Pumping Duration Yield Specific Capacity	Drilling 3 uring Development uter	fee fee ours Da	gallons gallons t below M.P. t below M.P. te4/24/2003
Formation Collaspse	Well Purpose	Monitoring well		
	- <u></u>	·	<u>-</u>	
140 #*	· · · ·		. <u>.</u>	
150 ft"	Remarks	Drill cuttings PID =	27ppm ma	ax
		- drum cuttings		
Measuring Point is Top of Well Casing Unless Otherwise Noted.				
 Depth Below Land Surface 	Prepared by	De	b Hornber	ger

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Well Construction Log (Unconsolidated)

一 不 ft	Project	MA000664.004A	Well	G6M-03-09X
LAND SURFACE	Town/City	Ayer	- <u></u>	
ИИ	County	Middlesex	State	MA
drilled hole	Permit No.			·····
	Land-Surface E	levation and Datum:		
	·	feet	Surve	eyed
Well casing,			Estim	nated
inch diameter,	Installation Date	e(s)4/16/	03 - 4/20/03	
Sch. 40 PVC	Drilling Method	Dri	ve & wash	
	u u	••		
Grout Portland Cement	Drilling Contrac	tor <u>Subsurface D</u>	rilling & Rem	ediation
~100 gals.	Drilling Fluid		Water	

$\begin{array}{ c c c c c c c c c c c c c c c c c c c$				
	Development E	Equipment Technique(s) a	nd Date(s)	
123_ft* X pellets	Whaler pump	· · ·		<u> </u>
	4/24/2003			
				<u> </u>
	Fluid Loss Dur	ing Drilling 2	200	gallons
<u>125</u> ft*				
	vvaler Remove	ed During Development	240	gailons
	Static Depth to	Water	feet t	elow M.P.
2 inch diameter	Pumping Dept	h to Water	feet b	elow M.P.
<u>Sch. 40 PVC</u> , <u>20</u> slot	Pumping Dura	tion 4 ho	ours	
	Yield	~ 1	Date	A/24/2003
		gpm	Dale	
	Specific Capa	citygi	m/ft	
Formation Collaspse	Well Purpose	Monitoring well		
	•			
		·······		
140_ft*	Remarks			
150ft *				
				······
Measuring Point is				
Unless Otherwise Noted.				<u> </u>
 Depth Below Land Surface 				
	Prepared by	De	b Hornberge	r

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Well Construction Log (Unconsolidated)

一 不ft	Project MA000664.004A Well G6M-03-1	10X
	Town/CityAyer	
ИИ	County Middlesex State MA	
4 inch diameter	Permit No.	
	Land-Surface Elevation and Datum:	
ИК	feet Surveyed	
Well casing,	Estimated	
inch diameter,	Installation Date(s) 4/8/03 - 4/11/03	-
Sch. 40 PVC	Drilling Method Drive & wash	_
Backfill		
X Grout Portland Cement	Drilling Contractor Subsurface Drilling & Remediation	
~150 gals.	Drilling Fluid Water	
115 #	-	
Bentonite Islurry	Development Equipment, Technique(s) and Date(s)	
118 ft* X pellets	Whaler pump	
	Pump and Surge	
	4/23/03 & 5/14/03	
	Fluid Loss During Drilling~550gallons	
120_ft*	Water Removed During Development567 gallons	
	Static Depth to Water61.71feet below M.P.	
Well Screen. 2 inch diameter	Pumping Depth to Water61.91feet below M.P.	•
	Pumping Duration7 hours	
	4/23/0	38
	Yield ~ 1 - 2.5 gpm Date _ 5/14/0	3
Gravel Pack	Specific Capacitygpm/ft	
X Sand Pack		
	Wall Burgage Manitaria and V	
<u>135</u> ft ⁻	Pomarka	
ft=	PID screening of drilling work water = 0 ====	
	The screening of unling wash water = 0 ppm	
Measuring Point is		
Unless Otherwise Noted.		
* Depth Below Land Surface		•
	Prepared by Deb Hornberger	

		1,2-	cis-1,2-			trans-1,2-		
Well	Sample	DCP	DCE	PCE	TCE	DCE	Arsenic	Iron
Designation	Date	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	mg/L
	5/10/00		220	2100	477	~2	NIC	NTC
G6M-03-01X	5/12/03	· <2	220	4100	47	<2	INS	INS
G6M-03-01XD	5/12/03	<2	160	4000	42	<2	NS	NS
G6M-03-02X	5/12/03	<2	4.4	1300	<2	<2	NS	NS
G6M-03-03X	5/13/03	<2	<2	<2	3.4	<2	\mathbf{NS}	NS
G6M-03-04X	5/13/03	<2	<2	9500	<2	<2	NS	NS
SB-03-05A	4/16/03	<2	<2	<2	<2	<2	NS	· NS
G6M-03-05X	5/13/03	<2	<2	6.1	<2	<2	NS	NS
G6M-03-06X	NI	NS	NS	NS	NS	NS	NS	\mathbf{NS}
G6M-03-07X	5/12/03	2.3	34	1200	7.2	<2	NS	NS
G6M-03-08X	5/14/03	<2	<2	750	<2	<2	<5	<1
G6M-03-09X	5/14/03	<2	<2	<2	<2	<2	<5	<1
G6M-03-10X	5/14/03	<2	<2	15	<2	<2	<5	<1

Summary of Groundwater Data, Pre-Design Investigation, April and May 2003, AOC 50, Devens, Massachusetts.

ug/L - micrograms per liter

[___]

mg/L - milligrams per liter

PCE - Tetrachloroethene

TCE - Trichloroethene

DCE - Dichloroethene

DCP - Dichloropropane

NS - Not sampled

NI - Not installed

Summary of Soil Data, Pre-Design Investigation, April 2003, AOC 50, Devens, Massachusetts.

Well	Sample	PCE
Designation	Date	ug/kg
SB-03-02 (6-8)	4/10/03	<24
SB-03-03 (4-6)	4/16/03	1600
SB-03-04B (6-8)	4/15/03	100
SB-03-05B (8-10)	4/14/03	<19
SB-03-09X (59-60)	4/20/03	<20

ug/kg - micrograms per kilogram PCE - Tetrachloroethene

Construction Quality Assurance Plan, AOC 50, Devens, Massachusetts

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Prepared For

G/FPR Remediation AOC 50 Devens, Massachusetts GSA Contract No. GS-10F-0266K Delivery Order No. DAKF11-01-F-

September 2004

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1. Site Location, AOC 50, Devens, Massachusetts.

APPENDICES

A. Forms

1.0 INTRODUCTION

During the installation of the final remedy (Remedial Alternative 6) at Area of Contamination 50 (AOC 50), construction and drilling activities will be necessary at the Site. This Construction Quality Assurance Plan was prepared to ensure that the remedy meets or exceeds design criteria, plans, and specifications. The location of AOC 50, Ayer, Massachusetts is shown on Figure 1.

1.1 Site Description and Background

AOC 50 is located on the northeastern boundary of the former Moore Army Airfield (MAAF), within the former North Post portion of Devens reserve forces training area (RFTA), Ayer, Massachusetts (Figure 1). The AOC 50 Source Area comprises less than 2 acres and surrounds Buildings 3803 (the former parachute shop), 3840 (the former parachute shakeout tower), 3824 (a gazebo), and 3801 (the former 10th Special Forces airplane parachute simulation building). Sources of groundwater contamination within AOC 50 include two World War II fueling systems, a drywell, and the tetrachloroethene (PCE) drum storage area; these sources are collectively referred to as the Source Area. Other potential sources of contamination may include a former cesspool and floor drain associated with Building 3840. Although these sources have been removed or taken out of commission, groundwater underlying AOC 50 contains elevated concentrations of volatile organic compounds (VOCs) most notably PCE. The primary area of groundwater contamination at AOC 50 is referred to as the Southwest Plume, which extends from the Source Area approximately 3,000-feet downgradient to the Nashua River.

Fort Devens was established in 1917 as Camp Devens, a temporary training camp for soldiers from the New England area. In 1931, the camp became a permanent installation and was renamed Fort Devens. Throughout its history, Fort Devens served as a training and induction center for military personnel, and as a unit mobilization and demobilization site. All or portions of this function occurred during World Wars I and II, the Korean and Vietnam conflicts, and operations Desert Shield and Desert Storm.

