

Environmental Baseline Survey for Building 4666 Area

Final

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Prepared for

**National Aeronautics and Space Administration
George C. Marshall Space Flight Center**

**Huntsville, Alabama
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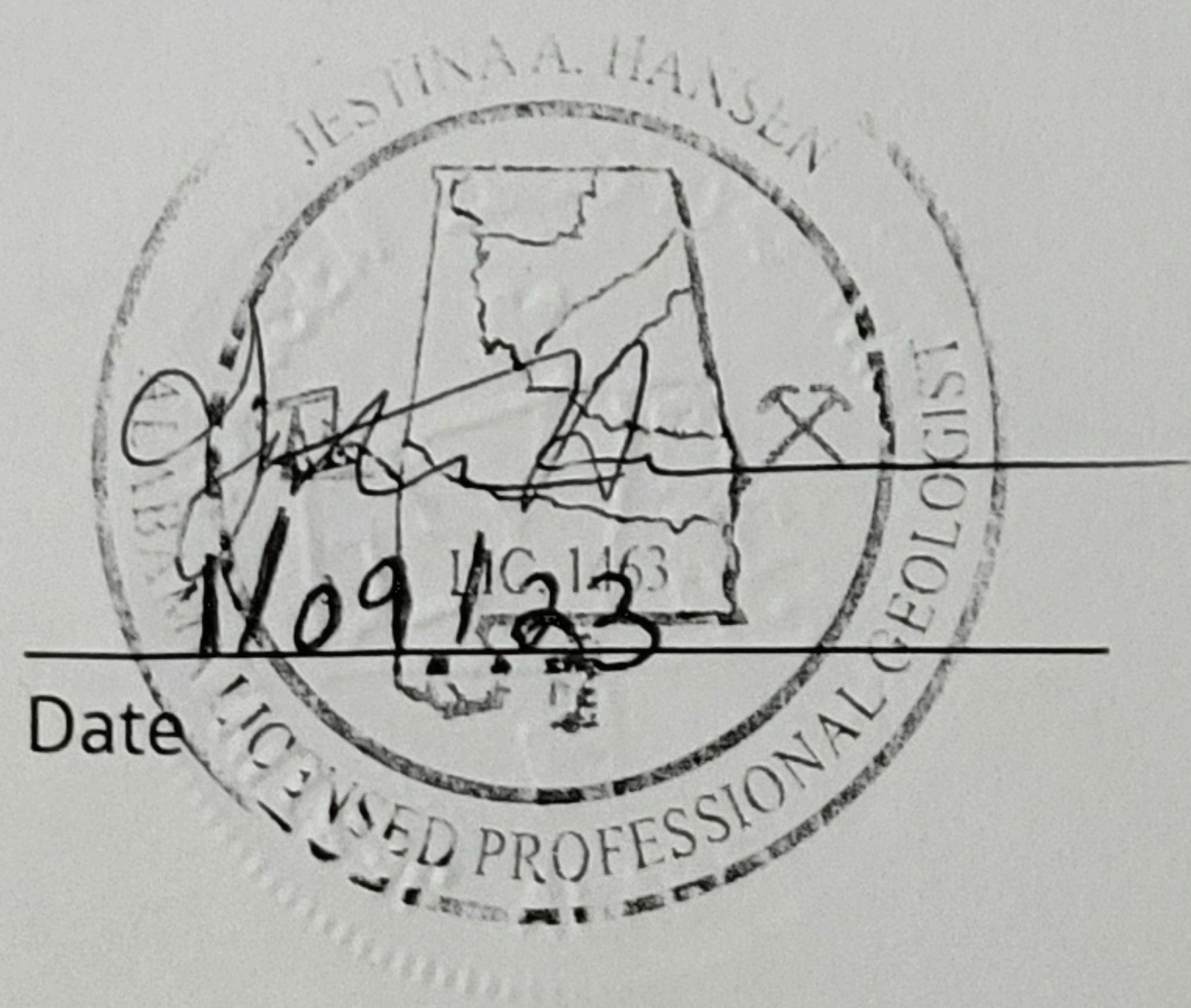
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Executive Summary

This environmental baseline survey (EBS) was prepared for a 55.8-acre area within the southwestern portion of the National Aeronautics and Space Administration (NASA) Marshall Space Flight Center in Huntsville, Alabama. The 55.8-acre area includes Building 4666, the Building 4666 parking area, a forested area north of Building 4666, and a forested and grassy area south of Building 4667. NASA is considering leasing the area referenced in this document for mixed (industrial/commercial) use and has prepared this EBS to document the current environmental conditions of the subject property.

To support the Environmental Condition of Property (ECP) classification for the subject property, a visual inspection, interviews with NASA staff, and reviews of documentation detailing previous environmental investigation and remediation efforts within the subject property were completed in general accordance with ASTM International D6008-96, *Standard Practice for Conducting Environmental Baseline Surveys* (ASTM 2014). Based on the findings from these activities, different portions of the 55.8-acre subject property have been assigned either ECP Area Type 4 or ECP Area Type 7 (Figure ES-1), as follows:

ECP Area Type 4

- Phase 2 Parcel B
- Phase 2 Parcel C
- South wing of Building 4666
- 24 acres of Phase 2 Parcel A
- 1.8 acres of the parking area

ECP Area Type 7

- Phase 2 Parcel D
- Phase 2 Parcel E
- 10.4 acres of Phase 2 Parcel A
- 0.3 acre of the parking area

ECP Area Type 4 is defined as: “[a]reas where release, disposal, or migration of hazardous substances has occurred, and all remedial actions necessary to protect human health and the environment have been taken.” ECP Area Type 4 determinations for the subject property are based on the presence of groundwater contamination beneath these areas, the land use controls implemented under the Operable Unit 3 Interim Remedial Action that prevent exposure to these contaminants, and the completeness of investigations identifying no potentially unacceptable risk in surface media (soil, sediment, and surface water).

ECP Area Type 7 is defined as: “[a]reas that have not been evaluated or require additional evaluation.” ECP Area Type 7 determinations for the subject property are based on the known presence of unexploded ordnance (UXO)/chemical warfare material (CWM) in these areas and the need for surface media and groundwater sampling to assess whether these media might be impacted by chemicals associated with the UXO/CWM or other potential release sources. When the UXO/CWM removal and additional investigations have taken place, the ECP Area Type for these portions of the subject property will be reassessed.

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Acronyms and Abbreviations

Acronym	Definition
ACM	asbestos-containing material
ADEM	Alabama Department of Environmental Management
AST	aboveground storage tank
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	<i>Code of Federal Regulations</i>
COC	contaminant of concern
COPC	contaminant of potential concern
CWM	chemical warfare material
DA	Department of the Army
EBS	environmental baseline survey
ECP	Environmental Condition of Property
EPA	U.S. Environmental Protection Agency
ERA	ecological risk assessment
ETA	East Test Area
FS	feasibility study
HHRA	human health risk assessment
HR	hydrogeologic regime
IRA	interim remedial action
LOX	liquid oxygen
LUC	land use control
MSFC	Marshall Space Flight Center
NASA	National Aeronautics and Space Administration
NPDES	National Pollutant Discharge Elimination System
NTCRA	non-time-critical removal action

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OU	Operable Unit
PAH	polycyclic aromatic hydrocarbon
PCB	polychlorinated biphenyl
RA	remedial action
RI	remedial investigation
RP	rocket propellant
RSA	Redstone Arsenal
SA	source area
TCE	trichloroethene
USACE	United States Army Corps of Engineers
USFWS	U.S. Fish and Wildlife Service
UST	underground storage tank
UXO	unexploded ordnance
VI	vapor intrusion
WNWR	Wheeler National Wildlife Refuge
WTA	West Test Area

1. Introduction

This environmental baseline survey (EBS) documents the baseline environmental conditions for the southern wing of Building 4666, the Building 4666 parking area, a forested area north of Building 4666 and Building 4667, and a forested and grassy area south of Building 4667 (these combined areas are referred to hereafter as the subject property) at the National Aeronautics and Space Administration (NASA) Marshall Space Flight Center (MSFC) in Huntsville, Alabama (Figure 1-1). NASA is considering leasing this 55.8-acre portion of MSFC for mixed (industrial/commercial) use. NASA has prepared this EBS to document the baseline conditions of the subject property in general accordance with ASTM International (ASTM) D6008-96, *Standard Practice for Conducting Environmental Baseline Surveys* (ASTM 2014), and in accordance with NASA Procedural Requirement 8800.15 regarding Out-Grants of NASA Real Property.

1.1 Property Identification

The subject property covers a combined area of 55.8 acres and includes the south wing of Building 4666, the Building 4666 parking area, a forested area north of Building 4666, and a forested and grassy area south of Building 4667. A portion of the subject property lies within the Building 4667 Area, which was evaluated during the Operable Unit 1 (OU-1) Remedial Investigation (RI) (NASA 2016a) (Figure 1-2). Approximately 16 acres of the subject property lies within MSFC-003 (Figure 1-2), which is currently undergoing unexploded ordnance (UXO) and chemical warfare material (CWM) remediation by the Department of the Army. Building 4666 is the only building found within the subject property (Figure 1-3).

MSFC is located in Redstone Arsenal (RSA) on a site previously occupied by the Department of the Army (DA). The RSA area, which shares a common boundary with MSFC, originally was established in the early 1940s to produce conventional and chemical munitions for use during World War II. From 1942 to 1945, DA operations were used to manufacture raw materials for toxic agents and incendiary materials and to assemble, store, and ship the final products. Onsite waste disposal activities included the disposal of construction debris, drums, and chemical munitions, and open burning of combustible materials. After the war, RSA became a center for the receipt, storage, and demilitarization of Allied and German chemical agents.

In 1949, RSA's mission was changed to research and development of rocketry and guided missile systems. In 1960, civilian rocketry and missile activities were transferred to NASA's MSFC. Since then, the area known as MSFC has been used to develop, test, and manufacture space vehicles and components.

