Draft Final

Proposed Plan
FTG-01, North Landfill Area
Fort Gillem
Forest Park, Georgia

Prepared for:
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List of Acronyms

µg/L	micrograms per liter
APTIM	Aptim Federal Services, LLC
ARAR	applicable or relevant and appropriate requirement
bgs	below ground surface
BHHRA	baseline human health risk assessment
BRAC	Base Realignment and Closure
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
COC	chemical of concern
COPEC	chemical of potential ecological concern
DCE	dichloroethene
EPA	U.S. Environmental Protection Agency
FORSCOM	U.S. Army Forces Command
Foster Wheeler	Foster Wheeler Environmental Corporation
FS	feasibility study
GA EPD	Georgia Department of Natural Resources, Environmental Protection Division
HGL	HydroGeoLogic, Inc.
HI	hazard index
IC	institutional control
IRA	interim remedial action
IT	IT Corporation
$KMnO_4$	potassium permanganate
mg/kg	milligrams per kilogram
MCL	maximum contaminant level
MNA	monitored natural attenuation
MOU	Major Operable Unit
MU	Manageable Unit
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NLA	North Landfill Area
North Wind	North Wind Services, LLC
O&M	operation and maintenance
OU	Operable Unit
PCB	polychlorinated biphenyl
PP	Proposed Plan

List of Acronyms *(Continued)*

RAO	remedial action objective
RCRA	Resource Conservation and Recovery Act
RI	remedial investigation
ROD	Record of Decision
RRS	Risk Reduction Standard
Shaw	Shaw Environmental, Inc.
SLERA	screening-level ecological risk assessment
SVOC	semivolatile organic compound
TAL	target analyte list
TCE	trichloroethene
TCL	target compound list
TCRA	Time-Critical Removal Action
UAO	Unilateral Administrative Order
URA	Urban Redevelopment Agency
USACE	U.S. Army Corps of Engineers
USATHAMA	U. S. Army Toxic and Hazardous Materials Agency
UU/UE	unlimited use and unrestricted exposure
VI	vapor intrusion
VOC	volatile organic compound

1.0 Introduction

The U.S. Army invites the public to review and comment on this Proposed Plan (PP), which documents the Army's Preferred Remedial Alternative that addresses environmental contamination associated with historical activities at the North Landfill Area (NLA), FTG-01, at Fort Gillem, Forest Park, Georgia. The PP also summarizes environmental investigations and human health and ecological risk assessments completed to date at FTG-01.

The Army issues this PP as the lead agency under the Comprehensive Environmental Response Compensation, and Liability Act (CERCLA) of 42 U.S. Code § 9601 et. seq. for cleanup at FTG-01. The Army is authorized to be the lead agency under Executive Order 12580, as amended. The response is in compliance with the Defense Environmental Restoration Program (10 U.S.C. §2701 et. seq.). The Georgia Department of Natural Resources, Environmental Protection Division (GA EPD) is the support agency and concurs with the preferred alternative. This PP was prepared in accordance with the public participation requirements of the CERCLA and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), 40 Code of Federal Regulations (CFR) § 300.430(f)(2).

It is the lead agency's current judgment that the Preferred Alternative identified in this PP, or one of the other active measures considered in the PP, is necessary to protect public health or welfare or the environment from actual or threatened releases of hazardous substances into the environment.

Environmental studies and investigations have been conducted since the late 1970s at FTG-01. The most recent remedial investigation (RI) began in 2016 to delineate the extent of soil and groundwater contamination and address remaining data gaps. In September 2014, the U.S. Environmental Protection Agency (EPA) issued a Resource Conservation and Recovery Act (RCRA) §7003 Unilateral Administrative Order (UAO) to the Army to investigate the potential for vapor intrusion (VI) from groundwater contamination underlying the property surrounding Fort Gillem. The UAO required the Army to conduct a survey of all water wells and springs, sampling of any water wells and springs identified by the survey, completion of a VI study, mitigation of contamination discovered by these efforts, and public outreach. The Army conducted the VI study in 2014 and 2015 in the mostly residential, off-post buildings around Fort Gillem, including the residential off-post area north of FTG-01 The VI study concluded that there were no complete VI pathways for any of the 308 structures evaluated for the study and that no further action is planned (Geosyntec Consultants, 2016). Based on the summary and conclusions of the recent VI work, an aggressive schedule for remediation of soil and

groundwater was implemented to decrease the potential for further VI concerns. The schedule included continuation of the RI activities to identify potential on-post soil and groundwater source areas that required treatment/removal to reduce on-post and off-post groundwater contamination.

Based on preliminary review of new and existing data, interim remedial actions (IRA) were initiated in 2016 to address unacceptable risk from soil and groundwater concurrently with preparation of the RI report. The objective of the soil removal action was to eliminate direct exposure to soil containing volatile organic compounds (VOC), semivolatile organic compounds (SVOC), and metals that posed unacceptable risk to commercial/industrial receptors or a potential leaching source to groundwater. Soil removal actions were successful in eliminating contaminant concentrations above industrial criteria but residual soil exceeding unrestricted residential criteria remains. Anticipated future land use at FTG-01 is commercial/industrial and cleanup goals have been achieved. Controls for managing soil at FTG-01 will be developed in a future land-use control Remedial Design document. No other alternatives for soils will be presented in this PP, only a summary of the previous investigations and removal actions conducted at the site, and the requirement to select land-use controls to restrict residential uses. The groundwater interim actions were completed from 2017 to 2021, while the RI was being completed. As such, the results of the groundwater remedial action were not incorporated into the RI report or the feasibility study (FS) and the subsequent PP. A PP for FTG-01 was initially prepared based on the existing RI/FS reports (Aptim Federal Services, LLC [APTIM], 2020a; 2021a). The PP was issued for public review (APTIM, 2021b). A public comment period was held from 25 February to 26 March 2021. No comments were received. A public meeting was not held since no comments were received from the public during the public comment period, nor was sufficient interest expressed from the public.

A subsequent RI/FS Addendum was issued that summarized the findings and conclusions of the RI conducted from 2016 to 2019, described the groundwater IRA implemented from 2017 to 2021 to address on-post and off-post groundwater VOC contamination associated with FTG-01, and described the remedial action alternatives that were evaluated for the FS Addendum (APTIM, 2022). The alternatives evaluation presented in the addendum included the completed remedial action as a component of the final remedy for FTG-01, where appropriate.

This revised PP, based on the RI/FS Addendum and findings of the IRAs, presents the preferred alternative for FTG-01 groundwater. After the public comment period, all the comments received will be evaluated. The comments will be summarized along with responses in the "Responsiveness Summary" section of the Record of Decision (ROD). The Army, in

consultation with GA EPD, will present the Preferred Remedial Alternative and incorporate it into a ROD as the permanent site remedy.

Fort Gillem is in the Atlanta metropolitan area, approximately 10 miles southeast of downtown Atlanta and approximately 3 miles east of Atlanta's Hartsfield-Jackson International Airport. Fort Gillem originally occupied 1,452 acres, and the Army operated the installation under various names from 1941 to 2011. Construction started in 1940 and was mostly completed by December 1942. Fort Gillem initially operated as two installations, the Atlanta Quartermaster Deport and the Atlanta Ordnance Depot. The Army consolidated the installations on April 1, 1948 and renamed them Atlanta General Depot. In 1962, the installation name was changed to the Atlanta Army Deport.

On June 28, 1974, the Atlanta Army Depot was renamed Fort Gillem, and Fort McPherson assumed administrative control. The installation was active through numerous military efforts from World War II through Operation Desert Shield/Desert Storm. The installation shared responsibility for providing the Army's needs, such as weapons and equipment, research and development, procurement, production, storage, distribution, inventory management, maintenance, and disposal of surplus and waste materials during peacetime and wartime. As a sub-post of Fort McPherson, Fort Gillem also supported the U.S. Army Forces Command (FORSCOM) readiness missions and was home for many FORSCOM and Fort McPherson activities, including the Army and Air Force Exchange Service and the Federal Emergency Management Agency.

On November 9, 2005, the U.S. Congress approved the Base Realignment and Closure (BRAC) Commission's recommendation to close Fort Gillem, and stand-down began in 2007. Please note that the BRAC terminology has subsequently been replaced with Department of the Army, G9, Environmental Division. Closure of Fort Gillem was completed on September 15, 2011; Army operations ceased, and the base was vacated.

The Army retained 260 acres of the western portion of Fort Gillem that comprises the Fort Gillem Enclave. The remaining acreage, or "excess property," totaled approximately 1,170 acres. The Forest Park Urban Redevelopment Agency (URA) purchased the excess property in 2014. To date, approximately 936 acres have been released to the URA and are currently being developed. The remainder of the acreage purchased by URA, including FTG-01, will be released upon completion of environmental restoration activities. Based on current development at Fort Gillem and planned development, the anticipated future land use at FTG-01 is commercial/industrial (non-residential).

2.0 Site Background

FTG-01 is in the northern portion of the former Fort Gillem (Figure 1). Surrounding land use to the north and west of the installation boundary is residential. The site is heavily wooded with some open fields and unpaved roads (Figure 2).