All but approximately 13 acres of the former MAAF (approximately 260 acres total) were transferred to Mass Development in 1997 for reuse. Currently, the airfield is closed to aircraft traffic and is used by the Massachusetts State Police for training and vehicle storage. The MAAF is zoned for Special Use II and Innovation and Technology Business. Under the Devens Reuse Plan (November 14, 1994), Special Use II and Innovation and Technology Business includes a broad range of industrial,

light industrial, office, and research and development uses. There are currently no plans for development of the MAAF, although the area can be developed if interested parties are identified. The Devens RFTA retained approximately 13 acres of the former airfield (including the AOC 50 Source Area) for vehicle storage and maintenance.

Fort Devens was identified for cessation of operations and closure under Public Law 101-510, the Defense Base Realignment and Closure (BRAC) Act of 1990, and was officially closed in September 1996. Portions of the property formerly occupied by Fort Devens were retained by the Army for reserve forces training and renamed the Devens RFTA. Areas not retained as part of the Devens RFTA were transferred to new owners for reuse and redevelopment.

2.0 PROJECT ORGANIZATION AND RESPONSIBILITIES

ARCADIS, under the supervision of the U.S. Army, will be responsible for the installation of the final remedy at AOC 50, including the supervision of subcontractors, the supervision and performance of field activities, and the interpretation, evaluation, and presentation of data. As stated in the site Health & Safety Plan, on-site workers, subcontractors, and supervisors will be trained consistent with regulations promulgated by the Occupational Safety & Health Administration (OSHA), 29 Code of Federal Regulations (CFR) 1910.120.

2.1 **Project Organization**

The primary ARCADIS personnel involved in the project are listed below.

Project Director	Peter Milionis	(267) 685-1800
Project Manager/QA/QC Officer	Chuck Castelluccio	(978) 937-9999
Project Engineer	John Horst	(267) 685-1800
Health and Safety Officer	Andy Robinson	(978) 937-9999
Field Engineer	Brian Therriault	(978) 937-9999
Field Technician	Diane Mosher	(978) 937-9999

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Infrastructure, buildings, environment, communications

Ms. Lynne Welsh MADEP Central Region 627 Main Street Worcester, MA 01605

subject: LSP Opinion, AOC 50, Devens, Massachusetts

Dear Ms. Welsh:

As we discussed, this letter serves as the Licensed Site Professional (LSP) Opinion that off-gas controls will not be necessary for the In-Well Stripping (IWS) system at AOC 50 Devens, Massachusetts. This is based on the opinion that the emissions, if not treated, will not exceed a level of No Significant Risk (NSR) to health, safety, public welfare, and the environment. Although this site is not a Massachusetts listed site, it is an adequately regulated site that is being overseen by the USEPA and this LSP Opinion is being prepared at your request.

The Simplified Remedial Emissions Evaluation Methodology that was developed by the Massachusetts Department of Environmental Protection was applied to the AOC 50 Devens site (MADEP Off-Gas Treatment of Point Source Remedial Air Emissions, Policy #WSC-94-150). This methodology evaluates the need to apply off-gas controls on remedial air emissions based on air emission rates and the distance to potentially impacted receptors. It was determined that the closest known non-occupational receptor (residence on Littleton Turnpike) is approximately 750 meters from the proposed IWS point source. The mass flux calculations and determination of off-gas treatment are on the attached table. Applying the equation from the MADEP Off-Gas Treatment of Point Source Remedial Air Emissions, Policy #WSC-94-150, 47 meters is the minimum distance required to achieve a level of NSR (Table 1). Therefore a level of NSR is achieved for human health and public welfare (WSC-94-150).

A level of No Significant Risk to Safety is achieved for the site as the remedial air emissions will not result in the generation and/or accumulation of explosive vapors. According to National Institute for Occupational Safety and Health (January 2003) (NIOSH), the lower explosive limit (LEL) and upper explosive limit (UEL) for tetrachloroethene is not applicable as it is not combustible. In addition, access to the remedial treatment system will be restricted to prevent physical harm or bodily ARCADIS G&M, Inc. 175 Cabot Street Suite 400 Lowell Massachusetts 01854 Tel 978 937 9999 Fax 978 937 7555 www.arcadis-us.com

ENVIRONMENTAL

Date: 3 May 2004

Contact: C. Castelluccio

Phone: 978-937-9999 x 316

Email: ccastelluccio@arcadisus.com

Our ref:

ARCADIS

Page:

2/3

injury. Access to this area is limited by gates and fences and is located in an area that is not easily accessible (steep bank, heavy vegetation, no roads).

Finally, based on the low level concentrations of tetrachloroethene present in the IWS area, a condition of No Significant Risk to the environment exists since remedial air emissions will not result in a deleterious impact to critical habitat, endangered species, or other sensitive ecological receptors. These findings are supported by an analysis of the potential for downgradient air emissions from the IWS system. Using EPA (1992) guidance on evaluating risks from hazardous air pollutants, a tetrachloroethene concentration of 0.136 ppv was conservatively determined assuming a stack height of 5 meters and a receptor distance of 30 meters (Table 1). These concentrations are consistent with background concentrations reported in rural and urban areas throughout the U.S (ATSDR 1977). Furthermore, EPA (2000, p. 3)) states that "most VOCs are generally not highly toxic to wildlife species". Indeed, EPA (2000) only considers VOCs to be of potential concern when they concentrate within the nest of burrowing species. Because such a scenario is not possible for tetrachloroethene released from the stack of the IWS system, inhalation by wildlife species is not considered a pathway of concern.

As shown above, the untreated emissions from the IWS system will not exceed a level of NSR to health, safety, public welfare, and the environment, and therefore, no off-gas controls are necessary for the IWS system at AOC 50.

Sincerely,

ARCADIS G&M, Inc.

Charles Castelluccio Principal Scientist, LSP

Copies:

Ms. Carol Keating, USEPA Mr. Ben Goff, BRAC Environmental Coordinator Mr. Ron Ostrowski, Mass Development Mr. Victor Bonilla, BRAC AFO Mr. Mike Kipp,

ARCADIS

Ms. Lynne Welsh 3 May 2004

References

ATSDR. 1997. Toxicological Profile for Tetrachloroethylene. U.S. Department of Health and Human Services. Agency for Toxic Substances and Disease Registry. September.

EPA. 1992. A Tiered Modeling Approach for Assessing the Risks Due to Sources of Hazardous Air Pollutants. EPA-450/4-92-001. U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, North Carolina. March.

EPA. 2000. Ecological Soil Screening Level Guidance – Draft. U.S. Environmental Protection Agency. June.

Table 1. Mass Flux Calculations and Determination of Off-Gas Treatment Requirements for the IWS wells.

AOC 50, Ft. Devens, Massachusetts

Objective:

Determine the need for off-gas treatment from the IWS system by calculating the emissions from the wells and using the MADEP⁽¹⁾ simplified method from the EPA "Screen" model.

The maximum PCE mass flux through the IWS area can be estimated based on the plume geometry and PCE concentrations detected in the groundwater:

Parameter	Value	Units	Basis
Aquifer hydraulic conductivity (K):	100	ft/day	Highly conservative K value for the IWS area
Groundwater gradient in the IWS area:	0.002		Gradient from recent groundwater flow maps in IWS area
PCE concentration:	750	ug/l	PCE data from microwell samples adjacent to IWS wells
Width of plume in IWS treatment area:	160	feet	Width from 100 ppb contours
Thickness of plume in IWS treatment area:	45	feet	Thickness from microwell data
Cross-sectional area in IWS treatment area:	7,200	square feet	Calculated sectional area
Groundwater flux through IWS area;	7.5	gpm	Basic groundwater flow equation
PCE mass transfer:	21.3	mg/min	Max. PCE flux through IWS area
IWS air flow rate:	180.0	cfm	Total air flow from both IWS wells
IWS air flow rate:	5.1	M ³ /min	Total air flow from both IWS wells
PCE concentration in IWS effluent air:	4,177	ug/M ³	Total PCE flux in total air flow rate
PCE flux through IWS area:	6.753E-02	lbs/day	PCE mass flux with conditions as stated
PCE flux through IWS area:	1.232E-02	tons/year	PCE mass flux with conditions as stated
IWS stack height discharge:	6	meters	Select conservative stack height of 5 meters
Assumed distance of closest ecological receptor:	30	meters	Assumed based on area around the IWS wells and system.
Normalized maximum annual concentration at or beyond the distance to the closest receptor:	7.460E+01	ug/M ³ /tons/year	From EPA Tiered Model Approach, EPA-450/4-92-001, Table 1
Estimated maximum annual concentration of PCE at a distance of 30 meters from the IWS wells	0.919	ug/M ³	Based on EPA Tiered Modeling Approach for Assessing the Risks Due to Sources of Hazardous Air Pollutants, EPA-450/4-92-001
Estimated maximum annual concentration of PCE at a distance of 30 meters from the IWS wells	0.136	ppbv	PCE concentration in ppb (vol/vol), estimated level is consistent with background concentrations
PCE flux through IWS area:	355	ug/sec	PCE mass flux with conditions as stated
The minimum distance to a receptor can be determined graphically equation ⁽¹⁾ :	y from Figure	4 ⁽¹⁾ based on the n	naximum emissions rate (as determined above) or calculated from the