The DA granted irrevocable use and occupancy to the lands and facilities known as MSFC to NASA for a term of 99 years beginning on July 1, 1960, and ending on June 30, 2059. The DA granted NASA full control and responsibility for MSFC land and facilities; however, the DA retained access rights to all major utility lines, railroad tracks, and main roads for the purposes of operating, maintaining, modifying, and extending the utilities, railroad tracks, and roads.

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2. Survey Methodology

This EBS was conducted in general accordance with ASTM D6008-96, *Standard Practice for Conducting Environmental Baseline Surveys* (ASTM 2014), and consists of a site visit with visual inspection of the subject property, interviews, and reviews of documentation in historical reports that describe past environmental investigation and remediation efforts at OU-1, which encompasses the areas subject to this EBS. Previous investigations at OU-1 include aerial photograph analysis, historical records searches, site inspections, interviews with site personnel, field sampling events, analytical data assessments, and human health and ecological risk evaluations. Documents reviewed for the EBS include:

- *Interim Record of Decision, Interim Action Project for Operable Unit 3: Groundwater at Marshall Space Flight Center* (NASA 2007a).
- *Historical Evaluation of the Southwest Area of the Marshall Space Flight Center* (NASA 2007b)
- *Historical Evaluation of the Southeast Area of the Marshall Space Flight Center* (NASA 2007c)
- *Removal Action Report: Time-critical Removal Action Operable Unit 1 Utility Trench Sediment* (NASA 2011)
- *Operable Unit 1 Remedial Investigation Report* (NASA 2016a)
- *UST and Product Transfer Line Closure Site Assessment, NASA/MSFC Buildings 4667* (NASA 2016b)
- *Integrated Cultural Resources Management Plan for Marshall Space Flight Center* (NASA 2016d)
- *Marshall Space Flight Center 2017 Environmental Resources Document* (NASA 2017b)
- *Operable Unit 3 Vapor Intrusion Investigation Report* (NASA 2017a)
- *Operable Unit 1 Feasibility Study (FS)* (NASA 2018a)
- *Action Memorandum: Non-time-critical Removal Action for OU-1, OU-5, OU-6, and OU-13* (NASA 2018b)
- *MSFC's Spill Prevention, Control, and Countermeasure Plan* (EEOH 2019)
- *Non-time-critical Removal Action Report for OU-1, OU-5, OU-6, and OU-13* (NASA 2022a)
- *Operable Unit 1 Proposed Plan* (NASA 2022b)
- *MSFC-004 Closure Certification Report* (NASA 2022c)

The site visit consisted of an inspection for visual signs of environmental impacts. The visual inspection of the adjoining properties included only the exterior of structures and properties adjacent to the subject property. An endangered species survey also was completed in November 2022. Site interviews were conducted to help identify a recognized environmental condition on the federal real property and other information necessary to characterize the standard Environmental Condition of Property (ECP) area types. Interviewees included Brian Roberson, NASA's Remedial Project Manager for MSFC (Appendix B-1), and Gregory Smith, MSFC's Industrial Hygiene Manager (Appendix B-2).

No sampling of soil, surface water, groundwater, or other media was performed as part of this EBS.

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3. Findings for the Subject Property

3.1 History and Current Use

The subject property consists of the south wing of Building 4666, the adjacent parking lot, and mixed forested and grassy parcels that overlap partially with the Building 4667 Area and Building 4693 Area OU-1 RI (NASA 2016a) evaluation areas and the MSFC-003 Army CERCLA site. MSFC-003 was part of the Old Bone Yard Disposal Area. Building 4666 is located northwest of the intersection of Dodd Road and Saturn Road and was constructed by NASA in 1961 as the Test Division Engineering Building. The Building later functioned as an office building from 1980 through to the present (NASA 2016a). Building 4666 was connected to Building 4566 via a 200-foot tunnel under Dodd Road.

According to 1967 documentation, the Scientific Problem Solving Facility was housed in Building 4666 and was equipped for digital computations in the fields of aerodynamic analysis, flight mechanics, pre- and post-flight performance, dynamics, thermodynamics, and flight test data reduction. In addition, the building was used for general support of automatic checkout, management system models, real-time data acquisition and computation, vibration and acoustical studies, weather, wind tunnel and miscellaneous data evaluation, and operations and numerical analysis research. Based on the results of the personnel interviews, site visits, and aerial photography review conducted during the OU-1 RI, Building 4666 was not deemed to be a likely source of environmental contamination (NASA 2016a).

Historical use of the Building 4667 Area and Building 4693 Area OU-1 RI evaluation areas are summarized in the following sections. Note that although the Building 4667 Area partially overlaps the subject property, the primary activities described for the Building 4667 Area took place on property adjacent to the subject property (NASA 2016a).

3.1.1 Building 4667 Area

The Building 4667 Area encompasses 10.8 acres in the West Test Area (WTA) (Figure 1-2), a portion of which is within the property subject to this EBS. The Building 4667 Area includes Buildings 4667, 4668, 4669, 4674, and 4675.

NASA constructed Building 4667 in 1964 as the pump house for the high-pressure industrial water pump system. This WTA high-pressure industrial water pump station supplied high-pressure industrial water to test stand flame deflectors as deluge water for testing and firing systems in both the East Test Area (ETA) and the WTA. Thirteen diesel-driven pumps in the WTA pump house transferred the water from two reservoirs (Buildings 4668 and 4669).

The site was equipped with a 12,000-gallon diesel underground storage tank (UST) to supply the generators with fuel. This tank was installed in 1962 and replaced with an aboveground storage tank (AST) in 1996. The former UST was closed under the Alabama Department of Environmental Management (ADEM) Storage Tank Program (NASA 1996). A second UST and product transfer line were removed using in-place closure procedures in 2015 (NASA 2016b).

NASA constructed Buildings 4668 and 4669 (tanks) in 1964 as a storage reservoir for industrial water in support of the pump house (Building 4667). Each tank has a capacity of 3.5 million gallons of industrial water. These tanks may have been painted with lead-based paint in the past.

NASA constructed Building 4674 in 1961 as the blockhouse for Saturn Static Test Stand (Building 4670) and F-1 Engine Static Test Stand (former Building 4696).

NASA constructed Building 4675 in 1964 as the boiler house, which supplied steam for the WTA. Historical drawings indicate that the Building 4675 steam system was equipped with a 24,000-gallon No. 2 fuel oil UST, formerly located northwest of the northwestern corner of the building (NASA 2007b). The UST was removed in the mid-1990s and replaced with a new AST. The former UST site was closed under the ADEM Storage Tank Program (NASA 1998).

3.1.2 Building 4693 Area

The Building 4693 Area encompasses approximately 1.8 acres in the northern part of the WTA (Figure 1-2). Stormwater runoff from the area flows northwest toward National Pollutant Discharge Elimination System (NPDES)-permitted outfall DSN-020 and then, ultimately, to the Wheeler National Wildlife Refuge (WNWR). The area consists of Buildings 4693 and 4694.

Building 4693, constructed in approximately 1954, historically functioned as propellant or hydrocarbon storage. Building 4693 consisted of USTs used for Rocket Propellant (RP)-1 fuel storage during the 1960s through approximately the mid-1970s. After the Saturn time frame (1960s), the facility was used for gasoline, aviation fuel, and No. 2-burner fuel (diesel). The MSFC Master Plans contain maps that show the routing of the underground and aboveground RP-1 pipelines in the test areas (NASA 2007b). The tanks and piping were removed (NASA 1999) and the groundwater monitoring at the facility currently is being regulated under ADEM's Storage Tank Program.

Building 4694, constructed in approximately 1954, historically functioned as a propellant and hydrocarbon storage area and hydrocarbon storage tool shelter. Currently, the building functions as a storage building. According to NASA contractor personnel formerly employed at the facility, Building 4694 was used for equipment storage for various operations performed at the adjacent Hydrocarbon Tank Storage Area, Building 4693. The hydrocarbon materials associated with motorized vehicles – for instance, motor oil and hydraulic oil for mobile cranes – were stored in the building (NASA 2007b).

3.2 Environmental Setting

The MSFC facility is made up of natural settings, farmland, rocket test stands, and various buildings that range from small sheds to large multi-story buildings. The buildings are mainly in the northern half of the facility, and the test stands are in the southern half of the facility. Farmland is located in the northernmost portion of the facility, and natural settings are scattered throughout the facility.

3.2.1 Hydrogeology

This section summarizes the general geologic and hydrogeologic setting beneath MSFC. A detailed description of the geology and hydrogeology beneath MSFC is included in Section 2.1.6 of the final *Sitewide Remedial Investigation/Feasibility Study Work Plan* (Sitewide RI/FS Work Plan; NASA 2016c). The description is based on the August 2004 regional conceptual site model, which was developed for MSFC and RSA by NASA and the DA and included in the Final OU-3 Work Plan (NASA 2008b), which was approved by the regulatory agencies. NASA has completed specific, supplemental geologic and hydrogeologic investigations for OU-3 (groundwater) and the OU-3 RI Report (NASA 2012) has been submitted to the U.S. Environmental Protection Agency (EPA) and ADEM.

The upper portions of the typical subsurface profile beneath MSFC consist of weathered, relatively low permeability clayey media, termed the residuum or overburden. This hydrostratigraphic unit is underlain by carbonate bedrock formations that compose the Tuscomb-Ft. Payne aquifer, which contains a karst flowpath network. The groundwater-bearing portions of the residuum and karst bedrock units form a complex, integrated groundwater system. The degree of hydraulic interconnection and the vertical interchange of water between the units are both spatially and temporally variable throughout MSFC.

Groundwater flow systems exist in regional, intermediate, and local subsurface basins, as defined by a series of integrated subsurface and hydraulic influences. The basin systems occur within four defined hydrogeologic regimes (HRs). The MSFC area lies in HR-IV, which generally is dominated by vertical flow conditions in the residuum and the increased prevalence of karst features along bedding planes and other solution features in the upper bedrock intervals, along with a general decrease in the frequency and size of karst features with depth. Groundwater from the basins eventually discharges either as diffuse seepage or through springs that exist in the downgradient surface water systems created by the impoundment of the Tennessee River. Seasonal effects in the hydraulic interaction between the groundwater and surface water systems occur because of changes in water surface elevations in the Wheeler Lake system.