The topography across Fort Gillem is gently rolling, with surface elevations ranging from 855 to 971 feet above mean sea level (Figure 3). A northeast-southwest-trending ridge bisects the installation and acts as a groundwater and surface water divide. FTG-01 is located north of the northeast-southwest-trending ridge bisecting the installation; therefore, surface topography as well as surface drainage slopes gently to the north-northwest.

FTG-01 was originally approximately 233 acres in size, but the site was split to facilitate the transfer of 97 acres of clean, uncontaminated property. The Army will retain the remaining 136 acres until a final remedial action is implemented at FTG-01. The land surface across FTG-01 has been planted in pine forest. However, there are areas of the site that are open fields or fields overgrown by briars and shrubs.

The post boundary road separates FTG-01 from the northern and western perimeter fence. There is also a network of gravel roads cross-cutting FTG-01 that provide access to the interior of the site.

FTG-01 was used from 1941 until approximately 1980 for waste disposal activities including localized landfilling, trenching, burning, and surface disposition of surplus and waste materials. A review of the historical documentation generally indicated that wastes are not uniformly distributed across FTG-01; the bulk of the disposal was in the central and west-central areas, and areas to the east were only lightly used as disposal areas. Hydrogeologic data indicate the more lightly used portions of the landfill are located upgradient from the more contaminated portions of the landfill. According to the installation assessment of Fort Gillem (U.S. Army Toxic and Hazardous Materials Agency [USATHAMA], 1980), burial operations and procedures in place from the 1940s through 1964/1965 are largely unknown due to the lack of records.

Historical aerial photographs show probable landfilling operations within the NLA as early as 1950 (EPA, 1981). Landfilling or disposal operations have been documented for the NLA from the mid-1960s through 1980. According to Table IV of the installation assessment (USATHAMA, 1980), the following materials were burned and buried or directly buried into the NLA: gas masks; medical training supplies; petroleum, oils, and lubricants; food products; rubber; miscellaneous chemicals; and sewage sludge. After 1980, sanitary and industrial waste, miscellaneous trash and debris, and construction rubble were not disposed of on Fort Gillem

property. Petroleum, oil, and lubricant wastes were collected and disposed through the Defense Logistics Agency, Property Disposal Office (USATHAMA, 1980).

2.1 Previous Investigations

Environmental studies and investigations at FTG-01 began in the late 1970s. The previous investigative activities conducted at FTG-01 included geophysical and soil vapor surveys, trenching, soil sampling from borings and trenches, installation and sampling of temporary and permanent monitoring wells, and surface water and sediment sampling from on-post surface water features and off-post surface water features north and northwest of FTG-01. Previous studies and investigations conducted at FTG-01 include the following:

- ***Subsurface Investigation (Law Engineering Testing Company, 1979).*** An assessment of subsurface conditions at FTG-01 was conducted for the consideration of developing a national cemetery for the Veterans Administration. One hundred eighty-four test borings/pits were completed to determine the nature of the underlying materials (identify the presence of buried debris, depth to groundwater, and depth to bedrock), The study concluded that approximately half the area under consideration was unusable due to buried debris or surface features which made it unfavorable for a cemetery.

- ***Installation Assessment of Fort Gillem (USATHAMA, 1980)***. The installation assessment was the first systematic evaluation of environmental quality at Fort Gillem. The evaluation identified the potential for contamination from historical waste disposal but did not include the collection and analysis of samples.

- ***Hydrogeologic Study of Fort Gillem (Geraghty and Miller, Inc., 1982).*** This was the first systematic investigation of the hydrogeology at Fort Gillem. The hydrogeologic investigation included the installation, testing, and sampling of permanent monitoring wells and included two phases. The Phase I wells were installed in June 1980 and sampled between July and September 1980. The Phase II monitoring wells were installed and sampled in October and November 1980. Monitoring wells associated with FTG-01 included 11 monitoring wells with the nomenclature "NLA-WELL." The laboratory analysis of water and sediment was conducted by Arthur. D. Little Inc. The data were presented in the 1982 report published by Geraghty and Miller, Inc.

- ***Environmental Survey of Fort Gillem (Environmental Science and Engineering, Inc., 1982).*** Environmental Science and Engineering, Inc. evaluated the hydrologic and analytical data collected by Geraghty and Miller, Inc. and merged the data with information collected by USATHAMA.

- ***Surface Water and Groundwater Sampling Results (Applied Biology, Inc., 1984).*** This report summarized the results of 3 surface water samples and the resampling of the 34 monitoring wells installed by Geraghty and Miller, Inc. in 1980. Eleven of the 34 monitoring wells were associated with FTG-01.

- ***Analytical Summary Report (U.S. Army Corps of Engineers [USACE], 1992).*** USACE issued a report in 1992 that summarized groundwater and surface water data collected between 1986 and 1991.

- ***Wastewater Management Study (U.S. Army Environmental Hygiene Agency,1993).*** The U.S. Army Environmental Hygiene Agency conducted a wastewater management study of Fort Gillem. The wastewater management study included analytical results from 17 surface water and sediment sampling locations. Twelve locations were located within Fort Gillem and five were located off post. The samples were collected three times in June 1993: during a dry weather period, during a rainstorm, and during a period 24 to 48 hours after the storm.

- ***Geophysical Survey (Black & Veatch Waste Science, Inc., 1993).*** Black & Veatch Waste Science, Inc. completed a surface geophysical survey across FTG-01 in 1993 to determine the potential for the presence of surface and subsurface contamination and identify the location of disposal sites. The survey identified 356 burial locations, 281 of which were grouped into Manageable Units (MU). The remainder of the burial locations were considered Independent Locations (Black and Veatch Waste Science, Inc., 1993). Information from the geophysical survey was incorporated into the Phase I and II RIs conducted by Foster Wheeler Environmental Corporation (Foster Wheeler) in 1994 and 1995 as the basis for sampling locations.

- ***Well Survey (Ebasco Environmental, 1993).*** Ebasco Environmental conducted a well survey to identify all withdrawal points of groundwater and surface water and potential contributors of off-post contamination within a 3-mile radius of the Fort Gillem boundary.

- ***RI (Foster Wheeler, 1996).*** The Foster Wheeler RI was the first comprehensive study of FTG-01. The RI included exploratory trenching, installation of monitoring wells, and collection of soil and groundwater samples from 1994 to 1995. Analyses for soil and groundwater samples included VOCs, SVOCs, pesticides/polychlorinated biphenyls (PCB), metals, and cyanide. Selected samples were also analyzed for herbicides.

- ***FS (ICF Kaiser, 1997).*** ICF Kaiser conducted an FS for FTG-01 following the Foster Wheeler RI (ICF Kaiser, 1997). The FS subdivided FTG-01 into Operable Units (OU) and Major Operable Units (MOU) based on media and types of contamination. Definition of each OU (OU-A through OU-Z) was based upon specific areas where contaminants exceeded cleanup goals. In addition to the OU subdivisions, the FS grouped the OUs into eight MOUs (MOU 100 through MOU 800). Much of the language still commonly used to describe features or areas within FTG-01 is from the OU/MOU descriptions developed and presented in the 1997 FS.

- ***Delineation Activities (IT Corporation [IT], 2002).*** IT collected and analyzed soil samples in 2000 to define the extent of contamination at areas of FTG-01 identified in the Foster Wheeler RI. All samples were collected by direct-push technology. The range of contaminants detected was consistent with those detected in historical sampling events and included VOCs, SVOCs, metals, and pesticides/PCBs.

The presence of pesticides was attributed to the application of registered pesticides in accordance with their intended purpose and consistent with the Federal Insecticide, Fungicide, and Rodenticide Act and other applicable laws and regulations.

- ***RI (HydroGeoLogic, Inc [HGL] and Shaw Environmental, Inc. [Shaw]*).** The 2008 RI evaluated FTG-01 on a watershed basis. Based on the hydrological and drainage features, FTG-01 was subdivided into three distinct watersheds, consisting of the Western, Central, and Eastern Watersheds. Soil, groundwater, surface water, and sediment samples were collected in 2006 to supplement the historical data collected since 1994. Soil, groundwater, surface water, and sediment samples were analyzed for VOCs, SVOCs, pesticides/PCBs, and metals. A baseline human health risk assessment (BHHRA) and screening-level ecological risk assessment (SLERA) were conducted for each of the three watersheds.

- ***Compliance Status Report (North Wind Services, LLC [North Wind]).*** In 2013-2014, North Wind installed monitoring wells and collected soil, groundwater, surface water, and sediment samples for analysis of VOCs, SVOCs, pesticides/PCBs, and metals. The analytical data were compared to GA EPD Hazardous Site Response Act Risk Reduction Standards (RRS). A BHHRA and SLERA were also conducted.