 $D = \{205 \text{ x} (logE)\}-476, \text{ for } D > 20$

where: D =	= minimun	n distance to nea	rest non-occupational receptor (meters)	
E=	emission =	s rate (ug/sec)	· · · · · · · · · · · · · · · · · · ·	<u>.</u>
Solving for D:	47	meters		
	151	feet		
Closest known non-occupational receptor:	750	meters	Residence on Littleton Turnpike (Rt. 2A)	

Since the closest known non-occupational receptor is the residence on Littleton Turnpike (Rt. 2A) at approximately 750 meters from the proposed discharge location, no off-gas treatment is required.

NOTES:

1) MADEP Off-Gas Treatment of Point Source Remedial Air Emissions, Policy # WSC-94-150

LEASE IN FURTHERANCE OF CONVEYANCE

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OF REAL PROPERTY AND FACILITIES ON

THE FORT DEVENS, MASSACHUSETTS,

MILITARY RESERVATION

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Article

Number

<u>Title</u>

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EXHIBITS

Number	Title			
A	Lease Premises			
В	Memorandum of Agreement	-	Delivered at Closing	
С	Survey of Condition		Delivered at Closing	

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DEPARTMENT OF THE ARMY LEASE IN FURTHERANCE OF CONVEYANCE UNDER BASE REALIGNMENT AND CLOSURE (BRAC) THE FORT DEVENS, MASSACHUSETTS, MILITARY RESERVATION

NO

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7.-

WHEREAS, the United States, acting through the SECRETARY OF THE ARMY, hereinafter referred to as the "Army" or "Lessor", has made a final disposal or reuse decision with regard to property located at the Fort Devens, Massachusetts, Military Reservation (Fort Devens), dated May 9, 1996; and

WHEREAS, pursuant to the Defense Base Closure and Realignment Act of 1990 (PL 101-510), as amended, (Base Closure Law) Fort Devens must close not later than July 10, 1997; and

WHEREAS, pursuant to Chapter 498 of the Massachusetts Acts of 1993, as amended, the Government Land Bank (Land Bank), hereinafter referred to as the "Land Bank" or "Lessee", was granted the authority to oversee and implement the civilian reuse of Fort Devens in accordance with a locally-approved reuse plan; and

WHEREAS, on December 7, 1994, the Reuse Plan and associated Bylaws for Fort Devens (Reuse Plan) were approved by the towns of Ayer, Harvard and Shirley; and

WHEREAS, the Land Bank, a Local Reuse Authority, has made an application for an Economic Development Conveyance (EDC) to the

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Department of the Army for the purchase of portions of the property that formerly comprised Fort Devens; and

WHEREAS, the Army, as authorized by the Base Closure Law, has determined that the Land Bank's application meets the criteria for conveyance to assist economic development and has accepted the application; and an offer to purchase/sell has been negotiated and accepted by Army and the Land Bank, in a Memorandum of Agreement (the MOA), dated May 9, 1996, regarding the transfer to the Land Bank of certain portions of Fort Devens not being retained by the Army or transferred to federal agencies, for the purpose of implementing the Reuse Plan; and

WHEREAS, due to the ongoing environmental cleanup and the unexploded ordnance (UXO) clearance process at Fort Devens being undertaken by the Army, in order to implement the intentions of the Army and the Land Bank as set forth in the MOA, certain parcels will be leased rather than conveyed pending completion of the environmental cleanup and UXO clearance by the Army, said parcels being more particularly described in Exhibit A, hereinafter referred to as the "Lease Premises."

WHEREAS, as soon as a Finding of Suitability to Transfer (FOST) is executed by the Army for the Leased Premises, or a portion of said Leased Premises, and said Leased Premises may be conveyed consistent with the requirements of the Comprehensive Environmental Response, Compensation and Liability Act, 42 U.S.C. 9620 (h), as amended, and other legal and policy requirements, the Secretary of the Army intends to convey the same to the Land Bank by one or more quitclaim deeds, as provided for in the MOA, and the Land Bank agrees to accept such conveyance(s) as soon as the above-referenced conditions are met; and

WHEREAS, the Army and the Land Bank have agreed to a Lease pending conveyance(s) so as to provide immediate possession of the Lease Premises to the Land Bank; and

WHEREAS, the parties hereto find, acknowledge, and agree that: (a) the public interest will be served by this Lease because interim use of the Lease Premises will facilitate economic recovery and reuse of the property and create new jobs in the region, thereby helping to offset the impacts of the closure of Fort Devens in a manner that will not interfere with or delay the environmental remediation and UXC clearance of the Lease Premises; (b) the Lease will relieve the Secretary of the expense of continued care, custody, control, operation and maintenance of the property; and (c) under said circumstances obtaining fair market value for leasing the Lease Premises is not compatible with the public interest.

AND WHEREAS, the Secretary has determined in accordance with the authority contained in 10 U.S.C. 2667(f), that the surplus property hereby leased would facilitate state or local economic adjustment efforts; would be advantageous to the United States and be in the public interest; and that obtaining fair market value is not compatible with the public benefit;

NOW THEREFORE,

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WITNESSETH

This lease (Lease) is made as of the 9th day of May, 1996, on behalf of the United States, between THE SECRETARY OF THE ARMY (Army), by the authority of Title 10, United States Code, Section 2667, having an address for purposes of the Lease at Department of the Army, C/O Commander and Division Engineer, United States

Army Corps of Engineers, New England Division, Frederick C. Murphy Federal Building, 424 Trapelo Road, Waltham, MA 02254-9149, and THE GOVERNMENT LAND BANK (Land Bank), a Massachusetts body corporate and politic created by Chapter 212 of the Acts of 1975, as amended, having its principal office at 75 Federal Street, 10th Floor, Boston, Massachusetts 02110.

THIS LEASE is granted subject to the following terms and conditions:

ARTICLE 1

LEASE; LEASE TERM; USE OF LEASE PREMISES

To have and to hold for a term commencing May 9, 1996 and 1.01 ending on May 9, 2046 (Lease Term), unless sooner terminated or conveyed in fee pursuant to the terms hereof or of the Memorandum of Agreement between the United States of America and the Government Land Bank for the Conveyance of Fort Devens, Massachusetts, dated May 9, 1996 (MOA), attached as Exhibit B, the Army hereby leases to the Land Bank, and the Land Bank hereby leases from the Army, the Lease Premises (Exhibit A herein), including all buildings, facilities and improvements thereon and rights appurtenant thereto. If due to default by the Land Bank or termination of the MOA, the Land Bank is not entitled to conveyance of the Leased Premises at the time the Army is able to convey in fee, then the Lease shall terminate on the date of execution of a Finding of Suitability to Transfer (FOST) by the Army with respect to that portion of the Leased Premises covered by the FOST. The Lessor reserves the use and occupancy of the following buildings, including all facilities and areas currently used by the Lessor in connection therewith, and the right of ingress and egress thereto, until July 10, 1997: T-204, ASP

Operations; T-3701, Administrative; P-3748, Warehouse; T-3758, TASC Warehouse; P-3759, Warehouse; P-3773, Reserve Center; P-3774, Organization Maintenance Shop; P-3775, Oil Storage Building; P-3776 Dispatch Building; P-3631 thru 3642, 3644, 3647, 3649, 3653, collectively the ASP; and Housing Units at 80 Walnut St., 822 Plum Street, and 540 Oak St. The Lessor may vacate said buildings and facilities at any time prior to July 10, 1997, after 30 days written notice to the Lessee.