3.2.2 Surface Water Features

Most surface drainage at MSFC flows through artificial ditches to intermittent and relatively small perennial streams that generally flow west into the tributaries of Indian Creek or south and southeast into the tributaries of Huntsville Spring Branch, which ultimately discharges into the Tennessee River. The level of the Tennessee River is regulated by the Tennessee Valley Authority, and the maximum water level permitted is 572.5 feet above mean sea level. Therefore, the 100-year floodplain created by the backwater is considered to be the area having an elevation of less than 572.5 feet above mean sea level. Additional details about the surface water features present at MSFC are provided in Section 2.1.8 of the Sitewide RI/FS Work Plan (NASA 2016c).

3.2.3 Watershed Description

Forested linear wetlands associated with onsite ditches and drainageways total 7.75 acres in size at MSFC. The hydrology in most of the forested linear wetlands associated with developed areas at MSFC is intermittent and controlled by stormwater runoff and process water. Because most of these drainages are intermittent, fish and larger aquatic animals are not likely to be found and were not observed during wetland studies. However, the intermittent streams provide habitats for other aquatic species such as insects and amphibians (NASA 2016c).

The forested linear wetlands also include portions of Indian Creek and braided unnamed tributaries to Indian Creek within the boundaries of MSFC. The complex of Indian Creek, including unnamed tributaries and the surrounding deciduous forest, provides habitat for a variety of aquatic and terrestrial wildlife. In addition, one of the unnamed tributaries in this complex forested linear system is formed by a spring boil. The boil of the spring is a small pool that is 20 to 25 feet in diameter. The water from the pool flows east into another forested drainageway that is influenced by runoff and process water. Numerous sunfish have been observed in the pool and several large tupelo (*Nyssa aquatica*) grow along the edge. The Tuscumbia darter (*Etheostoma tuscumbia*), a federal candidate species, has been found in this spring boil. Because of the potential for protected species and species of concern to occur in the spring and Indian Creek, these areas are considered critical habitats (NASA 2016c).

Three areas at MSFC support diverse or unique communities: (1) Indian Creek; (2) the spring near Indian Creek; and (3) the subterranean aquifer. Several protected species may inhabit these areas as year-round or migratory residents of MSFC and the WNR; however, none were observed during field surveys conducted in 1994 (NASA 1994). The area encompassed by the WNR is considered to be a critical habitat. As such, the U.S. Fish and Wildlife Service, Tennessee Valley Authority, RSA, and MSFC work closely to manage those parts of the WNR nearest to and within the RSA and MSFC boundaries. Many endangered and threatened species may exist as year-round or migratory residents at MSFC and the WNR (NASA 2016c).

Based on the presence of wetlands in the vicinity, the November 2022 site visit, and a follow-up phone call with Mr. David Medina of the United States Army Corps of Engineers (USACE) field office in Decatur, AL on

December 22, 2022, any drainage features within the area shown on Figure 3-1 are likely to be considered jurisdictional. Any proposed activities within jurisdictional waters and a 25-foot buffer zone around the jurisdictional features would require the appropriate permitting from the USACE Nashville District. Section 401 of the CWA also requires that certain types of activities in jurisdictional waters obtain a State Water Quality Certification through ADEM.

3.2.4 Endangered Species

An ecological resources survey of the subject property to assess habitat for endangered species that could potentially be present at MSFC (NASA 2017b) was conducted in November 2022. The results of the survey are provided in a memorandum included as Appendix C. Based on the survey, seven species were determined to potentially be affected by development of one or more parcels of the subject property, including the gray bat (*Myotis grisescens*), Indiana bat (*Myotis sodalis*), northern long-eared bat (*Myotis septentrionalis*), tricolored bat (*Perimyotis subflavus*), Bachman's sparrow (*Puecae aestivalis*), and golden-winged warbler (*Vermivora chrysoptera*) within Phase 2 Parcels A through D, and the monarch butterfly (*Danaus plexippus*) in Phase 2 Parcels A through E.

Mature trees within Phase 2, Parcels A through D may provide summer refugia for the listed bat species that might be impacted by development of the subject property. Tree removal activities in these areas should occur during the winter season (November 1 to March 31), and it is recommended that the local U.S. Fish and Wildlife Service (USFWS) office be consulted before tree removal.

Monarch butterfly, Bachman's sparrow, and the golden-winged warbler are not currently listed. USFWS consultation regarding these three species is not required, however, the USFWS recommends taking advantage of any opportunity to conserve the monarch butterfly, and if brushy areas within the parcels of occurrence (Phase 2, parcels A through E) can be maintained, it would benefit the species to do so. Golden-winged warblers are migratory species and might use the area for stopover habitat on their way to breeding grounds further north. Therefore, tree and brush clearing activities should be completed outside of the Bachman's sparrow's breeding season (February through September). Additionally, native bird species and their nests are protected under the Federal Migratory Bird Treaty Act, which prohibits the taking (including killing, capturing, selling, trading, and transport) of protected migratory bird species without prior authorization by USFWS. Under this act, it is illegal to destroy a nest that has eggs or chicks in it, or if there are young birds that are still dependent on the nest for survival. As such, nesting bird surveys should be conducted before any tree or brush clearing activities take place. If active nests are observed, stop-work orders should be put in place and the area around the nest cordoned off, until the birds are fully fledged and nest sites are no longer active.

3.3 Land and Resource Uses

Current land use throughout MSFC is classified as industrial and the land will retain industrial classification throughout the duration of NASA's occupation of the property. NASA maintains a Master Plan for the facility that manages land use consistent with NASA's missions and programs. The land use for OU-1, including the portions of the WTA subject to this EBS, is expected to remain industrial, as projected in the current NASA Master Plan.

In evaluating Superfund sites with groundwater contamination, EPA assesses potential beneficial uses of groundwater. The residuum and bedrock groundwater beneath OU-1 are classified by ADEM as a potable resource but are currently restricted from being used as such or for irrigation because of land use controls (LUCs) implemented as part of the OU-3 *Interim Record of Decision* (NASA 2007a). Groundwater beneath a portion of the subject property is contaminated from historical releases (Figure 3-2); additional information is provided in the OU-3 RI Report (NASA 2012). NASA is in the process of implementing interim remedial actions (IRAs) to treat the highest concentration source areas of groundwater

contamination, including Source Area 6 (SA-6), which is located west of the subject property boundary and is the source of the chlorinated solvent plume that extends beneath the southwestern portion of the subject property. Additional information regarding the IRA for SA-6 is available in the *Operable Unit 3 Interim Record of Decision: Interim Remedial Action for Moderate Concentration Chlorinated Solvent Plumes* (OU-3 Moderate Concentration Interim Record of Decision) (NASA 2020a).

3.3.1 Cultural Resources

Based on review of the *Integrated Cultural Resources Management Plan for Marshall Space Flight Center* (NASA 2016d), Building 4666 is eligible for the National Register of Historic Places. archaeological resource areas have been identified at MSFC; however, no archaeological resource areas are located within the subject property.

3.4 Previous Investigations and Risk Assessment

The RI at OU-1, which fully encompasses the areas subject to this EBS, included aerial photograph analysis, historical records searches, site inspections, interviews with site personnel, field sampling events, analytical data assessments, and human health risk evaluations. The results of these investigations are documented in the OU-1 RI report (NASA 2016a).

Extensive soil, sediment, surface water, and groundwater samples were collected at each site where releases may have occurred in OU-1, as determined from historical use. The Building 4667 Area is the only area within the subject property that was identified as a site where potential releases may have occurred. Samples were collected in biased locations and analyzed for the contaminants of potential concern (COPCs) identified for that site based on the site-specific conceptual site model, as well as the target compound list/target analyte list parameters. These target compound list/target analyte list parameters included volatile organic compounds, semivolatile organic compounds, metals, polychlorinated biphenyls (PCBs), pesticides, and cyanide. In addition, hexavalent chromium, organochlorine pesticides, and herbicides were analyzed for in the soil at most sites.

Metals were detected at concentrations above the OU-1 RI screening levels in soil in the Building 4667 Area. Metals and semivolatile organic compounds were detected at concentrations above the OU-1 RI screening levels in soil in the Building 4693 Area. A baseline human health risk assessment (HHRA) and ecological risk assessment (ERA) were conducted as part of the OU-1 RI using the sampling results for each evaluation area to assess potential risks to receptors from site contamination. The baseline risk is an estimate of the likelihood of health effects occurring if no cleanup action were taken at OU-1. Detailed results of the baseline HHRA are provided in the OU-1 RI report (NASA 2016a).

Subsequent to the OU-1 RI (NASA 2016a), the OU-1 FS was conducted to develop and evaluate the Remedial Action (RA) alternatives for OU-1 and to establish the most appropriate RA alternative to address potentially unacceptable risks identified in the RI for the OU-1 sites (NASA 2018a). The FS also refined the risk assessments completed during the OU-1 RI (NASA 2016a). Following these refinements, no potentially unacceptable risks to human or ecological receptors were found in the Building 4667 Area or the Building 4693 Area, therefore, the preferred alternative identified in the OU-1 FS report for these evaluation areas was Alternative 1 (No Action). As noted previously, no historical use that may have resulted in potential sources of contamination was identified for the remaining areas of the subject property. Therefore, no remedial actions have been taken for the subject property.

3.5 Results of Site Inspections and Interviews

The following findings for the subject property are based on the results of site inspections and interviews, in addition to the information from historical documents described in Section 3.4. Photographs taken

during the site inspection are presented in Appendix D. Interview records and communications are included in Appendix B.

3.5.1 Hazardous Substances and Petroleum Products

USTs associated with the Building 4693 Area were previously located on the subject property. Hazardous substances that historically were used and stored on the subject property included substances stored in the former USTs (RP-1 fuel, gasoline, and diesel fuel), and may have included small amounts of paints, batteries, and solvents (isopropyl alcohol and acetone) typically found in office supplies in Building 4666. In addition, transformers that potentially contained PCBs are currently present on the property.