- ***VI Study (Geosyntec Consultants).*** In September 2014, the EPA issued a RCRA §7003 UAO to the Army to investigate the potential for VI from groundwater contamination underlying the property surrounding Fort Gillem. The Order required the Army to conduct a survey of all water wells and springs, sampling of any water wells and springs identified by the survey, completion of a VI study, mitigation of contamination discovered by these efforts, and public outreach. The Army conducted a VI study in 2014 and 2015 in the mostly residential, off-post buildings around Fort Gillem, including the residential off-post area north of FTG-01. The VI study evaluated 308 structures (104 associated with the Southeast Burial Sites and 204 associated with the NLA). The VI study concluded that there were no complete VI pathways for any of the 308 structures evaluated for the study and that no further action is planned (Geosyntec Consultants, 2016).

- ***RI (APTIM).*** APTIM conducted an RI from 2016 to 2019 to complete the delineation of the nature and extent of contamination at FTG-01. The RI included the collection of soil, groundwater, surface water, and sediment samples. The analytical parameters included target compound list (TCL) VOCs, TCL SVOCs, TCL pesticides/PCBs, and target analyte list (TAL) metals. The soil and sediment data were compared to industrial and residential regional screening levels. Groundwater data were compared to tap water regional screening levels. Surface water data were compared to Georgia Instream Water Quality Standards or National Ambient Water Quality Standards. Metals and pesticide data from soil were also compared to Fort Gillem-specific background values. The FTG-01 RI was interrupted to respond to the 2014 RCRA §7003 UAO involving off-post exposure to VI. The CERCLA RI activities were resumed in 2016. Although the UAO work concluded there were no VI risks associated with VOCs migrating off post, the resumed RI activities identified the need for IRA to address groundwater contamination at FTG-01.

- ***RI/FS Addendum (HGL-Aptim Applied Science and Technology).*** As noted above, the FTG-01 RI began in 2016. Based on preliminary review of new and existing data, IRA (further discussed in Section 2.2) was initiated in 2017 to address unacceptable risk from groundwater concurrently with preparation of the RI report. As such, the results of the groundwater remedial action were not incorporated into the RI report or the FS. However, the remedial action was consistent with alternatives proposed in the FS. Therefore, the RI/FS Addendum summarized the findings and conclusions of the RI conducted from 2016 to 2019, described the remedial action implemented to address on-post and off-post groundwater VOC contamination associated with FTG-01, and described the remedial action alternatives that were evaluated for the FS. The alternative evaluations presented in the addendum included the completed IRA as a component of the final remedy for FTG-01, where appropriate (APTIM, 2022).

2.2 Remedial Actions Completed to Date

Remedial actions were conducted at multiple locations within FTG-01 from 1994 to 2021. The remedial actions conducted at FTG-01 are discussed below in chronological order.

- ***Construction of Surface Water Control Structures and the Leachate Interception and Treatment System.*** Landfilled materials in the topographically lower portions of FTG-01 (i.e., near the stream channels) were periodically eroded and transported off post (USATHAMA, 1980), prompting complaints from the residents living near the northern post boundary. Various actions were taken by the U.S. Army to address these issues, including the construction of flood control structures on the Eastern and Western Streams and the construction of a leachate interception and treatment system.

  Three detention basins were constructed during the spring and summer of 1994. Two are located on the Western Stream, and one is located on the Eastern Stream. These structures were designed to lower the velocity and reduce the volume of water in the streams immediately downstream of the structures during flood events. In addition to the flood control structures, concrete-filled, fabric-reinforced matting was placed on erosion-prone areas of the floodplain adjacent to the western stream and on the detention structure slopes.

  The purpose of the leachate interception and treatment system was to capture and treat contaminated leachate originating from a portion of a landfill trench which contains a seep or leachate spring. This leachate seep is in the northwestern portion of OU-A, near the Western Stream. The leachate was collected within a shallow well or sump-like structure, then pumped through activated carbon to remove VOCs. The activated carbon canisters were later replaced with an air stripper. Treated water was discharged back to the Western Stream. The leachate interception and treatment system were constructed in the summer of 1995 and a pilot test completed on the system (Foster Wheeler, 1995a,b). The pilot test concluded that the system was successful in capturing and treating the leachate flow during the dry season but could not capture all the leachate during storm events (Foster Wheeler, 1995a). The leachate

interception and treatment system operated intermittently from late 1995 to the early 2000s.

- ***MOU 800 Drum Removal.*** Field investigations for this IRA began in February 1998 with a field reconnaissance effort intended to locate and identify drums and containers lying on the ground surface. Container collection began following the reconnaissance effort and continued until the middle of March 1998. Sixty-one empty, partially full, or full containers were collected, sampled and characterized, and disposed of according to applicable local, state, and federal regulations (IT, 2001a).

- ***MOU 600 Lead-Contaminated Soil Removal.*** An IRA was conducted from August 2000 to early 2001for MOU 600 (MOU 600, located within the OU-A study area, was identified as isolated surface soil areas contaminated with lead [ICF Kaiser, 1997]). During implementation, VOC-contaminated soil (MOU 200) was encountered and subsequently included in the IRA (IT, 2001b). During the IRA, approximately 27,686 tons of lead-containing soils, 2,034 tons of solvent- and petroleum-containing soils, 3 drums of solvent/water mixture, 1 drum of motor oil, and approximately 120 crushed drums and drum pieces were removed from the study area. Additional follow-on activities were completed in 2001 (IT, 2002) to recover one additional drum containing an organic solvent.

  A burn pit was discovered during confirmation sampling of the expanded two-dimensional area at the southern end of the MOU 600 site in mid-November 2000. The location of the burn pit was not within the initial boundary of the IRA. Field personnel identified an ash layer approximately 1 foot thick near ground surface that contained elevated levels of lead ranging from approximately 10,000 to 25,000 milligrams per kilogram (mg/kg) as measured by x-ray fluorescence. As removal of the ash continued in a northerly direction toward MOU 600, the excavation grew deeper. On December 22, 2000, USACE issued a stop-work order. The excavation was approximately 75 feet wide by 6 feet deep at the center when the stop-work order was issued. The excavation appeared to have uncovered an elongated burn pit. The ash layer was 1 foot thick near the surface of the cross section and nearly 3 feet thick at the deeper point. After the stop-work order was issued, the burn pit excavation was backfilled with soil and brush from the initial clearing and grubbing effort.

- ***OU-A***. IRAs were implemented in 2009 to mitigate sourcing of VOCs to groundwater. Two locations in OU-A, one in the area of monitoring well cluster NLA-MW44A/D, also referred to as OU-A(1) in other documents, and the other in the area of OU-A(2)/NLA-MW57, were targeted for excavation and disposal of contaminated soil.

  In March 2009, six trenches (4 feet wide by 26 feet long by 8 feet deep) were excavated across six anomalies identified by geophysical methods around monitoring well NLA-MW57. The target depth at two anomaly locations was not reached due to encountering bedrock between 2.5 and 5.5 feet below ground surface (bgs). Soils were screened during the excavation with a photoionization detector. There were no detections of VOCs. It was observed that all anomaly locations were undisturbed native material. Approximately 152 cubic yards of soil were removed and disposed

off post. Post-excavation samples were collected from the base of each trench and submitted to an analytical laboratory for VOC, SVOC, and TAL metal analyses. An estimated 132 pounds of potassium permanganate ($KMnO_4$) were placed at the base of each trench to address residual VOC contamination. The trenches were then backfilled with clean material (Shaw, 2010).

In April 2009, approximately 1,136 cubic yards of soil were removed from the monitoring well NLA-MW44A/D well cluster area and disposed off post. The excavation focused on an anomaly identified during a geophysical and supplemental soil sampling investigation. Three individual areas were excavated and referred to as OUA-44W, OUA-44C, and OUA-44E. Soils were excavated to an approximate depth of 7 feet bgs. Excavated soils were staged near the OU-A(2)/NLA-MW57 area and stockpiled. Post-excavation samples were collected on 50-foot centers along the excavation sidewalls and from the excavation bottoms per every 300 square yards and submitted to an analytical laboratory for VOC, SVOC, and TAL metals analyses. Post-excavation sampling results indicated low-level VOC contamination remained at the base of the excavation. An estimated 2,640 pounds of $KMnO_4$ were placed in the excavation pits and covered with clean fill to address residual VOC contamination. The site was then graded to match the surrounding land surface (Shaw, 2010).

- ***OU-B***. In March 2009, an IRA was conducted in the OU-B(2) Trench 12 area. Soil removal areas included a 43 by 65-foot rectangular area and two smaller 15 by 15-foot areas. Approximately 712 cubic yards of contaminated soil and debris were excavated. The estimated soil removal to achieve reduction was 1,000 cubic yards at a total excavation depth of 7 feet. However, during excavation of the larger source area, a large mass of rock was encountered that reduced the volume of excavated material by approximately 30 percent. Excavated soils were direct loaded onto off-road dump trucks, hauled to a designated staging area near the MW-57 area, and stockpiled.

  Post-excavation sampling included collection of soil samples on 50-foot centers and every 300 square yards along the base of the excavation. The samples were submitted to an analytical laboratory for VOC, SVOC, and TAL metals analyses.