1.02 As provided in paragraph 1.03 of the MOA, the Lease Premises, or portions thereof, shall be conveyed in accordance with and pursuant to the terms of the MOA to the Land Bank upon execution of a FOST by the Army.

The Land Bank and any sublessees, subtenants or licensees 1.03 under this Lease (collectively "sublessees") may use the Lease Premises for all uses as may be permitted by the Reuse Plan or, upon approval of the Army, amendments to the Reuse Plan. If the Army reasonably determines any such amendment of the Reuse Plan allows a use or uses not adequately analyzed in the Fort Devens Disposal/Reuse Environmental Impact Statement (EIS), the Land Bank shall provide additional environmental analysis and documentation, at the Land Bank's expense, to the Army as the Army deems necessary to comply with the National Environmental Policy Act of 1969 and implementing regulations and other applicable environmental laws and regulations, prior to any use under such amendment. The Land Bank shall be solely responsible for complying with the Massachusetts Environmental Policy Act (MEPA).

1.04 Except as otherwise specifically provided, any reference herein to "Lessor" or "Army" shall include their duly authorized representatives. Any reference to "Lessee" or "Land Bank" shall

include successors and assigns, and their duly authorized representatives.

ARTICLE 2

RENT

2.01 The Land Bank shall provide the Army assume (Rent) hereunder, (a) protection, repair and maintenance of, and assumption of sole operating responsibility for the Lease Premises, except with regard to Army operations undertaken in furtherance of or related to the environmental clean-up or UXO clearance of the Lease Premises, and (b) payment of utility charges, as provided in the Utilities Agreement contained in the MOA. The Land Bank agrees that monetary rent received by the Land Bank from any Sublessee of the Land Bank under this Lease will be applied to costs incurred by the Land Bank for protection, maintenance, operation, repair and improvement of the Lease Premises, as may be necessary to cover such costs.

ARTICLE 3

CONDITION OF LEASE PREMISES; REPAIRS; UTILITIES; HISTORIC PRESERVATION

3.01 The Land Bank has inspected and knows and accepts the condition and state of repair of the Lease Premises. It is understood and agreed that the Lease Premises are leased in an "as is," "where is" condition; without any representation or warranty by the Army concerning the state of repair or condition of the Lease Premises, and without obligation on the part of the Army to make any alterations, repairs or additions, except as may be specifically provided herein. The Land Bank acknowledges that

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the Army has made no representation or warranty concerning the condition and state of repair of the Lease Premises nor any agreement or promise to alter, improve, adapt or repair the Lease Premises which has not been fully set forth in this Lease or the MOA. The parties specifically agree that the provisions of this paragraph in no way alter the indemnification and other obligations of the Army set forth in Article 5 of the MOA.

The Army and the Land Bank will jointly conduct an 3.02 inventory and condition survey of the Lease Premises, to include the environmental condition, prior to lease execution by either party. The inventory and condition survey will be documented in a survey report (Survey) prepared by the Army, signed by the duly authorized representatives of both parties, and attached as Exhibit C to this Lease. The Survey will refer to and incorporate by reference the Environmental Baseline Survey (EBS), dated March 8, 1996 prepared by the Army, as well as any other environmental conditions that may not be specifically identified in the EBS. The Land Bank hereby acknowledges receipt of a copy of the EBS. At the conclusion of the Lease Term, the Army and the Land Bank will jointly conduct a close-out survey. The Army will prepare a close-out report based upon the close-out survey. The close-out survey and report will include an updated EBS prepared in accordance with Article 16.11.a of this Lease. A11 significant variances from the initial Survey shall be clearly documented in the close-out report. The close-out survey and report will constitute the basis for settlement by the parties for any leased property shown to be lost, damaged, contaminated, or destroyed during the lease term and restoration of the property as required under this Lease.

3.03 The Land Bank shall keep the Leased Premises in good order and in a clean, safe condition at the Land Bank's sole cost and

expense. The Land Bank shall exercise due diligence in the protection of all property located on the Leased Premises against fire, casualty, or damage from any and all causes, excepting: (i) reasonable wear and tear, (ii) alterations, construction, site preparation or demolition undertaken pursuant to Article 12; and (iii) alterations or damage done in conjunction with environmental remediation or UXO clearance activities conducted by the Army or its contractors. For any Leased property that is not conveyed to the Land Bank upon termination or expiration of this lease; is not covered by the above exceptions; and that is damaged or destroyed by the Land Bank without written permission of the Army; the Land Bank shall be repair or replace said property to the reasonable satisfaction of the Army; or, in lieu of such repair or replacement, the Land Bank shall, at the Army's election, pay to the Army money in an amount sufficient to compensate for the loss sustained by the Army by reason of said damages or destruction. It is understood and agreed by the parties, however, that portions of the Lease Premises, as determined by the Land Bank, may be maintained at the minimal level necessary to prevent deterioration and diminution of value, pending reuse thereof by the Land Bank.

3.04 The Land Bank shall provide, at its sole cost and expense, janitorial, building maintenance and repair and grounds maintenance services at the Lease Premises, as may be required by the Land Bank in the operation of the Lease Premises.

3.05 In accordance with and if authorized by the Utilities Agreement contained in the MOA, the Land Bank may request, and the Army shall provide to the Lease Premises, electricity, natural gas, water, sewer, and telephone services, on a reimbursable basis during the period that the Army retains operation of said systems. Furthermore, if the Land Bank obtains

utility services from sources other than the Army, the charges and method of payment for each utility or service will be determined by the appropriate supplier of said utility or service in accordance with applicable laws or regulations, on such basis as the appropriate supplier and the Land Bank may agree.

The Lease Premises include historic buildings eligible for 3.06 listing on the National Register of Historic Places, as described in the Programmatic Agreement attached to the MOA (Exhibit B herein). These buildings will be maintained by the Lessee in accordance with the Secretary of the Interior's Standards for Rehabilitation and Illustrated Guidelines for Rehabilitating Historic Buildings (U.S. Department of the Interior, National Park Service 1992) (hereinafter Secretary's Standards). Lessee will notify the Army and the State Historic Preservation Officer (SHPO) of any proposed rehabilitations, structural or landscape alterations to these buildings prior to undertaking said rehabilitations/ alterations. If the Lessee does not receive a written objection from the Army or SHPO within 30 days, the Lessee may proceed with the proposed rehabilitations or alterations. Any approved rehabilitations, structural or landscape alterations to these buildings must adhere to the Secretary's Standards.

ARTICLE 4

COMPLIANCE WITH LAWS

4.01 Throughout the term of the Lease, the Land Bank shall, with regard to the Lease Premises, at its own cost and expense, promptly observe and comply with all applicable laws, orders, regulations, rules, ordinances, and requirements of the federal, state, county and local governments and of all of their

administrative departments, bureaus and officials and of the Devens Enterprise Commission established pursuant to Chapter 498 of the Massachusetts Acts of 1993, as amended. The Land Bank shall pay all costs, expenses, claims, fines, penalties and damages that may in any manner arise out of or be imposed because of the failure of the Land Bank to comply with said laws. The provisions of this paragraph shall (a) in no way compromise the Army's obligation under applicable legal requirements to complete the environmental clean-up of the Lease Premises or the clearance of UXO thereon, or to indemnify the Land Bank, as provided for in the MOA; (b) not obligate the Land Bank to complete the environmental clean-up of the Lease Premises being undertaken by the Army as required under CERCLA, the National Contingency Plan (NCP), the FFA, the MOA, and deeds from the Army to the Land Bank.

ARTICLE 5 INDEMNIFICATION OF THE ARMY

5.01 The indemnification provided by the Land Bank to the Army under this Article 5 is subject to the indemnification provided by the Army to the Land Bank under Article 5 of the MOA and in the event of conflict or inconsistency between the provisions of Article 5 of this Lease and said provisions of Article 5 of the MOA, said provisions of Article 5 of the MOA shall control.

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5.02 The Army shall not be responsible for damages to property or injuries or death to persons which may arise from or be attributable or incident to the condition or state of repair of the Lease Premises, or the use and occupation of them, or for damages to the property of the Land Bank, or for damages to the property or injuries or death to the person of the Land Bank's

officers, agents, contractors, servants or employees, or others who may be on the Lease Premises at their invitation or the invitation of any one of them. This paragraph shall not apply to damage to property or injuries or death to persons caused by or attributable to the actions of the United States in conducting environmental remediation or other activities on the Lease Premises.