3.5.2 Storage Tanks

Based on a review of MSFC's Spill Prevention, Control, and Countermeasure Plan (EEOH 2019), which documents storage tanks of 55-gallon capacity or more, no storage tanks are currently present on the subject property (Figure 3-3). As discussed in Section 3.1, USTs used for RP-1 storage, gasoline, and diesel during the 1960s through approximately the mid-1970s were historically present in Building 4693. The tanks and piping associated with these USTs have been removed and the groundwater monitoring at the facility currently is being regulated under ADEM's Storage Tank Program.

3.5.3 Oil/Water Separators

No evidence of current oil/water separators was identified at the subject property.

3.5.4 Pesticides

No evidence of pesticide use was encountered during the site visit. In addition, environmental samples collected during the OU-1 RI were analyzed for pesticides, and no pesticides were identified as contaminants of concern (COCs) for the OU-1 evaluation areas overlapping portions of the subject property (NASA 2016a). However, the OU-1 RI sampling efforts were conducted only within the OU-1 RI evaluation areas, and covered limited area within the subject property (NASA 2016a) (Figure 1-2).

3.5.5 Medical or Biohazard Waste

No evidence of medical or biohazard waste was encountered or documented in previous investigations or reports. Based on site records, the subject property has not been used as a medical or dental facility or for any use that might have resulted in medical or biohazard waste being present.

3.5.6 Ordnance and Radioactive Wastes

The Army has a CERCLA site (MSFC-003) that overlaps approximately 16 acres of the subject property (Figure 1-2); UXO and CWM is known to be buried at MSFC-003. The DA is currently investigating and removing the ordnance at MSFC-003. The removal of ordnance is expected to be completed in fiscal year 2025 in the portion of MSFC-003 that overlaps Phase 2, Parcel A and Phase 2, Parcel D of the subject property (Figure 1-2). Initial investigations are ongoing and ordnance removal is not anticipated to be completed until fiscal year 2046 in the portion of MSFC-003 that overlaps Phase 2, Parcel E of the subject property. Currently, any construction within the MSFC-003 boundary requires a DA site access form and may require UXO on-call construction support. No soil or groundwater sampling for COPCs related to UXO/CWM has been conducted to date.

No other evidence of ordnance or radioactive wastes or materials was encountered or documented in previous investigations or reports.

3.5.7 Solid Waste

No solid waste was present during the site inspection.

3.5.8 Groundwater and Drinking Water Quality

Leaching and migration of contaminants to subsurface soil and groundwater are known to have occurred throughout MSFC. Chlorinated solvents, primarily trichloroethene (TCE), make up the majority of groundwater contamination. NASA is in the process of implementing IRAs to treat the highest concentration source areas of groundwater contamination, including SA-6, which is located west of the subject property boundary and is the source of the volatile organic compound plume that extends beneath the southwestern portion of the subject property. Additional information regarding the IRAs for groundwater source areas at MSFC is available in the *Operable Unit 3 Interim Record of Decision: Interim Remedial Action for Moderate Concentration Chlorinated Solvent Plumes* (NASA 2020a) and the *Operable Unit 3 Interim Record of Decision: Interim Remedial Action for the Highest Concentration Chlorinated Solvent Plumes* (NASA 2020b). In addition to the SA-6 plume, two small plumes are located beneath the northern portion of the subject property (Figure 3-2).

NASA maintains an LUC as part of an approved interim record of decision (NASA 2007a) to restrict and manage groundwater use within the NASA facility, prohibiting the installation of potable water supply wells and coordinating the withdrawal and nonpotable use of groundwater within the facility boundary. Potable water on the facility is provided by Huntsville Utilities and RSA.

3.5.9 Wastewater Treatment, Collection, and Discharge

No wastewater treatment or collection facilities are located at the site. The subject property overall is drained by three permitted NPDES outfalls: DSN020, DSN019, and DSN008.

3.5.10 Asbestos-containing Material

Based on communication with Mr. Gregory Smith, MSFC's Industrial Hygiene Manager, asbestos-containing materials (ACMs), including primarily floor tiles and mastic, were abated in Building 4666 in 2013 (Smith 2022a; Appendix B-2). Building 4666 underwent a complete renovation at that time, and floor tiles and mastic were the only ACMs that were identified. Any other ACMs that were present in Building 4666 were removed prior to 2013. If any ACM remains in Building 4666, it is not known and would be in obscure areas not visible during a complete building renovation.

3.5.11 Polychlorinated Biphenyls

Based on review of MSFC's Spill Prevention, Control, and Countermeasure Plan (EEOH 2019), transformers, which may contain PCBs, are present at multiple locations within the subject property (Figure 3-3). Pole-mounted transformers were observed during the site inspection (Appendix D). No PCBs were detected at elevated concentrations within the subject property during the OU-1 RI sampling efforts. However, the OU-1 RI sampling efforts were conducted only within the OU-1 RI evaluation areas and covered limited area within the subject property (Figure 1-2).

3.5.12 Radon

Radon survey records were pulled for Building 4666, the only current building within the subject property. Radon sampling was conducted at several locations within Building 4666 between 1989 and 2016, with sample durations ranging from 91 days to 267 days. The maximum radon concentration detected at any

location and during any sampling event was 3.7 picocuries per liter, in the Building 4666 basement in 2012; this maximum concentration is below the EPA Action Level of 4 picocuries per liter.

3.5.13 Lead-based Paint

In the past, lead-based paint was used at multiple buildings and tanks at MSFC. According to communications with Mr. Smith (Smith 2022b) (Appendix B-2), during the Building 4666 renovation in 2013, most, if not all, of the interior building structure was removed. The interior portions of the building are newer construction and painted with non-lead-containing paint; it is unlikely that lead paint would be encountered in the interior. In addition, the exterior of the building was repainted during the renovation. However, many older buildings at MSFC have been found to have lead-containing orange primer on the steel structural beams above the ceiling. It is not known if the 2013 renovation resulted in changes to the structural beams, and it is possible that there could be lead coatings on some of them.

3.5.14 Air Quality

No potential air pollution sources exist on the subject property except for vapor intrusion (VI) from groundwater contamination in the southwest plume at MSFC (Figure 3-2). A quantitative evaluation of volatilization to air using modeling to predict soil-to-air concentrations was completed as part of the HHRA for OU-1. No COCs were identified based on volatilization to ambient or indoor air in the OU-1 evaluation areas subject to this EBS. In addition, NASA completed a sitewide VI investigation in 2015 as part of the OU-3 RI process. The VI investigation included the collection of subslab soil gas, indoor air, and outdoor air samples at preselected locations within and around 12 target buildings located throughout MSFC. However, no buildings on the subject property were selected for VI sampling, because none of the groundwater plumes extend under Building 4666 (Figure 3-2) and volatile organic compounds were not detected above screening criteria in soil samples in the area. Therefore, VI is not considered to be a likely concern on the subject property.

4. Adjacent Properties

Adjacent property use (defined as property within 500 feet of the subject property) and potential for impacts to the subject property are discussed in this section, in accordance with ASTM D6008-96. The Building 4667 Area partially overlaps the subject property; however most activities that may have resulted in an environmental impact at this site took place adjacent to the subject property. Land to the west of the subject property lies within the WTA of MSFC, and includes forested land as well as OU-1 RI evaluation sites MSFC-004, MSFC-056, MSFC-B, and the Building 4693 Area. The MSFC-078 Area OU-1 RI evaluation site is south of the subject property, and the Building 4567 Area OU-1 RI evaluation site is to the east of the subject property. Army CERCLA site MSFC-003, which overlaps about 16 acres of the subject property, also extends to the west, south, and east of the subject property.

An NPDES-permitted outfall is present west of the subject property. An air stripper is present along the northwestern boundary of the subject property. Groundwater pumped from the test stand basement is directed through piping to the concrete tanks and aboveground stripping tower of the groundwater treatment system. In May 2022, the effluent of the groundwater treatment system was connected to a high-density polyethylene pipeline that discharges through the NPDES outfall DSN-019. Because of the nature of the collection and treatment system, and the fact that the discharge is directly to an NPDES outfall, the treatment system meets the definition of a wastewater treatment unit under 40 *Code of Federal Regulations* (CFR) 260.10. Therefore, contaminated groundwater that goes to and is treated in the groundwater treatment system is covered by the wastewater treatment unit exemption under 40 CFR 264.1(g)(6) and 265.1(c)(10).

As noted in Section 3.5.8, groundwater beneath MSFC is contaminated from historical releases; additional information is provided in the OU-3 RI Report (NASA 2012). NASA is in the process of implementing IRAs to treat the highest concentration source areas of groundwater contamination, including those that extend beneath the southwestern portion of the subject property. Additional information regarding the IRAs for groundwater source areas is available in the *Operable Unit 3 Interim Record of Decision: Interim Remedial Action for Moderate Concentration Chlorinated Solvent Plumes* (NASA 2020a) and the *Operable Unit 3 Interim Record of Decision: Interim Remedial Action for the Highest Concentration Chlorinated Solvent Plumes* (NASA 2020b). In addition, NASA maintains an LUC as part of an approved interim record of decision (NASA 2007a) to restrict and manage groundwater use within the NASA facility, prohibiting the installation of potable water supply wells and coordinating the withdrawal and nonpotable use of groundwater within the facility boundary.

A brief summary of the environmental impacts associated with the OU-1 RI evaluation sites adjacent to the subject property, except for the Building 4667 Area and Building 4693 Area, is presented in the following sections. Historical and current use of the Building 4667 Area and the Building 4693 Area are described in Section 3.1. No potentially unacceptable risks to human or ecological receptors were identified in either the Building 4667 Area or the Building 4693 Area during the OU-1 RI risk assessments (NASA 2016a, 2018a). Therefore, activities in these areas are not likely to have significantly impacted the subject property. Adjacent OU-1 RI evaluation areas MSFC-004, MSFC-056, MSFC-B, and the Building 4693 Area are at a lower elevation and are hydrogeologically downgradient of the subject property. Therefore, although a summary of historical uses of these adjacent sites is provided in the following sections in accordance with ASTM D6008-96, it should be noted that activities at these sites are unlikely to impact the subject property.