  At the conclusion of the post-excavation soil sampling, the bottom of each excavation pit was layered with $KMnO_4$ and backfilled with clean fill material and the area was graded to match the surrounding grade. An estimated 2,970 pounds of KMnO4 were placed in the larger excavation pit and 330 pounds in each of the two smaller pits to facilitate remediation of residual VOC contamination (Shaw, 2010).

- ***OU-H***. In March and April 2009, Shaw performed an IRA that included the excavation of approximately 744 cubic yards of VOC-contaminated soil and debris from OU-H. Debris included cardboard, medical training equipment (intravenous tubes, needles, and flow regulators), and rusted 5-gallon drum carcasses. Some of the drums had the affixed label “TRICHLOROETHYLENE TECH.” The excavation was terminated at the top of bedrock, which was encountered between 5 and 10.5 feet bgs. Approximately 3,969 pounds of $KMnO_4$ were placed in the bottom of the excavation

pit and backfilled with clean fill material to address residual VOC contamination (Shaw, 2010).

- ***FTG-01 Groundwater Extraction and Treatment System.*** The groundwater extraction and treatment system at FTG-01 was constructed in the spring and summer of 2009 to mitigate the off-post migration of VOCs in groundwater. The system consists of 20 groundwater extraction wells installed on the northern and western boundaries of FTG-01. The system treats groundwater by air stripping and liquid-phase carbon absorption to remove VOCs. Effluent vapor from the air stripper is treated by two vapor-phase granulated activated carbon vessels prior to discharge into the atmosphere. The FTG-01 groundwater extraction and treatment system operated from November 2009 until September 2017 and removed approximately 991 pounds of contaminant mass.

- ***OU-I.*** In June 2010, HGL performed an IRA that included the excavation of 1,134 cubic yards of soil and debris from OU-I. The excavation depths ranged from 7 to 12 feet bgs. Eleven grids were excavated. A white powdery material was encountered during baseline soil sampling and during the excavation. The material was determined to be XXCC3 impregnate, or chloride, which was formerly used by the Army to prevent chemical warfare agents from penetrating clothing (HGL, 2011).

  Chemical analysis of the white powder detected carbon tetrachloride at 59 mg/kg and chloroform at 11 mg/kg. Toxicity characteristic leaching procedure results indicated that the white powder was nonhazardous, and therefore the waste generated by the excavation was disposed as nonhazardous (HGL, 2011). The planned dimensions of the excavation were 150 by 130 feet and up to 11 feet deep. The extent of the buried XXCC3 extended beyond the expected dimensions and depth of the planned excavation. Only the planned area was excavated, and the limits of the excavation were marked with 10-mil plastic liners along the excavation perimeter for possible future excavations. $KMnO_4$ was not added to the excavation as planned due to the potential oxidant demand associated with zinc oxide, one of the constituents in XXCC3.

  The confirmation soil samples collected from the OU-I excavation contained concentrations of carbon tetrachloride, trichloroethene (TCE), tetrachloroethene, and other VOCs above cleanup criteria.

- ***MU 4C and Additional OU-H IRAs.*** In August 2012, North Wind performed two IRAs, one at MU 4C and the other at OU-H. None of the representative samples of excavated soil indicated hazardous characteristics. The total volume of debris and soil excavated from these areas was 25.1 cubic yards. All the excavated soil material was disposed off site, either by incineration (for suspect glass vials) or by transport to a Subtitle D landfill for nonhazardous disposal. Excavations were backfilled with clean soil transported from an off-site source (North Wind, 2014).

- ***2016-2019 Time-Critical Removal Action (TCRA).*** APTIM conducted TCRAs from April 2016 to June 2019 at the following areas within FTG-01:

  - MOU 600 Burn Pit
  - MOU 600 East
  - MOU 600 North
  - MOU 600 West
  - MU 1A
  - MU 1E/MU 1F
  - MU 1H
  - MU 1I
  - MU 4C
  - MU 8A
  - OU-H
  - OU-I
  - Sample Area 2
  - Trench 12
  - Trench 40 Area.

  An approved Action Memorandum (U.S. Army, 2017) consisted of pre-excavation delineation sampling, excavation, confirmation sampling, surveying, transportation and off-site disposal of excavated soil and debris, and site restoration as needed. Contaminants in soil that were addressed by the TCRAs included VOCs, SVOCs, and metals. A total of 103,963 tons (84,436 cubic yards) of excavated soil and debris were disposed off site as nonhazardous waste (APTIM, 2020b). The remedial goals for soil were based upon the future industrial use scenario for FTG-01. The remaining contaminant concentrations in soil are below industrial criteria, but exceed unrestricted (i.e., residential criteria), therefore unlimited use and unrestricted exposure (UU/UE) conditions were not met, and institutional controls (IC)/land-use controls and 5-Year Reviews will be required for FTG-01 soil.

- ***2017-2021 Groundwater Interim Actions.*** The FTG-01 RI was interrupted in order to respond to the 2014 RCRA §7003 UAO involving off-post exposure to VI. The CERCLA RI activities were resumed in 2016. Although the UAO work concluded there were no VI risks associated with VOCs migrating off post, the resumed RI activities identified the need for additional IRA to address groundwater contamination at FTG-01. An interim action was implemented from 2017-2021 while the RI was being completed. The interim action consisted of Enhanced Bioremediation. The remedial activities should have been implemented under a TCRA in accordance with 40 CFR 300.415(b); however, they were implemented under a continuation of the RCRA UAO response. APTIM implemented the interim action to address off-post and on-post VOC groundwater contamination associated with FTG-01. Enhanced bioremediation included a combination of a carbon source in the form of emulsified vegetable oil, microbial nutrients, and a bioaugmentation culture, which were injected into the aquifer by direct-push technology. Off-post groundwater enhanced bioremediation activities consisted of the injection of approximately 358,341 gallons of amendment solution into 124 points at 6 biobarriers. On-post enhanced bioremediation activities consisted of the injection of

977,644 gallons of amendment solution to create four biobarriers and one injection grid. Post-injection performance monitoring was conducted from 2018 to 2021 to evaluate the effectiveness of the groundwater remedial actions. Figures 4 and 5 illustrate the overburden and partially weathered rock groundwater plume footprints for before and after the interim action, respectively (APTIM, 2021c).

3.0 Site Characteristics

FTG-01 investigations conducted from the 1980s to 2019 resulted in the collection and analysis of 529 surface soil samples, 1,692 subsurface soil samples, over 1,500 groundwater samples, over 300 surface water samples, and over 200 sediment samples. The summary below is based upon samples collected from 2016 to 2019.

Soil. The 2020 RI report (APTIM, 2020b) concluded that there is minimal contamination present in surface and subsurface soil. Screening-level exceedances were detected infrequently and were generally delineated laterally and vertically by concentrations that were either below screening criteria or nondetect.

Groundwater. VOC contamination is present in the overburden, partially weathered rock, and bedrock zones in on- and off-post monitoring well locations. The various investigations conducted for FTG-01 identified four groundwater plumes emanating from OU-A, OU-B, OU-H, and OU-I. The OU-A and OU-B plumes occupy the largest footprints, have similar contaminant signatures (primary contaminants are TCE and cis-1,2-dichloroethene [DCE]), and have migrated off post to the north and northwest of FTG-01 (Figure 4). Other VOCs detected above screening criteria were generally within the dimensions of the FTG-01 plumes.

Enhanced bioremediation was implemented as an interim measure for on-post and off-post groundwater treatment of VOC contamination from 2017 to 2019. On-post and off-post groundwater enhanced bioremediation activities at FTG-01 included injecting emulsified vegetable oil, a dechlorinating microbial culture, and microbial nutrients into groundwater in a series of on-post and off-post biobarriers and one on-post injection grid.

The enhanced bioremediation treatment was effective, as shown by the occurrence of active bioremediation via enhanced reductive dichlorination (Figure 4 and Figure 5). In the OU-A plume, the overall plume area was reduced by approximately 22 percent between baseline and current (2020) conditions based on the 5 micrograms per liter (µg/L) contour. Reductions were also observed in the areal extent of the TCE plume greater than 50 µg/L (74 percent), 100 µg/L (9 percent), and 1,000 µg/L (64 percent). In addition, no detections of chemicals of concern (COC) greater than 10,000 µg/L were previously observed in baseline sampling. Similarly,

reduction in the areal extent were also seen in the OU-B and OU-I plumes. While enhanced bioremediation has significantly reduced contaminant concentrations in on-post and off-post groundwater, the concentrations remain above RRS values and UU/UE conditions have not been met. The VOC concentrations in the OU-A plume are one to two orders of magnitude greater than the concentrations in the OU-B plume. The on-post OU-H plume does not extend off post. The primary contaminants present in the OU-H plume are TCE, cis-1,2-DCE, trans-1,2-DCE, and vinyl chloride. The OU-I plume is limited in size but has migrated off post to the north of FTG-01. The primary contaminants associated with the OU-I plume are carbon tetrachloride and chloroform.