5.03 The Land Bank agrees to assume all risks of loss or damage to property and injury or death to persons by reason of or incident to its possession and/or use of the Lease Premises or the activities conducted under this Lease. The Land Bank expressly waives all claims against the United States for any such loss, damage, personal injury or death caused by or occurring as a consequence of such possession and/or use of the Lease Premises by the Land Bank, or the conduct of activities or the performance of responsibilities under this Lease by the Land The Land Bank further agrees, to the extent permitted Bank. under state law, to indemnify and hold harmless the Army, its officers, agents and employees, from and against all suits, claims, demands or actions, liabilities, judgments, costs and attorneys' fees arising out of, or in any manner predicated upon, personal injury, death or property damage resulting from, related to, caused by or arising out of the possession and/or use of the Lease Premises by the Land Bank. The indemnification obligations of the Land Bank contained herein do not extend to damages, claims, suits, liabilities, judgments, costs and attorney's fees arising out of, caused by or predicated upon (a) the gross negligence or willful misconduct of the Army or its officers, agents or employees, without contributory fault on the part of the Land Bank or any other person, firm, or corporation, or (b) activities undertaken by the Army in relation to the CERCLA clean-up or UXO clearance of the Lease Premises. The Army will

give the Land Bank notice of any claim against it covered by this indemnity as soon after learning of such claim as practicable.

5.04 The Land Bank shall indemnify and hold harmless the United States from any costs, expenses, liabilities, fines, or penalties resulting from discharges, releases, emissions, spills, storage, disposal, or any other action by the Land Bank giving rise to United States liability, civil or criminal, or responsibility under Federal, state or local environmental laws.

5.05 This Article 5 and the obligations of the Land Bank hereunder shall survive the expiration or termination of the lease and the conveyance of the Leased Premises to the Land Bank. The Land Bank's obligation hereunder shall apply whenever the United States incurs costs or liabilities for the Land Bank's actions giving rise to liability under this Article.

ARTICLE 6 ASSIGNMENT; SUBLETTING

6.01 Without the prior written consent of the Army through the Corps of Engineers, New England Division, the Land Bank shall not sublease, license, or grant any interest under this lease, except as provided for in Article 9 (Mortgaging). The Army's consent shall not be unreasonably withheld or delayed and shall be deemed granted if a response is not received by the Land Bank within twenty-one (21) days of the receipt by the Army of a written request for consent. Every sublease shall specifically identify and require compliance with the Environmental Protection provisions set out in Article 16 of this Lease and shall state that it is subject to the terms and conditions of this lease and that, in case of any conflict between the instruments, this lease

will control. The Land Bank shall provide each sublessee with, and make available as appropriate to licensees, a copy of this Lease and MOA.

6.02 The Land Bank may not assign this Lease without the prior written consent of the Army, which consent shall not be unreasonably withheld or delayed, and no assignment shall be valid unless the assignee shall, by an instrument in a form sufficient for recording, enter into an assumption agreement and assume all of the Land Bank's obligations under this Lease. A duplicate original of that assumption agreement will be delivered to the Army within thirty (30) days after the making of the assignment: Upon compliance with the foregoing condition, but not otherwise, the Land Bank shall be released and discharged from any and all liability under the Lease that may accrue from and after the date of the assignment. The assignee shall have no rights under the MOA and shall not be entitled to a conveyance of the Leased Premises upon execution of a FOST by the Army for the Leased Premises or a portion thereof.

6.03 Upon request of the Lessee, the Lessor shall consider attorning to a particular sublease, where the terms of said sublease are consistent with standard Government lease terms and applicable law, regulation, and policy.

ARTICLE 7 TAXES

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7.01 The Land Bank shall pay to the proper authority, when and as the same become due and payable, all taxes, assessments and similar charges, which at any time during the term of this Lease,

may be taxed, assessed or imposed upon the Property or interest of the Land Bank with respect to or upon the Lease Premises.

ARTICLE 8

DEFAULTS

8.01 The following shall be deemed a default by either the Army or the Land Bank and a breach of the Lease: a party's failure to observe or perform any of its obligations under the terms; covenants or conditions of the Lease, which failure persists after the expiration of ninety (90) days from the date the aggrieved party gives written notice to the party calling attention to the existence of that failure. However, if the default is one relating to a matter that exposes occupants or the public to an imminent danger to safety or health of which the public authorities have given due notice to the party, then such shorter notice to the party, whether written or otherwise, shall be sufficient notice of default under this Lease.

8.02 In the event of a default, as provided in 8.01, the aggrieved party may, at its option, following the expiration of applicable notice and grace periods: (a) seek injunctive relief, monetary damages, or both; (b) take such measures as the aggrieved party deems reasonable to mitigate the effects of or cure such default, and assess all costs incurred for such mitigation to the defaulting party; (c) terminate this Lease; or (d) avail itself of any combination of said remedies.

8.03 Any action taken by either party under this Article 8 shall not waive any right that the party would otherwise have against the other party who shall remain responsible for any loss and damage suffered by reason of the default or breach.

If the Land Bank shall have made any sublease hereunder and 8.04 if any Sublessee thereunder shall have given to the Army a notice (Sublessee Notice), specifying the name and address of the Sublessee, the Army shall give to the Sublessee a copy of each notice of default by the Land Bank at the same time as and whenever any such notice of default shall thereafter be given by the Army to the Land Bank, addressed to the Sublessee at the address last furnished to the Army. No notice of default by the Army shall be deemed to have been given to the Land Bank unless and until a copy thereof shall have been so given to the Sublessee. The Sublessee shall then have a period of ten (10) days more, after service of the notice upon it, for remedying the default or causing it to be remedied, than is given the Land Bank hereunder after service of such notice upon it, except in the case of imminent danger to safety or health.

8.05 The Army will accept performance by any Sublessee hereunder of any covenant, condition or agreement to be performed under the Lease by the Land Bank, with the same force and effect as though performed by the Land Bank.

8.06 From and after receiving a Sublessee Notice, the Army and the Land Bank will not materially modify or amend the Lease without giving each Sublessee that gave a Sublessee Notice to the Army hereunder thirty (30) days written notice thereof.

8.07 Other than under the provisions of this Article 8, the Army shall have no legal responsibility or obligation to the Land Bank's sublessees or licensees.

ARTICLE 9

MORTGAGING

9.01 The Land Bank or any Sublessee may make a mortgage or mortgages on its interest in the Lease. The provisions of this Article 9 shall be fully applicable to Sublessees of the Land Bank.

If the Land Bank shall have made any mortgage (sometimes 9.02 referred to as a Leasehold Mcrtgage) and if a Leasehold Mortgagee (the holder of any Leasehold Mortgage) shall have given to the Army a notice (Leasehold Mortgagee's Notice) specifying the name and address of the Leasehold Mortgagee, the Army shall give to the Leasehold Mortgagee a copy of each notice of default by the Land Bank at the same time as and whenever any such notice of default shall thereafter be given by the Army to the Land Bank, addressed to the Leasehold Mortgagee at the address last furnished to the Army. No notice of default by the Army shall be deemed to have been given to the Land Bank unless and until a copy thereof shall have been so given to the Leasehold Mortgagee. The Leasehold Mortgagee shall then have a period of ten (10) days more after service of notice upon it, for remedying the default or causing it to be remedied, than is given the Land Bank under paragraph 8.01 herein, except in case of imminent danger to safety or health. The Leasehold Mortgagee, in case the Land Bank shall be in default, shall, within the period provided for in this paragraph 9.02 and, if applicable, 9.04, have the right to remedy the default or cause it to be remedied.

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9.03 The Army will accept performance by the Leasehold Mortgagee of any covenant, condition, or agreement to be performed under

the Lease by the Land Bank with the same force and effect as though performed by the Land Bank.

9.04 Except where the default is one relating to a matter that exposes occupants or the public to an imminent danger to safety or health of which the public authorities have given due notice to the Land Bank, whether written or otherwise, the time of the Leasehold Mortgagee to cure any default by the Land Bank that reasonably requires the Leasehold Mortgagee be in possession of the Lease Premises to do so, shall be deemed extended to include the period of time required by the Leasehold Mortgagee to obtain possession and foreclose expeditiously and with due diligence.

9.05 From and after receiving the Leasehold Mortgagee's Notice, the Army and the Land Bank will not materially modify or amend the Lease in any respect without the prior consent of the Leasehold Mortgagee, which consent shall not be unreasonably withheld or delayed. In the event the Leasehold Mortgagee fails to respond to a notice of material modification or amendment of the Lease within thirty (30) days after service of notice, the Leasehold Mortgagee will be deemed to have given its consent.