4.1 MSFC-004 Area

The MSFC-004 Area encompasses 49.9 acres of the WTA (Figure 1-2). The area consists of the MSFC-004 Pond and the adjacent buildings, where surface water drained directly to the former pond. The former pond was within MSFC boundaries in scrub-shrub wetland habitat. The size of the former pond within the wetland fluctuated based on the dewatering requirements for the test stands. Stormwater for this area drained toward the MSFC-004 former pond and then flowed to Indian Creek. The following buildings were part of the MSFC-004 Area: Buildings 4658, 4670, 4671, 4672, 4676, 4679, 4680, and 4693, and former Buildings 4681, 4684, 4685, 4686, 4687, 4689, 4690, 4691, 4692, and 4696.

Activities for the MSFC-004 Area that took place within 500 feet of the subject property include activities at the MSFC-004 Pond and Buildings 4658 and 4676, and activities at former Buildings 4684, 4686, and 4687. The MSFC-004 Pond serves to detain deluge water from testing activities conducted in the WTA, and historically was used to detain unburned kerosene-based rocket fuels (RP-1) and past solvent washings (TCE) from degreasing operations. The test stands also were equipped with a hydraulic system. The pond is approximately 4 acres, with an average depth of about 3 feet. The pond was constructed in 1963 of native soil; water exits through an NPDES-permitted outfall west of the pond. Continuous dewatering operations are required to keep the Building 4670 test stand foundation dry and operable. Groundwater from dewatering operations conducted at Building 4670 and former Building 4696 discharged to the pond. Groundwater from dewatering operations in the basement of Building 4670 is extracted at a rate of approximately 1.5 million gallons per day. Historically, groundwater also was pumped out of the basement sump in Building 4696, the former F-1 Test Stand, until its demolition in 2013. Approximately 500,000 gallons per day of groundwater was extracted from the basement of Building 4696.

Because the extracted groundwater is known to contain elevated concentrations of chlorinated volatile organic compounds, including TCE, pumped groundwater is routed from the WTA sumps to a packed tower aeration stripping tower process unit for treatment. The treatment system has been operated since 1998 but was shut down between 2003 and 2013 in accordance with a CERCLA directive on the basis that the groundwater did not pose significant risk to human health and the environment.

Historically, treated groundwater flowed from the treatment system through a more channelized area of the MSFC-004 surface impoundment that normally holds water before final discharge via NPDES outfall DSN-019. The discharge of the treated groundwater directly into the MSFC-004 Deluge Pond was discontinued in May 2022; the discharge is currently piped from the packed tower aeration system directly to the NPDES outfall.

After significant rainfall events, groundwater flow into the basement of Building 4670 can increase to the point that the continuous pumping system cannot handle the flow. Historically, the excess groundwater that could not be pumped to the stripping tower based on capacity restraints was discharged directly to the deluge pond; the excess extracted groundwater traversed the deluge pond to outfall DSN-019. Extracted groundwater also was discharged directly in the MSFC-004 Deluge Pond during the period from 2003 to 2013 when the treatment system was shut down at the direction of EPA. Discharge from the MSFC-004 impoundment is to an unnamed tributary to Indian Creek via an NPDES-permitted outfall.

Buildings 4658 and 4676 and Former Buildings 4684, 4686, and 4687 are and were associated with the operations of the test stand. Building 4658 is the Blower Building. Former Building 4684 was the Nitric Acid Storage Area. Former Buildings 4686 and 4687 were the Tank Pit for the Liquid Oxygen (LOX) Storage Area and Tool Shelter for LOX Storage, respectively. The facility was constructed by the DA as the Disposal Pond for Aniline-Furfuryl Storage Area Tank Shelter. The MSFC website indicates that the facility functioned as the Flow Chart Building under NASA administration.

Building 4676 was constructed by NASA in 1965 as the Helium Booster Compressor Building/Helium Compressor Building. The High Purity Helium Compressor Facility is equipped to compress and purify helium gas for transfer via trailers to the storage and distribution system (NASA 2007b). The high-purity helium storage and distribution system, activated in 1964, consists of nineteen 5,000-pounds-per-square-inch-gauge storage vessels stationed at various locations. These storage tanks may have been coated with lead-based paint in the past.

4.1.1 MSFC-004 Area Environmental Impacts

Human health and ecological COCs, including PCBs, polycyclic aromatic hydrocarbons (PAHs), and lead, were identified for the MSFC-004 Area during the OU-1 RI and subsequent revisions to the risk assessments in the OU-1 FS (NASA 2016a, 2018a). PCBs were the only COCs identified that contributed to potentially unacceptable risk for industrial receptors. Since land use at MSFC is and will likely remain industrial, a non-time-critical removal action (NTCRA) was conducted in 2019 to 2022 that removed the majority of soil with PCB concentrations contributing to potentially unacceptable risk to industrial receptors in the MSFC-004 Area. The planned excavation could not be completed to depth in one area on the south side of Building 4670, immediately adjacent to the subject property, because of the presence of high-tension wires (NASA 2022a). PCBs in subsurface soil in that area remain at concentrations contributing to potentially unacceptable residual risk for residential and industrial receptors (NASA 2022a). As such, NASA plans to implement an LUC to restrict exposure to the elevated PCB concentrations.

The MSFC-004 Area is greater than 500 feet from the subject property, is at a lower elevation than and hydrogeologically downgradient of the subject property, is not considered a likely source for contamination to groundwater, and is unlikely to impact the subject property.

4.2 MSFC-056 Area

The MSFC-056 Area encompasses 2.8 acres of the WTA (Figure 1-2) in the southwestern portion of MSFC, including former Building 4673. MSFC-056 is a fuel-loading area that supported testing in the WTA. Building 4673 was constructed as the RP-1 Fuel Storage Tank facility, consisting of two ASTs (totaling 312,000 gallons) for RP-1 fuel storage. These tanks have been removed.

The fuel-loading area is where the tanks were refilled by railcars, which docked at the spur on the hill to the east, near Building 4688. Hookups for RP-1 fuel transfer from the railcars are located from the northeastern corner of Building 4688 extending southward to the spur termination. RP-1 fuel was piped from the railcar westward to the RP-1 Storage Tanks (former Building 4673) via underground pipelines. The supply of RP-1 fuel by railcar ended in 1969, with the last test engine tests performed at the associated test stands, Building 4670, and former Building 4696. Approximately 3 million gallons of RP-1 fuel were brought in by rail for testing at former Building 4696, and approximately 2.8 million gallons of RP-1 fuel were brought in by rail for testing at Building 4670. After the late 1960s, RP-1 was trucked into the WTA and received at the RP-1 Transfer Stations east of the RP-1 tanks.

4.2.1 MSFC-056 Area Environmental Impacts

No potentially unacceptable risks to human or ecological receptors were identified for the MSFC-056 Area in the baseline risk assessments completed during the OU-1 RI (NASA 2016a) and updated during the OU-1 FS (NASA 2018a).

4.3 MSFC-B Area

The MSFC-B Area encompasses approximately 2 acres in the southwestern portion of MSFC (Figure 1-2). The area comprises Building 4688, which is CERCLA site MSFC-B, and the immediate surrounding area. Runoff from the area drains to MSFC-004 and eventually into an NPDES-permitted discharge. Building 4688 was constructed in approximately 1954 and functioned as the Propellant Drum Storage Area in 1954, and as the Aniline-Furfuryl Drum Storage from 1957 through 1968. Currently, the facility functions as a storage building for miscellaneous equipment. The building has three drains internally that are piped to a ditch on the northwestern side of the building. Building 4688 is at a higher elevation than the ditch to the west, so the discharge from the pipes flow down the slope to the west toward the main drainage ditch. The main drainage ditch then flows in a northerly direction along the roadside, where it converges with a ditch flowing southwest from Building 4696. Surface water then flows west to a storm sewer that leads to MSFC-004 Pond beneath Saturn Road. The ditch is about 200 feet long and channels releases that might have occurred from the building to MSFC-004.

4.3.1 MSFC-B Area Environmental Impacts

The baseline risk assessments completed during the OU-1 RI and updated during the OU-1 FS (NASA 2016a, 2018a) identified PCBs as COCs for both residential and industrial receptors in the MSFC-B Area. However, the NTCRA conducted in 2019 to 2022 removed PCB-contaminated soil in the MSFC-B Area, and PCBs were not identified as a COC contributing to potentially unacceptable residual risk for the MSFC-B Area during the supplemental risk assessment conducted following the NTCRA (NASA 2022a). In addition, the MSFC-B Area is at a lower elevation than and hydrogeologically downgradient of the subject property, and is unlikely to have impacted the subject property.

4.4 MSFC-078 Area

The MSFC-078 Area covers approximately 30.6 acres in the southern portion of MSFC (Figure 1-2).

The area consists of MSFC-078, a 2-acre storage area used to store large rocket parts in support of testing operations south of the WTA. Items that are stored include piping, Saturn V boosters, control panels, and other miscellaneous test hardware.

4.4.1 MSFC-078 Area Environmental Impacts

No potentially unacceptable risks to human or ecological receptors were identified for MSFC-078 Area in the baseline risk assessments completed during the OU-1 RI and updated during the OU-1 FS (NASA 2016a, 2018a).

4.5 Building 4567 Area

The Building 4567 Area consists of Buildings 4549, 4552, 4562, and 4567, and former Buildings 4555, 4565, 4566, 4568, and 4569. There is also an unnumbered small security guard building along Saturn Road for the ETA. It is currently unmanned and has no known historically activity that might have contributed to an environmental release. A portion of this area is associated with MSFC-003, which is the responsibility of the DA and will be investigated by the DA in the future. DA-responsible stormwater runoff from the area flows south-southwest toward Dodd Road and eventually to Huntsville Spring Branch.

Building 4549 was constructed in 1960 and used as the Booster Pump Station, Deionized Water Treatment Plant, and Deionized Water Plant. The facility houses a deionization facility east of the two industrial water reservoirs that provides the capability to deionize domestic water. The facility is equipped with six insulated storage tanks (NASA 2007c).