In addition to VOCs, sporadic concentrations of SVOCs, pesticides, and metals were also detected in groundwater at concentrations above screening criteria. The exceedances were generally located within the footprints of the FTG-01 groundwater plumes.

Surface Water. VOC and SVOC concentrations in surface water were below screening criteria. The VOC contaminant signatures in surface water and groundwater were similar, suggesting that contaminated groundwater discharges to surface water. TCE and 1,1,2,2-tetrachloroethane were detected in historical surface water samples at concentrations above screening criteria. The most recent screening criteria exceedances for pesticides and metals were limited to four concentrations of dieldrin and one concentration of zinc.

Sediment. VOCs detected in sediment were below screening criteria; the VOCs detected in sediment were also detected in FTG-01 groundwater, further suggesting that contaminated groundwater discharges to surface water bodies. Several SVOCs detected in sediment exceeded screening criteria. Pesticide exceedances were limited to one concentration of dieldrin. All 2018 metals concentrations in sediment were below screening criteria.

4.0 Scope and Role of Response Actions

This PP is for Installation Restoration Program site FTG-01 at the former Fort Gillem and includes both the on-post and off-post areas of the plume. Soil, groundwater, surface water, and sediment samples were collected during investigations conducted at FTG-01 from 1982 to 2019 to define the extent of contamination. Based on VOC concentrations above screening criteria detected in on-post and off-post groundwater, remedial actions were warranted.

5.0 Summary of Site Risks

A risk assessment was conducted for FTG-01 in 2020 that included a BHHRA and a SLERA.

The 2020 BHHRA (40 CFR 300.430[d][4]) evaluated exposure to a commercial worker; construction worker; hypothetical on-post residential receptor; and adult, child, and youth recreationist as plausible receptors for FTG-01. Although on-post residential use is not a plausible scenario, the BHHRA also evaluated exposure to the hypothetical on-post residential receptor for information purposes. Media to which the commercial worker and construction worker and hypothetical on-post residential receptor were hypothetically exposed included surface soil, shallow subsurface soil, deeper subsurface soil, and groundwater hypothetically developed as a potable source. The recreationists were assumed to be exposed to off-post surface water.

The 2020 BHHRA concluded that cancer risks for exposure to on-post total soil for the commercial worker and construction worker were within the EPA risk management range. The hazard index (HI) estimates from the exposure to on-post total soil for the commercial worker did not exceed the threshold level. The HI estimate for the construction worker exposed to total soil exceeded the threshold level, based upon two TCE concentrations in subsurface soil. However, further evaluation concluded that the exposure pathway for the construction worker was incomplete based upon sample depth, low frequency of screening criteria exceedance, and the addition of amendments to treat residual contamination. Concentrations of several compounds in on-post soil contributed to cumulative risk for hypothetical residential receptors. Cancer risk exceeded the EPA risk management range for hypothetical residential receptors. The HI estimate for the hypothetical child resident exceeded the threshold level.

Cancer risks for exposure to groundwater for the on-post industrial and off-post residential receptors exceeded the EPA risk management range. HI estimates from the exposure to groundwater for the on-post industrial and off-post residential receptors exceeded the threshold level. The concentrations of several COCs in groundwater exceeded the EPA's unacceptable risk level and the HI.

Cancer risk for the adult (lifetime), child, and youth recreationists exposed to surface water were within the EPA risk management range. HI estimates for all recreationists were below the threshold level.

The SLERA (40 CFR §300.430[d][1]) concluded that the results of the community-level assessments and food chain assessment for FTG-01 indicated that the initial food chain chemicals of potential ecological concern (COPEC) and direct contact COPECs were determined

to be of low concern and unlikely to impact ecological receptors. No further action was recommended for COPECs in surface soil, sediment, and surface water.

6.0 Remedial Action Objectives

Remedial action objectives (RAO) are medium-specific goals for protecting human health and the environment. RAOs provide the basis for the identification, detailed analysis, and selection of remedial alternatives.

The RAOs developed for the protection of human health and the environment specified the following:

- Environmental media to be addressed
- Relevant exposure routes and receptors
- Chemical concentration limits specific to COCs and environmental media, referred to as remedial goals, if any.

As previously noted, residual soil concentrations do not pose an unacceptable risk above the selected remediation goals for the designated land use (commercial/industrial). Therefore, the only environmental medium that needs to be addressed at FTG-01 is groundwater. The relevant exposure routes were ingestion, inhalation, and dermal contact with contaminated groundwater. Relevant receptors included residential, commercial/industrial, and construction receptors. Based on these three criteria, the RAOs for groundwater at FTG-01 included the following:

For human health protection:

- Prevent ingestion, inhalation, and dermal contact with groundwater containing COCs above remedial goals (Type 1 residential RRS values for off-post residential receptors and Type 3 nonresidential RRS values for on-post commercial/industrial receptors).

For environmental protection:

- Control migration of the plume in the aquifer.

The groundwater COCs for residential off-post receptors and their respective Type 1 RRS values were as follows:

- 1,1,2,2-Tetrachloroethane– 0.8 µg/L
- 1,1,2-Trichloroethane – 5 µg/L
- 1,2-Dichloroethane – 5 µg/L

- 1,2-Dichloropropane – 5 µg/L
- 1,4-Dichlorobenzene – 75 µg/L
- Benzene – 5 µg/L
- Carbon Tetrachloride – 5 µg/L
- Chlorobenzene – 100 µg/L
- Chloroform – 80 µg/L
- cis-1,2-DCE– 70 µg/L
- Methylene chloride – 5 µg/L
- Tetrachloroethene– 5 µg/L
- trans-1,2-DCE– 100 µg/L
- TCE – 5 µg/L
- Vinyl chloride – 2 µg/L.

The groundwater COCs for commercial/industrial on-post receptors and their respective Type 3 RRS values were as follows:

- 1,1,2,2-Tetrachloroethane– 3.3 µg/L
- 1,1,2-Trichloroethane – 5 µg/L
- 1,2-Dichloroethane – 5 µg/L
- 1,2-Dichloropropane – 5 µg/L
- 1,4-Dichlorobenzene – 75 µg/L
- Benzene – 5 µg/L
- Carbon Tetrachloride – 5 µg/L
- Chlorobenzene – 100 µg/L
- Chloroform – 80 µg/L
- cis-1,2-DCE– 70 µg/L
- Methylene Chloride – 5 µg/L
- Tetrachloroethene– 5 µg/L
- trans-1,2-DCE– 100 µg/L
- TCE – 5 µg/L
- Vinyl chloride – 2 µg/L.

7.0 Evaluation of Remedial Alternatives

The FTG-01 RI/FS Addendum (APTIM, 2022) evaluated remedial action alternatives for groundwater contamination at the site. Implementation of remedial alternatives was necessary to address VOCs in groundwater, primarily TCE and cis-1,2-DCE, to protect human health and the environment.

The RI/FS Addendum identified potential remedial action technologies for groundwater followed by a screening of the alternatives for detailed analysis. The detailed analysis included the No Action alternative and two active remedial action alternatives.

The No Action general response action was evaluated as required by the NCP (40 CFR 300.430[e][6]). This alternative provided a comparative baseline against which other alternatives were evaluated. Under this alternative, no remedial action is conducted. The contaminants are left in place without implementing any containment, removal, treatment, or other mitigating actions. For the No Action alternative, reductions in groundwater contaminant concentrations is not expected other than those resulting from natural processes. The No Action alternative does not provide for access control actions taken to reduce the potential for contaminant exposure.

The alternatives retained and evaluated in the detailed analysis included:

- Alternative 1: No Action – Required by the NCP to be carried forward as a baseline for detailed comparison.

- Alternative 2: Monitored Natural Attenuation (MNA) and ICs - MNA consists of the implementation of a monitoring program to track natural attenuation processes and their effectiveness in achieving RAOs for a site. Natural attenuation is defined as a variety of physical, chemical, and biological processes that, under favorable conditions, act without human intervention to reduce the mass, toxicity, mobility, volume, or concentration of contaminants in groundwater.

  On-post ICs include municipal water supply, deed covenants restricting groundwater use for property transferred from Army control, and groundwater monitoring. Off-post ICs include municipal water supply, public education outreach, periodic well surveys, and groundwater monitoring. ICs will remain in place until UU/UE conditions are met.

  On-post groundwater receptors have been provided with municipal water to eliminate potential exposure to contaminated groundwater. Use of groundwater is prohibited on Army-controlled property overlying groundwater with concentrations exceeding federal maximum contaminant levels (MCL) through deed covenants at the time of property transfer until RAOs are met. On-post groundwater monitoring will be conducted until RAOs are met. As such, groundwater use restrictions will be described in a post-ROD Remedial Design/Remedial Action Land-Use Control Implementation Plan and finalized prior to transferring property. The Army is responsible for implementing, maintaining, monitoring, and enforcing the ICs, unless the Army transfers these responsibilities to another party by contract, property transfer agreement, deed, or other legal means. However, the Army shall retain ultimate responsibility for remedy implementation and protectiveness.