9.06 No Leasehold Mortgagee shall become liable under the Lease unless a Leasehold Mortgagee becomes the owner of the leasehold estate, and in such event shall be liable only for as long as such Leasehold Mortgagee remains the owner of the leasehold estate.

9.07 If a Leasehold Mortgagee acquires the Land Bank's interest in the Lease as a result of a sale under its Leasehold Mortgage pursuant to a judgment of foreclosure and sale, or through any transfer in lieu of foreclosure, or through settlement of or

arising out of any pending or contemplated foreclosure action, the following provisions of this paragraph shall apply, namely:

a. The Leasehold Mortgagee must assume the Lease and the Leasehold Mortagee shall have no right with respect to the Lease Premises unless said Leasehold Mortgagee assumes and delivers to the Army a duplicate original of the assumption agreement (to be executed in form for recording) within ten (10) days after said Leasehold Mortgagee acquires title to all or a portion of the Land Bank's interest in the Lease.

b. The Leasehold Mortgagee may transfer its interest in the Lease to a nominee or a wholly-owned subsidiary corporation without the prior consent of the Army, provided, however, that the Leasehold Mortgagee shall deliver to the Army in due form for recording within ten (10) days after the date of the transfer a duplicate original of the instrument of assignment and an instrument of assumption by the transferee of all of the Land Bank's obligations under the Lease, and provided further that the Army shall be given prior written notice of such transfer, and that the transferee shall use the Lease Premises in a manner that conforms to the Reuse Plan. The Leasehold Mortgagee shall be relieved of any further liability under the Lease after the transfer.

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9.08 Any purchaser at a foreclosure sale must assume the Lease and said purchaser shall have no right with respect to the Lease Premises unless said purchaser so assumes and delivers to the Army a duplicate original of the assumption agreement (to be executed in form for recording) within ten (10) days after said purchaser acquires title to all or a portion of the Land Bank's interest in the Lease.

ARTICLE 10

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QUIET ENJOYMENT

10.01 The Land Bank, upon performing its obligations under the Lease shall and may, at all times during the Lease Term, peaceably and quietly have, hold, and enjoy the Lease Premises, subject to the rights of the Army under this Lease and the MOA.

ARTICLE 11

SUCCESSORS AND ASSIGNS

11.01 The covenants and agreements contained in the Lease inure to the benefit of and are binding upon the parties to the Lease, their successors and assigns, but this Article does not modify the provisions governing assignment, as elsewhere provided for in the Lease.

ARTICLE 12

IMPROVEMENTS; RESTORATION

12.01 The Land Bank shall have the right to make improvements to the Lease Premises, which improvements may include, without limitation, the demolition of existing buildings and the construction of new buildings and facilities, as provided for in the Reuse Plan and that do not violate the terms of this Lease. If the lease expires or terminates without conveyance of the Lease Premises to the Land Bank pursuant to the terms of the MOA, all improvements to the Lease Premises will become the property of the United States, and the Land Bank shall not be entitled to any compensation therefor.

12.02 If, on or before the date of expiration of this Lease or its termination by the Land Bank or the Army in accordance with the terms hereof, the Land Bank shall vacate the Lease Premises, the Land Bank will remove any personal property of the Land Bank therefrom, and restore the Lease Premises to as good order and condition as that existing upon the date of commencement of the term of this Lease, except for: (a) alterations, site preparation, improvements or demolition undertaken -- (i) pursuant to this Article 12, Article 16, or otherwise hereunder by the Army in conjunction with environmental remediation or UXO clearance activities, or (ii) with the permission of the Army; or (b) due to fair wear and tear. If this Lease is terminated by the Army in accordance with the terms hereof, the Land Bank shall vacate the Lease Premises, remove personal property therefrom, and restore the Lease Premises to the condition aforesaid within such reasonable time as the Army may designate. In either event, if the Land Bank does not remove said personal property and so restore the Lease Premises, then, at the option of the Army, said personal property shall either become the property of the United States, without compensation therefor, or the Army may cause it to be removed and the Lease Premises to be restored at the expense of the Land Bank, and no claim for damages against the United States or its officers or agents shall be created by or made on account of such removal and/or restoration work.

ARTICLE 13 NOTICES

13.01 All notices to the parties shall be addressed to them at the respective addresses first given for them in this Lease, or to such other address of which either of them, as the case may

be, shall notify the other in the manner stated in this Article 13 for giving notice. Notices must be given by either registered mail, return receipt requested, or by certified mail, return receipt requested. The service of the notice shall be deemed complete upon the receipt of said notice, or the refusal thereof, by the applicable party.

> ARTICLE 14 NO WAIVER

14.01 The failure of the Army or the Land Bank to insist in any one or more instances, upon a strict performance of any of the covenants of the Lease, or to exercise any option contained in the Lease, shall not be construed as a waiver of or relinquishment for the future of the performance of that covenant, or the right to exercise that option, but the same shall continue and remain in full force and effect.

ARTICLE 15

REMEDIES CUMULATIVE -

15.01 The rights and remedies given to the Land Bank or the Army upon the breach of any of the terms of the Lease are distinct, separate and cumulative remedies, and no one of them, whether exercised or not, shall be deemed to be in exclusion of any of the others.

ARTICLE 16

ENVIRONMENTAL AND SAFETY PROVISIONS

16.01 The parties acknowledge that Fort Devens has been identified as a National Priorities List Site under CERCLA. The Land Bank acknowledges that the Army has provided it with a copy of the FFA and will provide the Land Bank with a copy of any amendments thereto. The Land Bank agrees to abide by the applicable terms of the FFA and any documents originating therefrom, and further agrees that should any conflict arise between the terms of the FFA, as it may be amended, and the Lease, the FFA shall take precedence. The Land Bank further agrees that, except as provided in the provisions of Article 5 of $_{
m sf}$ the MOA, the Army assumes no liability to the Land Bank should implementation of the FFA interfere with the Land Bank's use of the Leased Premises, provided, however, that the Army shall, to** the extent reasonable, practical, and without additional costs, minimize interference with such use. The Land Bank shall have no claim on account of any such interference against the Army or any. officer, agent, employee or contractor thereof, other than for abatement of rent.

15.02 The United States' rights under this Lease specifically include the right for United States officials to inspect, upon reasonable notice, the Leased Premises for compliance with environmental, safety, and occupational health laws and regulations, whether or not the United States is responsible for enforcing them. Such inspections are without prejudice to the right of duly constituted enforcement officials to make such inspections. The United States normally will give the Lessee twenty-four (24) hours prior notice of its intention to enter the Leased Premises unless the United States determines earlier entry is required for safety, environmental, operations, or security purposes. The Lessee shall have no claim on account of any entries against the United States, the Commonwealth, or any officer, agent, employee, or contractor thereef.

16.03 The Land Bank shall not construct or make or permit its sublessees to construct or make any substantial alterations; additions; or improvements to or installations upon or otherwise modify or alter the Leased Premises in any way which may adversely affect the cleanup; human health, or the environment without the prior written consent of the Army. Such consent may include a requirement to provide the Army with a performance and payment bond satisfactory to it in all respects and other requirements deemed necessary to protect the interests of the United States. For construction or alterations, additions, modifications, improvements, or installations in the proximity of operable units that are part of a National Priorities List (NPL) site, such consent may include a requirement for written approval by the United States' Remedial Project Manager.

16.04 The Army, EPA and the Massachusetts Department of Environmental Protection (DEP), their officers, agents, employees, contractors and subcontractors have the right, upon reasonable notice to the Land Bank, and to parties in possession, to enter upon the Leased Premises for purposes consistent with the applicable provisions of the FFA, and for the following purposes:

a. to conduct investigations and surveys, including, where necessary, drilling, soil and water sampling, test pitting, soil boring tests and other activities required under the FFA;

b. to inspect field activities of the Army and its
 employees, agents, contractors and subcontractors in implementing
 the FFA;

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c. to conduct any test or survey required by EPA or DEP relating to the implementation of the FFA or environmental conditions at the Leased Premises, or to verify any data submitted to the EPA or DEP by the Army relating to such conditions; and ·[]

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d. to construct, operate, maintain or undertake any other response or remedial action as required or necessary under the FFA, including, but not limited to, monitoring wells, soil removal, pumping wells and treatment facilities;

provided that the Leased Premises are restored in a reasonable manner to their condition prior to the exercise of the above rights, and provided further that any such inspection, survey, investigation or other response or remedial action will, to the extent reasonable, practical and without significant additional cost, be coordinated with a representative of the Land Bank and be performed in a manner that will minimize interference with the operations of the Land Bank. The Land Bank agrees to comply with the provisions of any health or safety plan in effect during the course of the above-described response or remedial actions.