Building 4552 serves as a 1-million-gallon industrial water reservoir for testing activities performed in the MSFC Test Areas. Building 4552 is near groundwater Source Area 4 (SA-4), which is associated with a landfill near Water Tanks 4552 and 4562.

Building 4562 was used as the industrial water reservoir under the DA and currently is used by NASA as a 1-million-gallon-capacity Booster Pump Station Reservoir/Water Reservoir for testing activities performed in the MSFC test areas.

Building 4567 was erected by the DA in 1953 and functioned as a boiler house containing steam boilers and water booster pumps for the guided missile test area (1956) (NASA 2007c). The facility currently is used to pump water during test firings. Building 4567 is equipped with four pump rooms, a boiler room, and a control room. The facility is equipped with seven 1,200-horsepower diesel engines, as well as various pumps and electrical motors (NASA 2007c). Several fuel tanks associated with this building were closed out under the ADEM Storage Tank Program in the mid-1990s.

Former Buildings 4555, 4565, 4566, 4568, and 4569 were all former structures associated with the operations of the Guided Missile Test Facility. Former Buildings 4555, 4565, and 4569 do not have suspected contamination associated with them. Building 4555 was constructed as an observation bunker; Building 4565 was operated as a sound study facility; and, Building 4569 functioned as the guard house at the entrance to the ETA. Building 4566 was an office building that housed the engineers and data processors for the Test Areas. A dark room was connected to the sanitary sewer on the east-west wing of the building. This structure was demolished in 2007. A portion of this building remained and was reassigned as Building 4565, the exit from the storm shelter tunnel. It is the eastern exit point for the tunnel that runs beneath Dodd Road from Building 4666. Building 4568, a former DA substation, was located between razed Building 4566 and Building 4567.

4.5.1 Building 4567 Area Environmental Impacts

Based on the baseline risk assessments completed during the OU-1 RI and updated during the OU-1 FS (NASA 2016a, 2018a), PAHs in subsurface soil were identified as COCs for residential receptors for the Building 4567 Area. No COCs were identified for industrial or ecological receptors. The PAH concentrations in subsurface soil are limited in extent, have low solubility, are not considered a continuing source of groundwater contamination in the Building 4567 Area, and are unlikely to impact the subject property.

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5. Environmental Suitability Evaluation

The subject property is 55.8 acres within the southwestern portion of MSFC. Based on the findings from these activities, different portions of the 55.8-acre subject property have been assigned either ECP Area Type 4 or ECP Area Type 7, as summarized in Table 5-1 and shown in Figure 5-1. ECP Area Type 4 is defined as: “[a]reas where release, disposal, or migration of hazardous substances has occurred, and all remedial actions necessary to protect human health and the environment have been taken.” ECP Area Type 4 determinations for the subject property are based on the presence of groundwater contamination beneath these areas, the LUCs implemented under the OU-3 IRA that prevent exposure to these contaminants, and the completeness of investigations identifying no potentially unacceptable risk in surface media (soil, sediment, and surface water).

ECP Area Type 7 is defined as: “[a]reas that have not been evaluated or require additional evaluation.” ECP Area Type 7 determinations for the subject property are based on the known presence of UXO/CWM in these areas, and the need for surface media and groundwater sampling to assess whether these media may be impacted by chemicals associated with the UXO/CWM or other potential release sources. When the UXO/CWM removal and additional investigations have taken place, the ECP Area Type 7 for these portions of the subject property will be reassessed.

This report is intended to be a living document. As such, if a future release to the environment on the subject property (or to an adjacent property that may affect the subject property) occurs, or additional information about existing site conditions is identified, the future impacts/releases or additional information will be incorporated into Appendix E. Any resulting changes to the environmental suitability evaluation will be included in this section.

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Table

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Table 5-1. Environmental Condition of Property Summary
NASA MSFC Building 4666 Area Environmental Baseline Survey

Parcel	ECP Area Type	Acreage	Contaminated Media	Additional Investigation Required?	Endangered Species Concerns/Actions	Other Concerns/Actions
Parking Area	4 ^[a]	1.8	Groundwater	No	None	None
	7 ^[b]	0.3	Groundwater	Yes, UXO/CWM constituents and other chemicals have not been analyzed in environmental media within this area.	None	
Phase 2, Parcel A	4 ^[a]	24	Groundwater	No	Potential endangered, protected, and/or candidate species habitat. Tree cutting restricted to November 1 to end of February. Consultation with local USFWS office prior to tree cutting is recommended. Conduct nesting bird surveys prior to tree or brush clearing activities. If active nests are observed, stop work and cordon off the area until the birds are fully fledged and nest sites are no longer active. Potential candidate species (Monarch butterfly) habitat. Recommended to maintain unmowed, brushy areas.	Potential
	7 ^[b]	10.4	Groundwater	Yes, UXO/CWM constituents and other chemicals have not been analyzed in environmental media within this area.		
Phase 2, Parcel B	4 ^[a]	9.5	Groundwater	No		None
Phase 2, Parcel C	4 ^[a]	3.7	Groundwater	No		None
Phase 2, Parcel D	7 ^[b]	3.1	Groundwater	Yes, UXO/CWM constituents and other chemicals have not been analyzed in environmental media within this area.		None
Phase 2, Parcel E	7 ^[b]	2.8	Groundwater	Yes, UXO/CWM constituents and other chemicals have not been analyzed in environmental media within this area.	Potential candidate species (Monarch butterfly) habitat. Recommended to maintain unmowed, brushy areas.	None
South Wing	4 ^[a]	0.2	Groundwater	No	None	None

^[a] Areas where release, disposal, or migration of hazardous substances has occurred, and all remedial actions necessary to protect human health and the environment have been taken.

^[b] Areas that have not been evaluated or require additional evaluation.

CWM = chemical warfare material

ECP = Environmental Condition of Property

USFWS = U.S. Fish and Wildlife Service

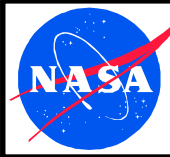


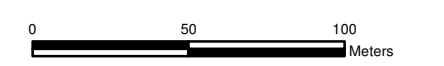

UXO = unexploded ordnance

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Figures

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14-Dec-2022
Drawn By:
Erin Eppling

Figure ES-1
Environmental Condition of Property Areas
NASA MSFC Building 4666 Area Environmental Baseline Survey