  ICs applicable to off-post groundwater downgradient of FTG-01 include verification of the municipal water supply, public education outreach, periodic well surveys, and groundwater monitoring until groundwater concentrations meet federal MCLs. ICs will remain in place until UU/UE conditions are met.

  Off-post groundwater receptors have been provided with municipal water to eliminate potential exposure to contaminated groundwater. Public education outreach

conducted by the Army has included fact sheets, newspaper advertisements, public meetings, and social media. In addition, the Army has conducted off-post well surveys to assure that there are no off-post withdrawals or use of potentially contaminated groundwater. Thus, the off-post exposure pathway is already mitigated, and the Army will include assessment of this pathway through 5-Year Reviews, community notifications, and periodic consultation with the County Health Department. The Army will continue to conduct off-post groundwater monitoring until RAOs are met.

- Alternative 3: Enhanced Bioremediation MNA and ICs – A process that accelerates the natural biodegradation process of contaminants by providing amendments, including nutrients, carbon that provides metabolic and hydrogen sources, and contaminant-degrading microorganisms that may otherwise be limiting factors in the conversion of organic contaminants to innocuous end products. Amendments are injected into groundwater, often as a series of permeable biobarriers oriented perpendicular to groundwater flow direction. Typical carbon sources injected into the aquifer are commercially available hydrogen release compounds, molasses, sodium lactate, and emulsified vegetable oil. The enhanced bioremediation injections occurred during the IRAs under the RCRA UAO continuation response. This alternative does not consider additional injections.

  Sufficient data have been collected to determine that off-post aquifer conditions downgradient of FTG-01 are favorable for MNA, based upon the presence of TCE and carbon tetrachloride daughter products (cis-1,2-DCE and chloroform) that indicate natural degradation is occurring. However, the most recent concentrations of TCE (280 µg/L) and carbon tetrachloride (190 µg/L) detected in off-post groundwater suggest that it is highly unlikely that groundwater cleanup objectives (reduction of VOC concentrations to meet Type 1 RRS) could be achieved in a reasonable time frame by MNA as a stand-alone remedial alternative.

  ICs applicable to on-post groundwater use include municipal water supply, deed covenants restricting groundwater use when the Army-controlled property is transferred, and groundwater monitoring to achieve protection of human health and the environment and compliance with all legal requirements. ICs will remain in place until UU/UE conditions are met.

  On-post groundwater receptors have been provided with municipal water to eliminate potential exposure to contaminated groundwater. Use of groundwater is prohibited on Army-controlled property overlying groundwater with concentrations exceeding federal MCLs through deed covenants at the time of property transfer until RAOs are met. On-post groundwater monitoring will be conducted until RAOs are met. As such, restrictions prohibiting on-post residential use and groundwater use will be described in a post-ROD Remedial Design/Remedial Action Land-Use Control Implementation Plan and finalized prior to transferring property. The Army is responsible for implementing, maintaining, monitoring, and enforcing the ICs, unless the Army transfers these responsibilities to another party by contract, property transfer agreement, deed, or other legal means. However, the Army shall retain ultimate responsibility for remedy implementation and protectiveness.

ICs applicable to off-post groundwater downgradient of FTG-01 included municipal water supply, public education outreach, periodic well surveys, and groundwater monitoring until groundwater concentrations meet federal MCLs. ICs will remain in place until UU/UE conditions are met.

Off-post groundwater receptors have been provided with municipal water to eliminate potential exposure to contaminated groundwater. Public education outreach conducted by the Army has included fact sheets, newspaper advertisements, public meetings, and social media. In addition, the Army has conducted off-post well surveys to assure that there are no off-post withdrawals or use of potentially contaminated groundwater. Thus, the off-post exposure pathway is already mitigated, and the Army will include assessment of this pathway through 5-Year Reviews, community notifications, and periodic consultation with the County Health Department. The Army continues to conduct off-post groundwater monitoring until RAOs are met.

The detailed analysis of each of the retained remedial action alternatives was conducted in accordance with *Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA* (EPA, 1988) and the NCP (40 CFR 300.430[e][9]). The detailed analysis phase includes the evaluation of remedial action alternatives against nine criteria. The evaluation criteria are divided into three categories: threshold criteria, primary balancing criteria, and modifying criteria. Threshold criteria (overall protection of human health and compliance with applicable or relevant and appropriate requirements [ARAR]) must be met for an alternative to be viable for selection in the ROD. Primary balancing criteria (long-term effectiveness and permanence; short-term effectiveness; reduction of toxicity, mobility, or volume through treatment; implementability; and cost, including capital, operation and maintenance [O&M], and present value costs) forms the basis for comparing alternatives to site-specific conditions. Modifying criteria (state acceptance and community acceptance) will be addressed in the ROD after this PP is completed by incorporating state support agency (GA EPD) review comments and community feedback from the 30-day public comment period.

Table 1 presents the evaluated alternatives, estimated costs, and a summary of the evaluation. Alternatives 2 and 3 would reduce the contaminant concentrations; however, based on the estimated time frame to achieve RAOs and total cost to implement each alternative, the enhanced bioremediation with MNAs and ICs alternative is the preferred alternative as described below.

In conformance with the NCP (40 CFR 300.430[e][9][iii][A]-[I]), seven evaluation criteria were used during the detailed analysis:

1. **Overall Protection of Human Health and the Environment**

   - Enhanced bioremediation reduced current and future risk posed to human health and the environments through elimination and reduction of contaminated groundwater. In addition, it continues to mitigate the potential for further downgradient migration of contaminated groundwater by reducing contaminant volumes and concentrations. Performance monitoring will be implemented to track the progress of the enhanced bioremediation.

2. **Compliance with ARARs**

   - Relevant ARARs will be met under this remedial alternative, as the contaminated groundwater in target treatment areas will be treated and monitored in the short term. Remediation of contaminated groundwater by this alternative would mitigate the potential migration of the plume.

3. **Long-Term Effectiveness and Permanence**

   - Enhanced bioremediation is reliable and effective in protecting human health and the environment in the long term because the biologically mediated treatment is irreversible. A significant mass of VOCs in groundwater is already remediated and the natural attenuation processes will follow.

4. **Short-Term Effectiveness**

   - The enhanced bioremediation injections have already occurred, and therefore there are no limitations for short-term effectiveness. No significant short-term environmental impacts or potential disruption of ecosystems were observed.

5. **Reduction in Toxicity, Mobility, and Volume Through Treatment**

   - Enhanced bioremediation has reduced the toxicity, mobility, and volume of contaminated groundwater because biologically mediated treatment of VOCs is irreversible, resulting in their destruction.

6. **Implementability**

   - The injection portion of enhanced bioremediation has already been implemented. The remainder of this alternative is the MNA and easily implemented.

7. **Cost, Including Capital, O&M, and Present Value Costs**

   - The estimated cost of enhanced bioremediation is $2,494,000, which is approximately 66 percent of the cost of MNA. It is estimated that implementation of enhanced bioremediation will reach RAOs in approximately 15 years, whereas MNA is estimated to require 30 years or more to achieve RAOs.

The comparative analysis in the FS used the results of the detailed analysis to select the best overall remedial action alternative for groundwater at FTG-01. The selection of the best alternatives depended on effectiveness, time frame to achieve RAOs, and cost.

8.0 Preferred Alternative

The Army's Preferred Remedial Alternative for the FTG-01 site is Enhanced Bioremediation with MNA and ICs to restrict residential use and groundwater use.

The enhanced bioremediation alternative consists of the injection of amendments, including emulsified vegetable oil, a dechlorinating microbial culture, buffer, and microbial nutrients into the aquifer to enhance the biodegradation of VOCs in groundwater. Amendments are injected by direct-push technology to create a series of biobarriers and injection grid perpendicular to the direction of groundwater flow. The injections took place during the initial RI period and are complete.

The performance monitoring component of the alternative evaluates the effectiveness of the remedy after implementation of amendment injection. The MNA component of the alternative provides five years of data to track post-treatment natural attenuation of VOCs in groundwater. ICs will remain in place until RAOs are achieved and UU/UE conditions are met. ICs for on-post Army-controlled property include municipal water supply, restricting groundwater use through deed covenants and groundwater monitoring. ICs for off-post receptors include municipal water supply, public education outreach, periodic well surveys to document there are no unauthorized groundwater withdrawals, and groundwater monitoring. Based on an evaluation of FTG-01 groundwater data and field-demonstrated biodegradation rates, it is expected that RAOs will be reached in approximately 15 years.

As previously noted, an interim action consisting of enhanced bioremediation was implemented to address VOC groundwater contamination associated with FTG-01. This interim action is consistent with the Army's Preferred Alternative. The post-injection performance monitoring conducted from 2018 to 2021 has demonstrated that this approach is effective at reducing groundwater VOC concentrations.