16.05 The Land Bank or any agent or contractor of the Land Bank shall not undertake subsurface excavation, drilling, digging or . other substantial disturbance of the surface of the ground, or construction, alterations, additions, modifications, improvements or installations that may adversely affect the clean up being undertaken on the Leased Premises or other portions of the Fort Devens NPL site, without: (a) seven (7) days prior written notice to the Army, EPA and DEP; and (b) prior written consent of the Army, which consent shall not be unreasonably withheld or delayed, and which consent may include a requirement for written approval by the EPA and DEP. Such consent may involve a requirement to provide the Army with a performance and payment bond satisfactory to it in all respects and other requirements deemed necessary to protect the interests of the Army. groundwater will be extracted for any purposes Excavation of garbage or landfill materials is prohibited.

16.06 The Land Bank hereunder shall be solely responsible for obtaining, at its cost and expense, any environmental permits required for its operations under the Lease, independent of any

existing permits, provided however, that the Army shall, where permitted by applicable law or regulation, and at no cost to the Army, assign any such permits to the Land Bank, if so requested by the Land Bank, except where such assignment is prohibited by regulations or written policy of the Army.

16.07 The Land Bank shall have a plan approved by the Army for responding to hazardous waste, fuel and other chemical spills prior to commencement of operations on the Leased Premises, which approval shall not be unreasonably withheld or delayed. Such plan shall be independent of Fort Devens or its successors and shall not rely on use of installation personnel or equipment. Should the Army provide any personnel or equipment, spill containment, either on request of the Land Bank, or because the Land Bank was not, in the reasonable opinion of the Army, conducting timely cleanup actions, the Land Bank agrees to reimburse the Army for its costs.

16.08 The Land Bank shall comply with: (i) the requirement of 10 U.S.C. § 2692 to obtain the necessary Army approval for any storage of toxic or hazardous materials on the Leased Premises and (ii) the hazardous waste permit requirements under the Resource Conservation and Recovery Act (RCRA) and its Massachusetts equivalent. Except as specifically authorized by the Army in writing, the Land Bank must provide, at its own expense, any hazardous waste management facilities, required by applicable laws and regulations. Hazardous waste management facilities of the Army will not be available to the Land Bank.

16.09 Any Army accumulation points for hazardous and other wastes will not be used by the Land Bank. The Land Bank will not permit their hazardous waste to be commingled with hazardous waste of the Army.

16.10 The Land Bank acknowledges that the Leased Premises are being leased subject to a Finding of Suitability to Lease (FOSL), dated March 28, 1996, which has been provided to the Land Bank.

The parties hereto acknowledge and agree that the Leased Premises consist of parcels identified by the Army and EPA as parcels that require further environmental remediation, or documentation of the completion of remediation, by the Army, and include areas designated as Areas of Contamination, Study Areas, and Areas Requiring Environmental Evaluation.

16.11 Notices

a. Preceding expiration, revocation or termination of this lease, the Lessee shall fully fund the Army's preparation of an updated EBS that will document the environmental condition of the property at that time in conjunction with the close-out survey and report, as described in Article 3.02 of this Lease. The updated EBS will serve to support the FOST for the transfer or conveyance of the property or, if the termination is not for purposes of conveying said property, a comparison of the initial and close-out surveys will assist the Division Engineer in determining any environmental restoration requirements, to be completed by the Lessee in accordance with the condition Article 12 of this Lease.

b. NOTICE OF HAZARDOUS SUBSTANCES. To the extent such information is available on the basis of a complete search of Army files, notice regarding hazardous substances stored for one year or more, known to have been released, or disposed of on the Leased Premises is provided in the notice attached to the MOA (Exhibit B herein). The Land Bank should consult the EBS for more detailed information.

c. NOTICE OF THE PRESENCE OF ASBESTOS. The Leased Premises are known to contain certain amounts of asbestos, such as in, but not limited to, the floor tile, linoleum and associated mastic, asbestos-containing pipe and tank insulation, heating, ventilating and air conditioning vibration joint cloths, exhaust flues, acoustic ceiling treatment, siding, and roofing materials.

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The Lessee covenants and agrees that in its use and occupancy of the property, it will comply with all applicable laws relating to asbestos, and the Army assumes no liability for damages for personal injury, illness, disability, or death to the Lessee, its successors or assigns, or to any other person including members of the general public, arising from or incident to the purchase, transportation, removal, handling, alteration, renovations, use, disposition or other activity causing or leading to contact of any kind whatsoever with asbestos on the property described in this Lease, regardless of whether the Lessee, its successors, or assigns, have properly warned or failed to properly warn the individual(s) injured.

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d. NOTICE OF THE PRESENCE OF LEAD-BASED PAINT. The Lessee is hereby informed and does acknowledge that all buildings on the Lease Premises, which were constructed or rehabilitated prior to 1978, are presumed to contain lead-based paint. Lead from paint, paint chips, and dust can pose health hazards if not managed properly. Lead exposure is especially harmful to young children and pregnant woman. Before renting pre-1978 housing (target housing) lessors and sublessors must disclose to sublessees the presence of lead-based paint and/or lead-based paint hazards in the dwelling. "Target housing" means any housing constructed prior to 1978, except housing for the elderly or persons with disabilities (unless any child who is less than 6 years of age resides or is expected to reside in such housing) or any 0bedroom dwelling.

(1) Available information concerning known lead-based paint and/or lead-based paint hazards, the location of lead-based paint and/or lead-based paint hazards, and the condition of painted surfaces is contained in the EBS, dated March 8, 1996, and the Finding of Suitability to Lease, dated March 28, 1996,

which have been provided to the Lessee. All lessees and sublessees must also receive the federally approved pamphlet on lead poisoning prevention. The Lessee hereby acknowledges receipt of the information described in this paragraph.

(2) The Lessee and its sublessees, successors, and assigns, shall not permit the occupancy of any target housing without complying with this section 16.07d and all applicable federal, state, and local laws and regulations pertaining to lead-based paint and/or lead-based paint hazards. Prior to permitting the occupancy of target housing, if required by law or regulation, the Lessee will abate and eliminate lead-based paint hazards by treating any defective lead-based paint surface in accordance with all applicable laws and regulations.

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e. NOTICE OF THE PRESENCE OF RADON. Buildings on the Lease Premises may contain unhealthy levels of radon. Available and relevant radon assessment data pertaining to the Lease Premises are in the EBS. Prior to the use of any building for residential use or 24-hour per day occupancy, the Lessee, at its expense, must take appropriate measures to reduce the radon level to safe levels, in accordance with EPA guidelines.

f. NOTICE OF THE PRESENCE OF UXO. Certain portions of the Lease Premises, as designated as A2, A21, and A22 in Exhibit A herein (UXO Parcels), are subject to further UXO clearance by the Army, which clearance shall be undertaken by the Army promptly and at Army expense, subject to availability of funds. The Army will inform the Land Bank in writing when the clearance has been completed.

16.12 Each sublease, tenancy or license agreement made by the Land Bank hereunder shall contain provisions that will ensure the continuing compliance of the Land Bank, and the grantee thereunder, with the FFA, CERCLA, and this Article 16. Furthermore, the Land Bank shall provide to the EPA and DEP, by certified mail, a copy of each sublease or license of the Leased Premises (as the case may be) within fourteen (14) days after the effective date of such transaction. The Land Bank may delete the financial terms and any other proprietary information from the copy of any sublease or license furnished pursuant to this paragraph.

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16.13 The Lessee shall not occupy or use parcels A.1 and A.20 of the Leased Premises as described in Exhibit A without the written consent of the Army.