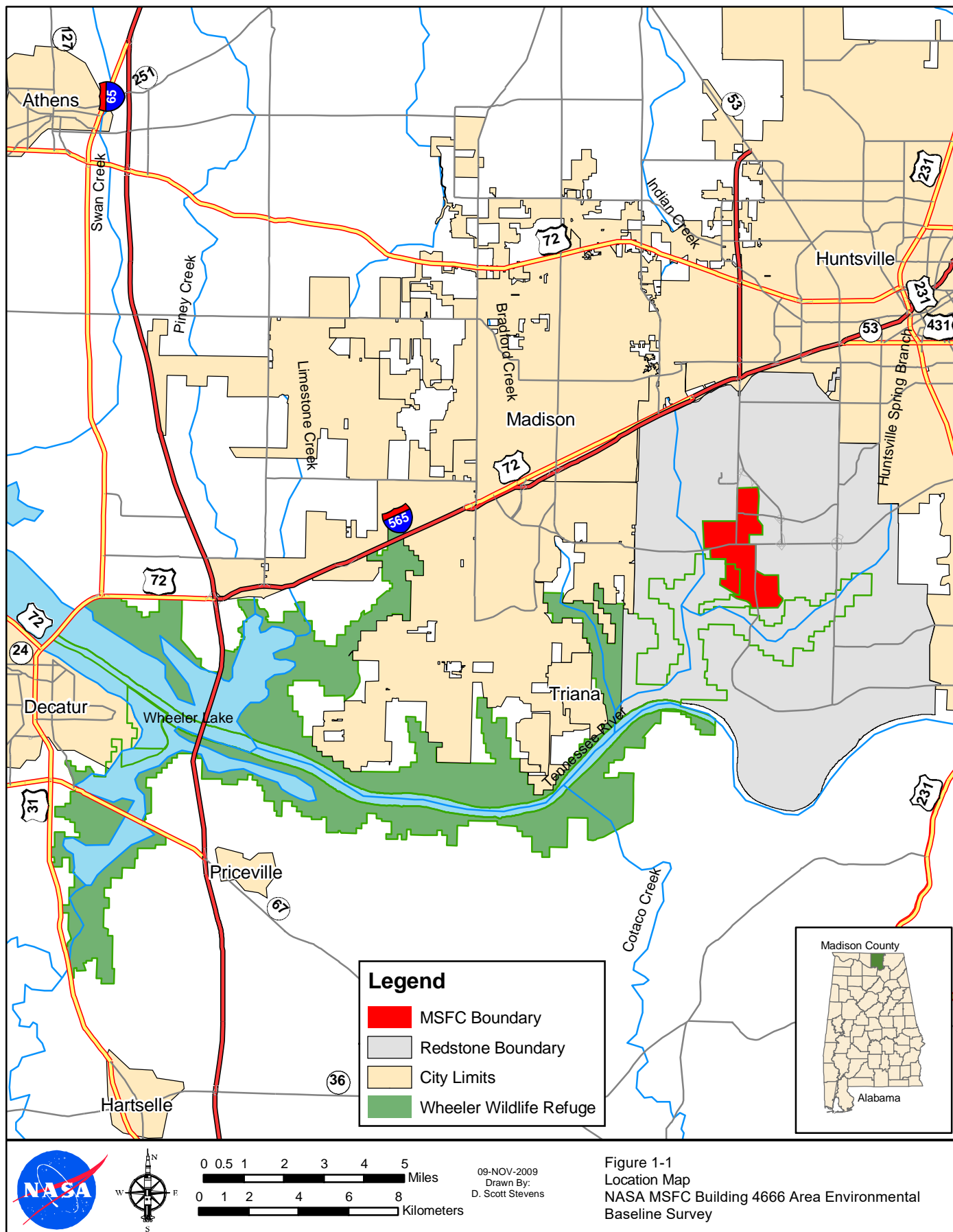
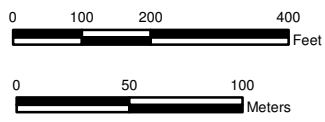
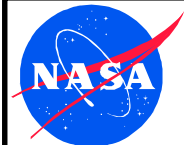
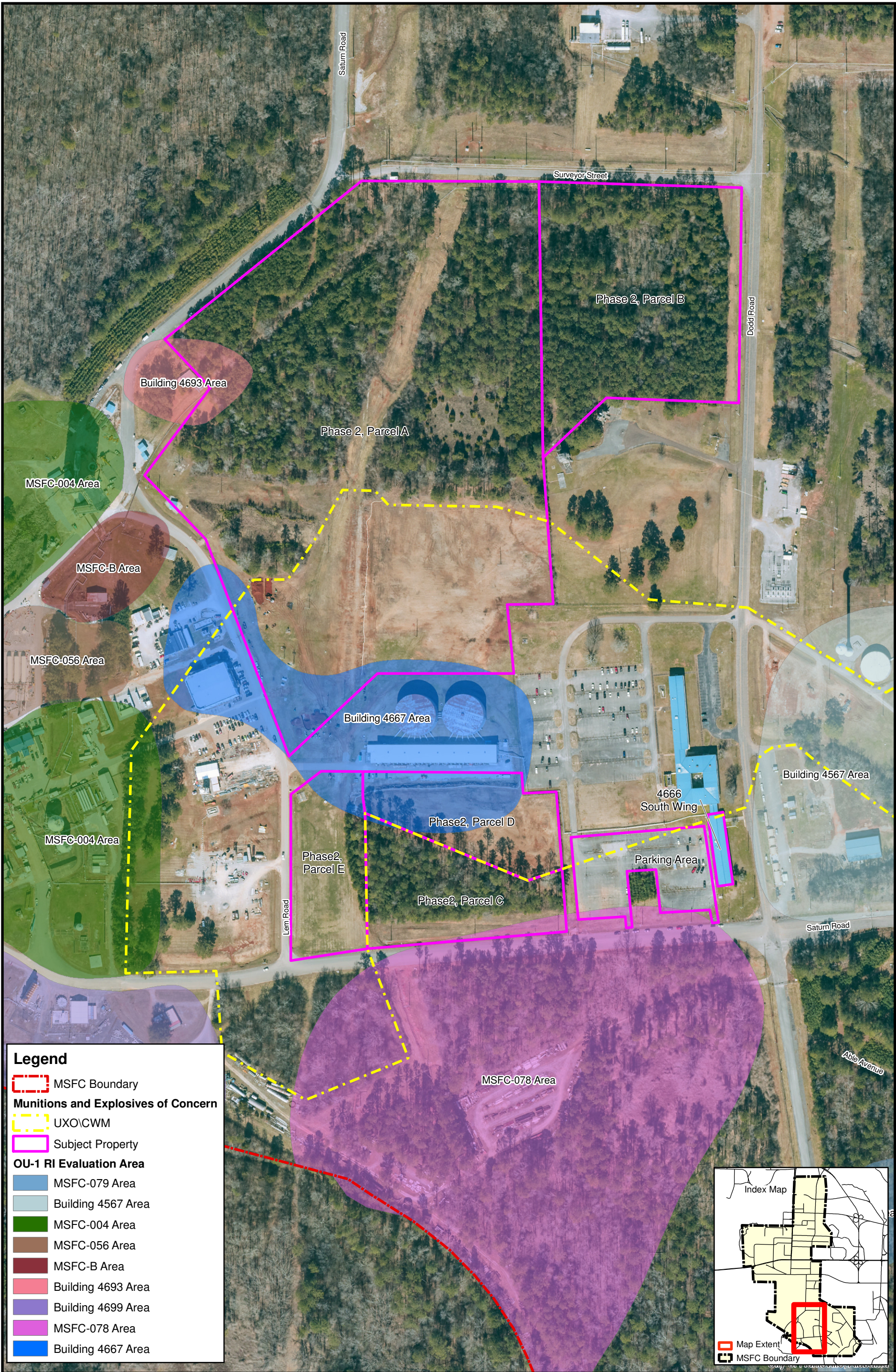
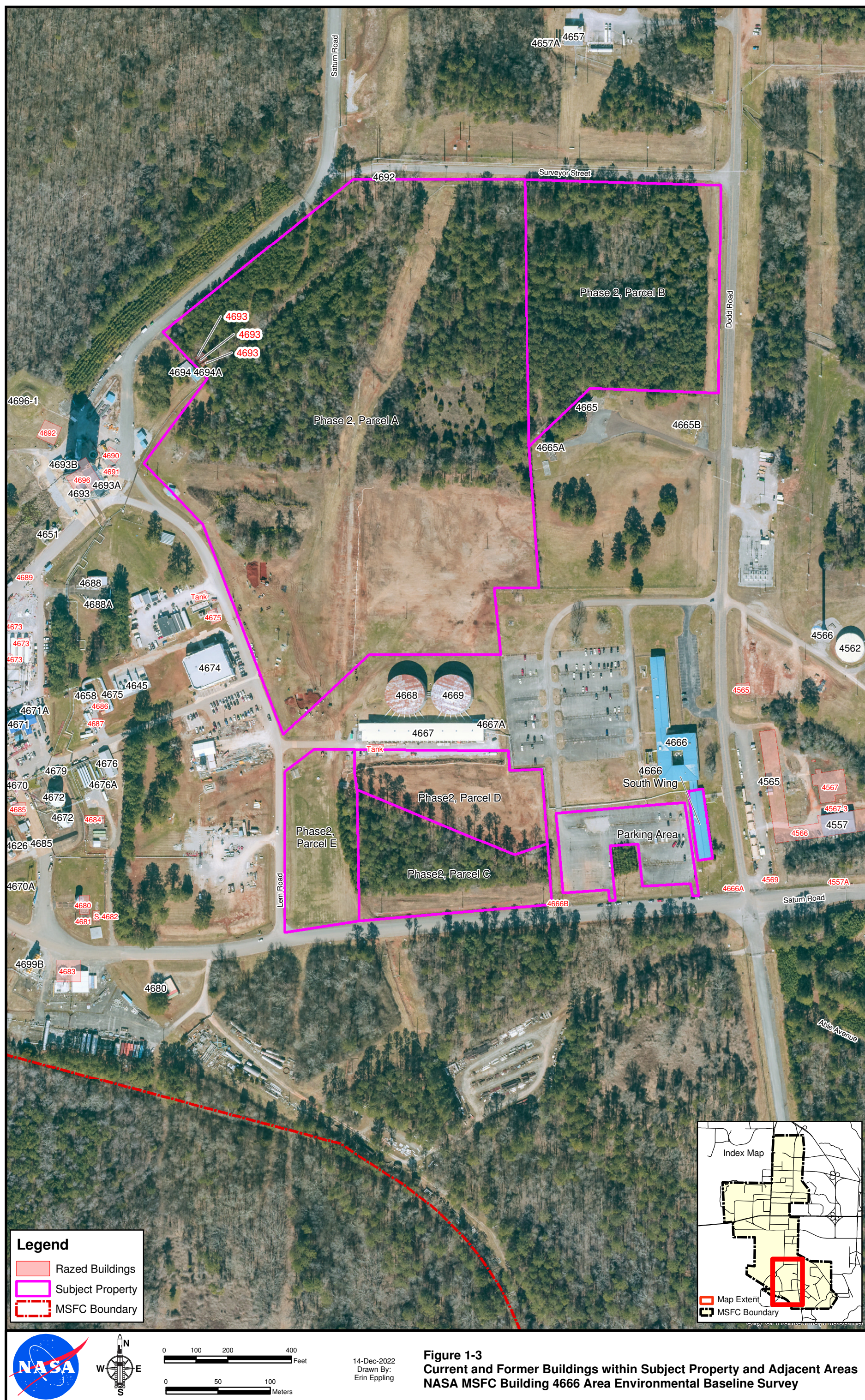
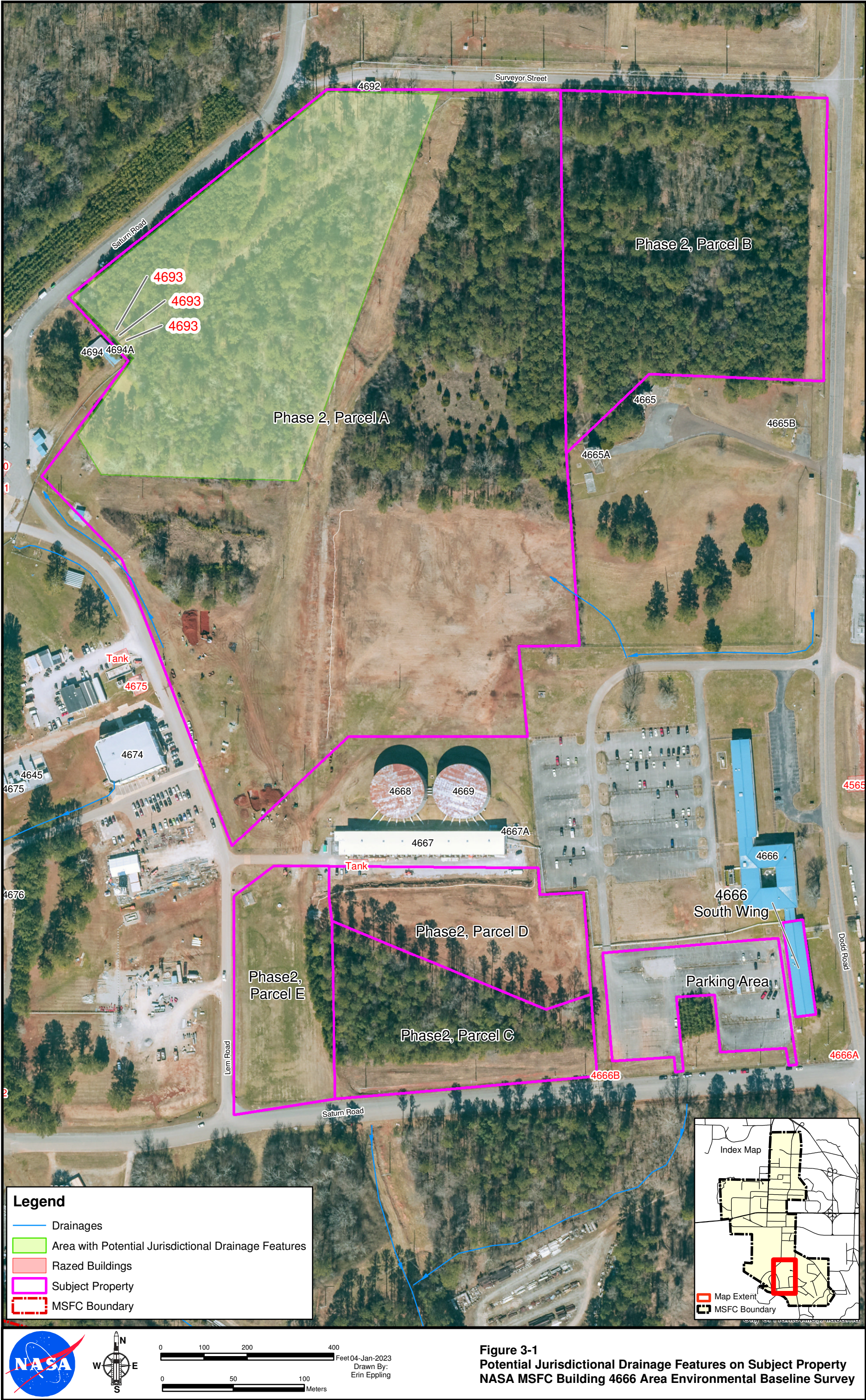