Based on information currently available, the lead agency believes the Preferred Alternative meets the threshold criteria and provides the best balance of tradeoffs among the other alternatives with respect to the balancing and modifying criteria. The Army expects the Preferred Alternative to satisfy the following statutory requirements of CERCLA §121(b): (1) be protective of human health and the environment, (2) comply with ARARs, (3) be cost-effective,

(4) utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable, and (5) satisfy the preference for treatment as a principal element. Because chemicals in groundwater remain at the site above concentrations that allow for UU/UE, a CERCLA § 121(c) review will be conducted every five years until the site contamination reaches concentrations that are safe for UU/UE. The Preferred Remedial Alternative can change in response to public comments or new information.

9.0 Support Agency Comments

The GA EPD has reviewed the results of the historical studies, the RIs, and the FS reports for FTG-01. GA EPD has consulted with the Army concerning the Preferred Remedial Alternative selected for FTG-01. It is anticipated that GA EPD will concur with the Preferred Remedial Alternative for FTG-01.

10.0 Community Participation

Public participation is an important part of selecting the final remedy. The public is encouraged to submit written comments to the Army within the 30-day public comment period. The Army will review all written comments prior to finalizing the remedy selection in the ROD for FTG-01. All public comments and associated responses will be included in the Responsiveness Summary Section of the ROD.

10.1 Information Repositories

This PP for FTG-01 is part of the Fort Gillem administrative record and available for review on the USACE Savannah's Web site link that will be provided in the *Atlanta Journal-Constitution* prior to the public comment period.

10.2 Public Meeting

The Army will schedule a public meeting, should the public express interest. The public will be notified of the date, time, and location through a notice in the *Atlanta Journal-Constitution*.

10.3 Public Comment Period

The public comment period for the FTG-01 PP will run from September 22, 2022 to October 21, 2022.

Please submit all written comments to Mr. Tom Lineer via e-mail at thomas.a.lineer.civ@army.mil.

Comments received at the public meeting (if scheduled) and during the comment period will be considered in the selection of the final remedy. These comments will be addressed in the responsiveness summary section of the ROD for FTG-01. If the GA EPD concurs with Preferred Remedial Alternative selected in the FTG-01 PP, the FTG-01 ROD will document the permanent site remedy for FTG-01 groundwater.

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TABLE

Table 1

Rationale for Recommended Remedial Action Alternative
FTG-01 Proposed Plan
Fort Gillem, Forest Park, Georgia

	Evaluated Alternatives	Total Capital and Present Worth Costs	Evaluation Summary
On-Post and Off-Post Groundwater	No Action	$0	Will not be protective of human health and the environment.
	Monitored Natural Attenuation and Institutional Controls	Capital Cost: $530,400 Present Worth of Annual O&M: $3,241,200 Total: $3,772,000	Monitored natural attenuation as a stand-alone remedy is unlikely to achieve RAOs in a reasonable time frame. Institutional controls will remain in place until groundwater contaminant concentrations are below RAOs and UU/UE conditions are met. Estimated time frame to achieve RAOs and UU/UE is 30 years or more.
	Enhanced Bioremediation with Monitored Natural Attenuation and Institutional Controls	Capital Cost: $1,362,900 Present Worth of Annual O&M: $1,131,000 Total: $2,494,000	Destruction of VOCs in groundwater by enhanced bioremediation will reduce contaminant concentrations to be protective of human health and the environment. The alternative also includes Monitored Natural Attenuation and Institutional Controls until groundwater contaminant concentrations are below RAOs and UU/UE conditions are met. Estimated time frame to achieve RAOs and UU/UE is 15 years, based on an evaluation of FTG-01 groundwater data and field-demonstrated biodegradation rates.

Bolding indicates the recommended remedial action alternative.
O&M - Operation and maintenance.
RAO - Remedial action objective.
UU/UE - Unlimited use and unrestricted exposure.
VOC - Volatile organic compound.

FIGURES

2018 Aerial Photograph

FTG-01

Western Stream

Eastern Stream

Conley Creek

US HWY 23

Anvil BlockRd

Big Cotton Indian Creek

FORT GILLEM

FTG-10

FTG-07

FTG-02

FTG-09

FTG-08

Highway 42

Jonesboro Rd

Main St

ENCLAVE

HoodAve

State Hwy 54

State Hwy 331

LakeDr

ForestPky

Union Creek

Legend

- Stream
- FTG-01
- Other Environmental Sites
- Gillem Enclave
- Fort Gillem Boundary

Figure 1

FTG-01
Site Location Map

Fort Gillem
Forest Park, Georgia

1 inch = 1,000 feet

0 500 1,000 2,000 Feet

WGS84 UTM Zone 16N Meters

APTIM

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2018 Aerial Photo

FTG-01 Groundwater Treatment Building

Surface Water Control Structure

Surface Water Control Structure

Leachate Spring

Concrete Beach

Western Stream

Eastern Stream

Surface Water Control Structure

Legend

- Leachate Spring
- Stream
- Surface Water Control Structure
- Concrete Beach
- FTG-01 Boundary
- Fort Gillem Boundary

Figure 2

FTG-01
Site Map

Fort Gillem
Forest Park, Georgia

1 inch = 300 feet

0 150 300 600 Feet

WGS84 UTM Zone 16N Meters

APTIM

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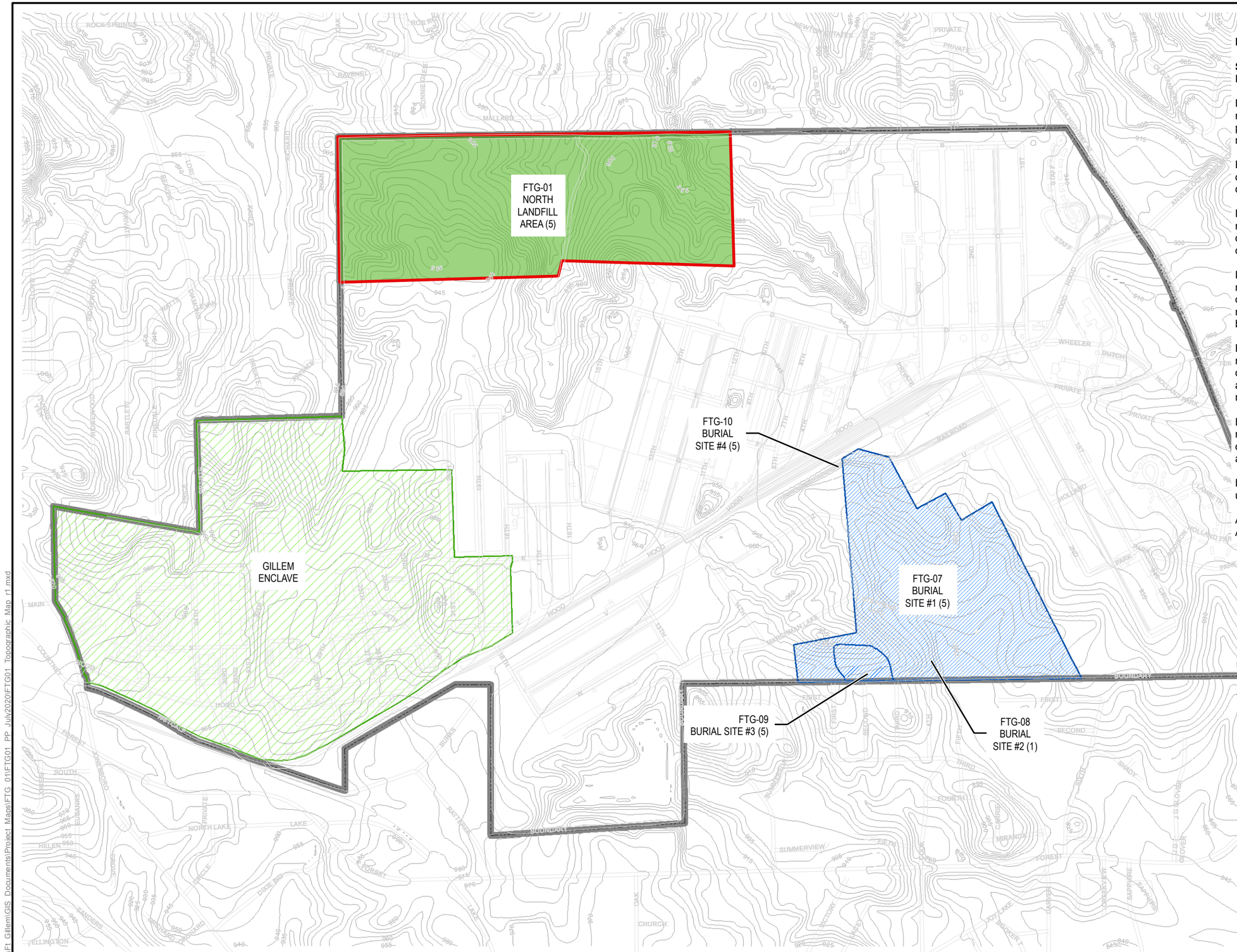

Notes

Site Label Definition
FTG-01 (4) - Number in parentheses = ECP Category

ECP Category 1 - An area or parcel of real property where no release or disposal of hazardous substances or petroleum products or their derivatives has occured (including no migration of these substances from adjacent properties).