16.14 As contemplated in 40 CFR 51.853 (c) (xix) and 93.153(c) (xix) governing the conduct of General Conformity determinations, implementing Clean Air Act § 176(c), this lease is in furtherance of the transfer of the property through an EDC application and, as soon as the Finding of Suitability to Transfer (FOST) is issued and said property can be conveyed in accordance the requirements of the Comprehensive Environmental Response, Compensation and Liability Act, 42 U.S.C. 9620(h)(3), as amended, and other legal and policy requirements, the Army is legally obligated to convey to the Land Bank by one or more quitclaim deeds, the Lease Premises. The Army does not intend to and does not retain continuing authority to control air pollutant emissions associated with activities conducted on the Leased Premises pending the conveyance(s) within the meaning of 40 CFR 51.853(c)(xix) and 91.153(c)(xix).

ARTICLE 17 DISPUTES CLAUSE

17.01 Except as provided in the Contract Disputes Act of 1978 (41 U.S.C. 601-613) (the Act), all disputes arising under or relating to this lease shall be resolved under this clause and the provisions of the Act.

17.02 "Claim", as used in this clause, means a written demand or written assertion by the Land Bank seeking, as a matter of right, the payment of money in a sum certain, the adjustment of interpretation of lease terms, or other relief arising under or relating to this lease. A claim arising under this lease, unlike a claim relating to this lease, is a claim that can be resolved under a lease clause that provides for the relief sought by the Land Bank. However, a written demand or written assertion by the Land Bank seeking the payment of money exceeding \$100,000 is not a claim under the Act until certified as required by section 17.04 below.

17.03 A claim by the Land Bank shall be made in writing and submitted to the Division Engineer for a written decision. A claim by the United States against the Land Bank shall be subject to a written decision by the Division Engineer.

17.04 For Land Bank claims exceeding \$100,000, the Land Bank shall submit with the claim a certification that (i) the claim is made in good faith; and (ii) supporting data are accurate and complete to the best of the Land Bank's knowledge and belief; (iii) and the amount requested accurately reflects the lease adjustment for which the Land Bank believes the United States is

liable.

17.05 The certification shall be executed by (i) a senior company official in charge of the Land Bank's location involved; or (ii) an officer or general partner of the Land Bank having overall responsibility of the conduct of the Land Bank's affairs.

17.06 For Land Bank claims of \$100,000 or less, the Division Engineer must, if requested in writing by the Land Bank, render a decision within 60 days of the request. For Land Bank-certified claims over \$100,000, the Division Engineer must, within 60 days, decide the claim or notify the Land Bank of the date by which the decision will be made.

17.07 The Division Engineer's decision shall be final unless the Land Bank appeals or files a suit as provided in the Act.

17.08 At the time a claim by the Land Bank is submitted to the Division Engineer or a claim by the United States is presented to the Land Bank, the parties, by mutual consent, may agree to use alternative means of dispute resolution. When using alternate dispute resolution procedures, any claim, regardless of amount, shall be accompanied by the certificate described in section 17.04 of this Article, and executed in accordance with section 17.05 of this clause.

17.09 The United States shall pay interest or the amount found due and unpaid by the United States from (1) the date the Division Engineer received the claim (properly certified if required), or (2) the date payment otherwise would be due, if that date is later, until the date of payment. Simple interest on claims shall be paid at the rate, fixed by the Secretary of the Treasury as provided in the Act, which is applicable to the period during which the Division Engineer receives the claim and

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then at the rate applicable for each 6-month period as fixed by the Treasury Secretary during the pendency of the claim.

17.10 The Land Bank shall proceed diligently with the performance of the lease, pending final resolution of any request for relief, claim, or action arising under the lease, and comply with any decision of the Division Engineer.

ARTICLE 18

MISCELLANEOUS

18.01 Both parties acknowledge and agree that a Notice of Lease will be recorded in the public records, which Notice shall be signed by the parties hereto and identify the Lease Premises.

18.02 The Lease is subject to all existing easements and rights of way of record.

18.03 The provisions of this Lease are not subject to 10 U.S.C. §2562.

18.04 This Lease contains the entire agreement between the parties regarding the lease of the Lease Premises to the Land Bank, and any agreement hereafter made shall not operate to change, modify or discharge this Lease in whole or in part unless that agreement is in writing and signed by the party sought to be charged with it.

18.05 No member or delegate to Congress or Resident Commissioner shall be admitted to any share or part of this Lease or to any benefit to arise therefrom. Nothing herein contained, however,

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shall be construed to extend to any incorporated company, if the Lease be for the general benefit of such corporation or company.

18.06 Nothing contained in this Lease will make or will be construed to make the parties hereto partners or joint venturers with each other, it being understood and agreed that the only relationship between the Army and the Land Bank hereunder is that of lessor and lessee. Neither will anything in this Lease render or be construed to render either of the parties hereto liable to any third party for debts or obligations of the other party hereto.

18.07 The brief headings or titles preceding each Article are merely for purposes of identification, convenience and ease of reference and will be completely disregarded in the construction of this Lease.

18.08 This Lease is executed in two (2) counterparts, each of which is deemed an original of equal dignity with the others and which is deemed one and the same instrument as the other.

18.09 All personal pronouns used in this Lease, whether used in the masculine, feminine or neuter gender, will include all other genders.

18.10 This Lease shall terminate upon the transfer of all of the Lease Premises to the Land Bank in fee, or otherwise as provided for herein.

18.11 If any provision of this Lease is declared or found to be illegal, unenforceable or void, then both parties shall be relieved of all obligations under that provision. The remainder

of this Lease shall remain enforceable to the fullest extent permitted by law.

18.12 Discrimination.

a. The Lessee shall not discriminate against any person or persons or exclude them from participation in the Lessee's operations, programs or activities conducted on the Leased Premises, because of race, color, religion, sex, age, handicap, or national origin.

b. The Lessee, by acceptance of this lease, is receiving a type of Federal assistance and, therefore, hereby gives assurance that it will comply with the provisions of Title VI of the Civil Rights Act of 1964, as amended (42 U.S.C. § 2000d); the Age Discrimination Act of 1975 (42 U.S.C. § 6102); and the Rehabilitation Act of 1973, as amended (29 U.S.C. § 794). This assurance shall be binding on the Lessee, its agents, successors, transferees, sub-lessees and assignees.

Article 19 Insurance

19.01. At the commencement of this lease, the Land Bank shall obtain, from a reputable insurance company, or companies, comprehensive liability insurance. The insurance shall provide an amount not less than a combined single limit of \$1,000,000 for any number of persons or claims arising from any one incident with respect to bodily injuries or death resulting therefrom, property damage, or both, suffered or alleged to have been suffered by any person or persons resulting from the operations of the Lessee under the terms of this lease.

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The liability insurance policy shall insure the hazards of 19.02 the demised premises and operations conducted in and on the demised premises, independent contractors, contractual liability (covering the indemnity included in this leases agreement), and shall name the United States as an insured party. Each policy will provide that any losses shall be payable notwithstanding any act or failure to act or negligence of the Land Bank or the United States or any other person; provide that the insurer will have no right of subrogation against the United States; and be reasonably satisfactory to the United States in all respects. Under no circumstances will the Land Bank be entitled to assign to any third party rights of action that it may have against the United States arising out of this Lease. The Land Bank shall require that the insurance company give the Division Engineer thirty (30) days written notice of any cancellation or change in such insurance. The Division Engineer may require closure of any or all of the Lease Premises during any period for which the Lessee does not have the required insurance coverage. The Land Bank shall require its insurance company to furnish to the Division Engineer a copy of the policy or policies, or if acceptable to the Division Engineer, certificates of insurance evidencing the purchase of such insurance. The minimum amount of liability insurance coverage is subject to revision by the Division Engineer every three years or upon renewal or modification of this lease.

19.03 It is the Buyer/Lessee's option to obtain insurance on the structures and improvements of the Lease Premises, for such periods as the Lessee is in possession of the Lease Premises pursuant to this lease, to protect its interest. Nothing herein contained shall be construed as an obligation upon the United States to repair, restore or replace the Lease Premises or any

part thereof should it be diminished in value, damaged or destroyed. The purchase price will not be altered should such damage occur and the Lessee has failed to obtain insurance. Any proceeds paid to the United States shall be applied to the purchase price.

19.04 The Land Bank shall maintain worker compensation and employer's liability insurance as required by the Commonwealth of Massachusetts.

IN WITNESS WHEREOF, the parties have executed the Lease as of the day and year first above written.

UNITED STATES OF AMERICA

By Cant Writ Johnson

Deputy Assistant Secretary of the Army (Installations and Housing)

THE GOVERNMENT LAND BANK

Michael P. Executive Director