ECP Category 2 - An area or parcel of real property where only the release or disposal of petroleum products or their derivatives has occurred.

ECP Category 3 - An area or parcel of real property where release, disposal, or migration of hazardous substances has occured, but in concentrations that do not require removal or other remedial response.

ECP Category 4 - An area or parcel of real property where release, disposal, or migration, or some combination thereof, of hazardous substances has occurred, and all remedial actions necessary to protect human health and the environment have been taken.

ECP Category 5 - An area or parcel of real property where release, disposal, or migration, or some combination thereof, of hazardous substances has occurred and removal or remedial actions, or both, are under way, but all required actions have not yet been taken.

ECP Category 6 - An area or parcel of real property where release, disposal, or migration, or some combination thereof, of hazardous substances has occurred and removal or remedial actions, or both, have not been implemented.

ECP Category 7 - An area or parcel of real property that is unevaluated or requires additional evaluation.

All unshaded area is considered Urban Redevelopment Authority property and is not controlled by the Army.

Legend

- FTG-01
- Elevation Contour (in feet above mean sea level)
- Gillem Enclave
- Army-Retained IRP/MMRP Sites
- Fort Gillem Boundary

Figure 3
FTG-01
Topographic Map
Fort Gillem
Forest Park, Georgia

1 inch = 1,000 feet
0 500 1,000 2,000 Feet
WGS84 UTM Zone 16N Meters

APTIM

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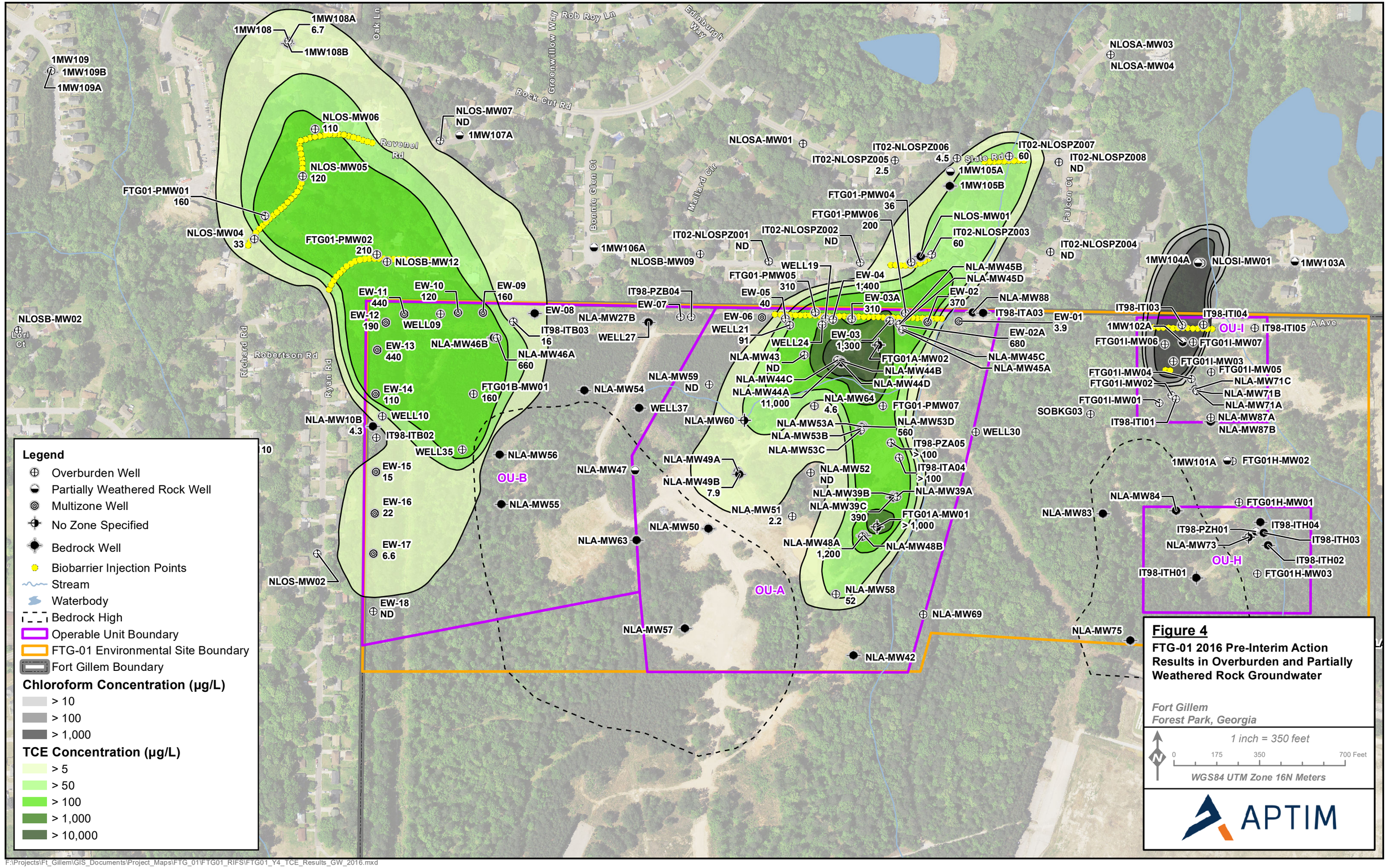

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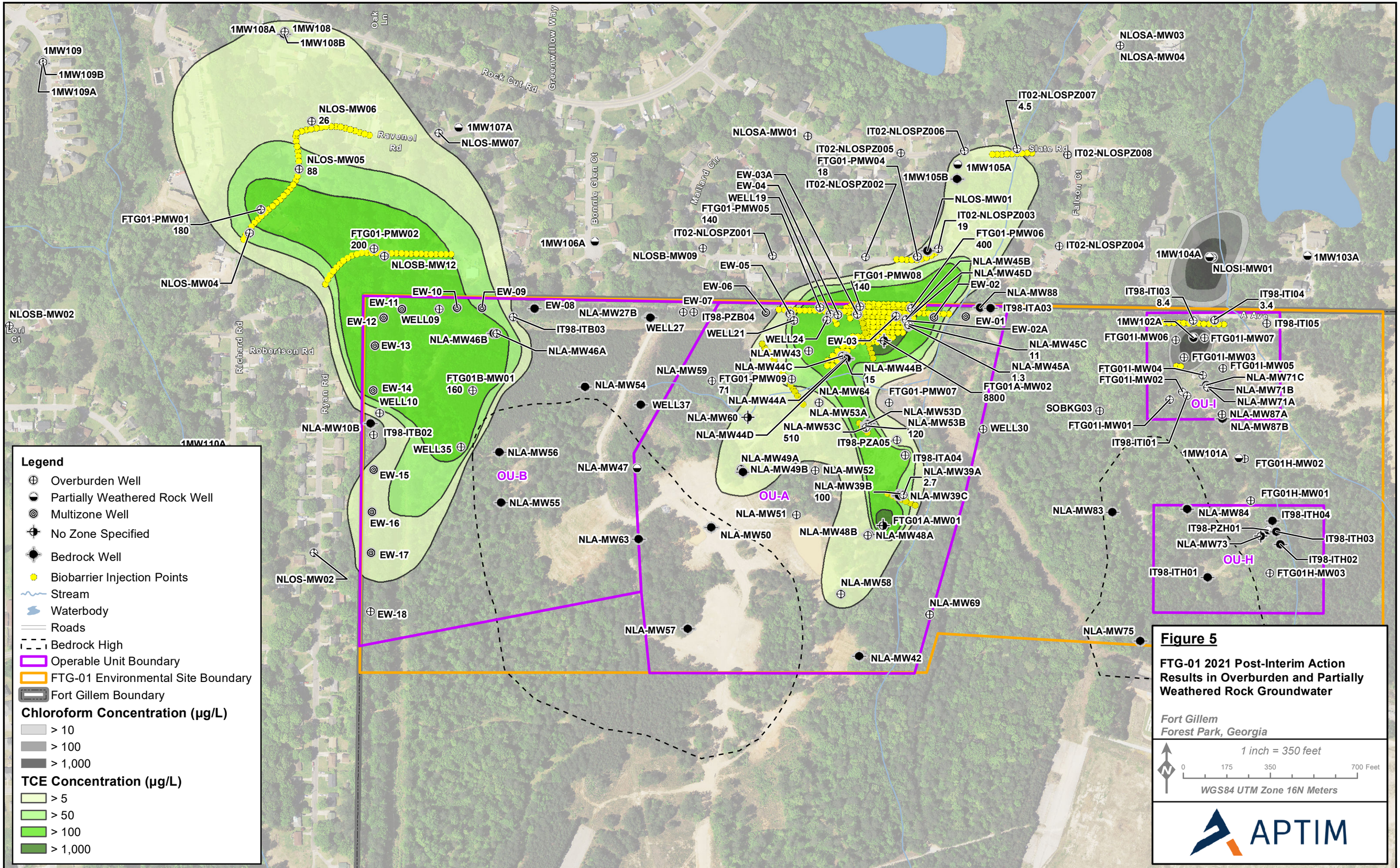

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