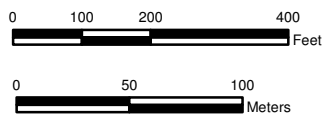
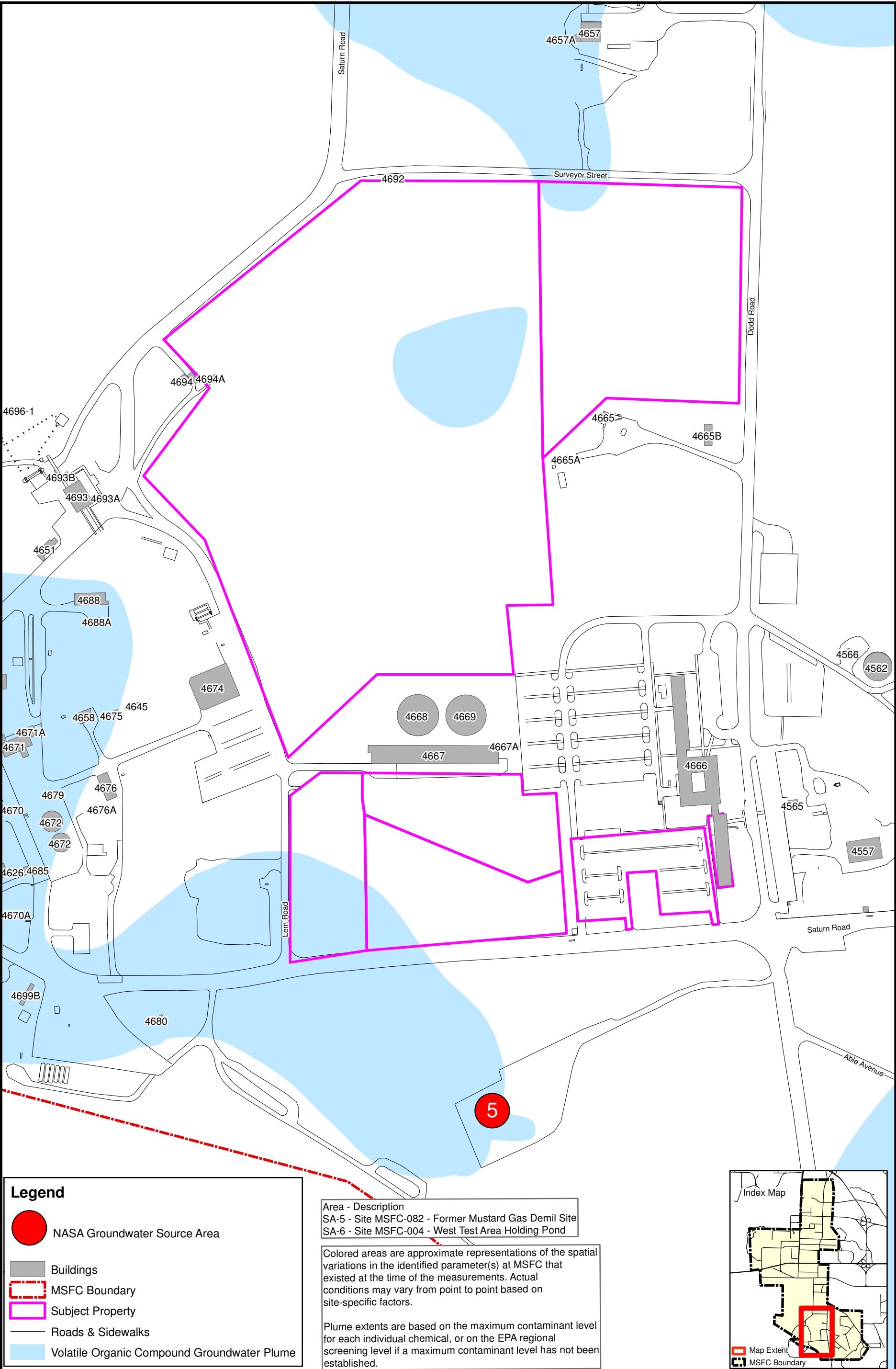
Figure 1-1
Location Map
NASA MSFC Building 4666 Area Environmental
Baseline Survey



14-Dec-2022
Drawn By:
Erin Eppling

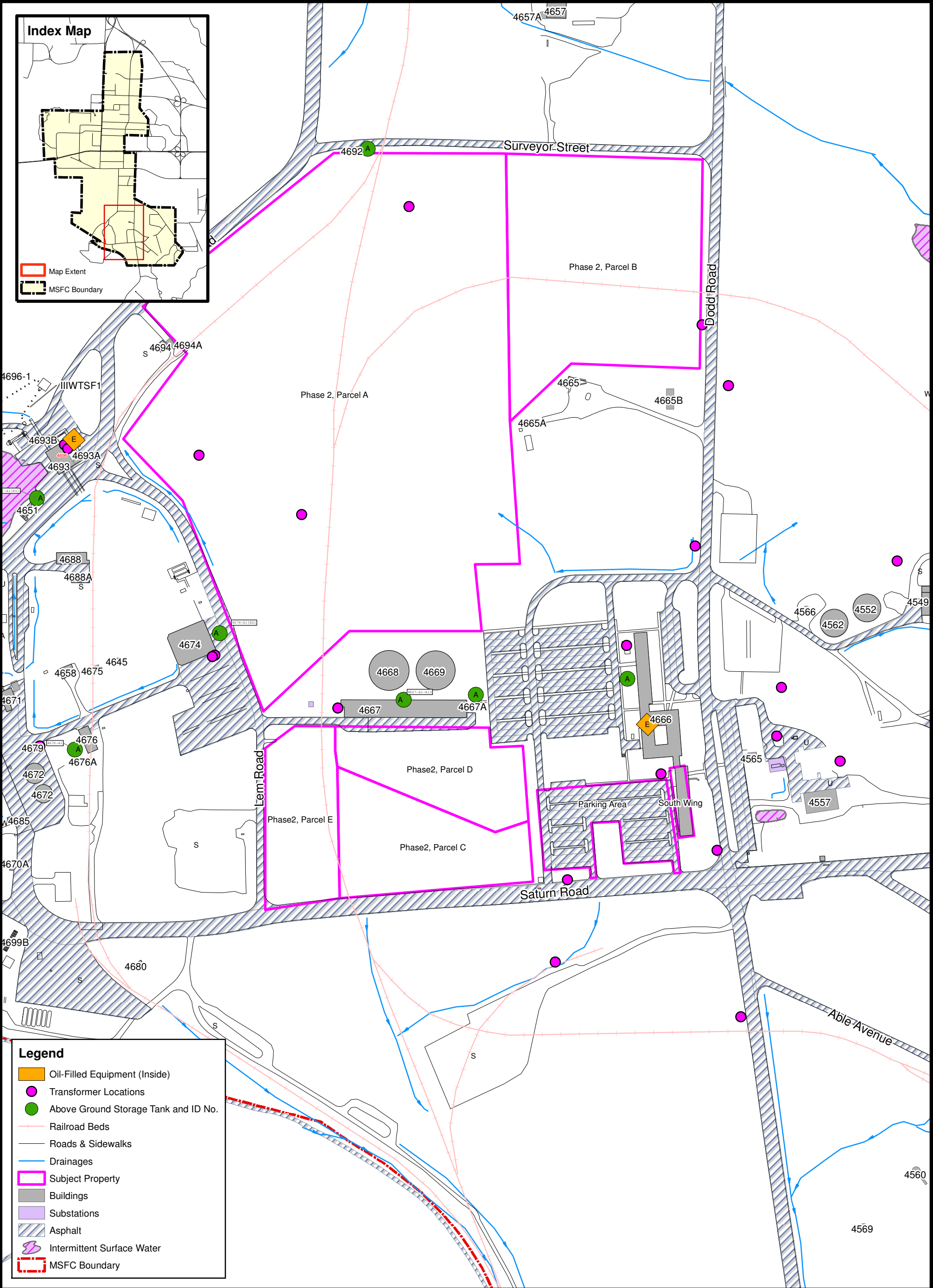






14-Dec-2022
Drawn By:
Erin Eppling

Figure 3-2
Groundwater Plumes in Southwestern MSFC
NASA MSFC Building 4666 Area Environmental Baseline Survey

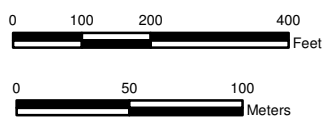
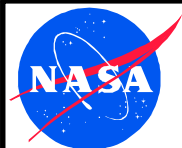
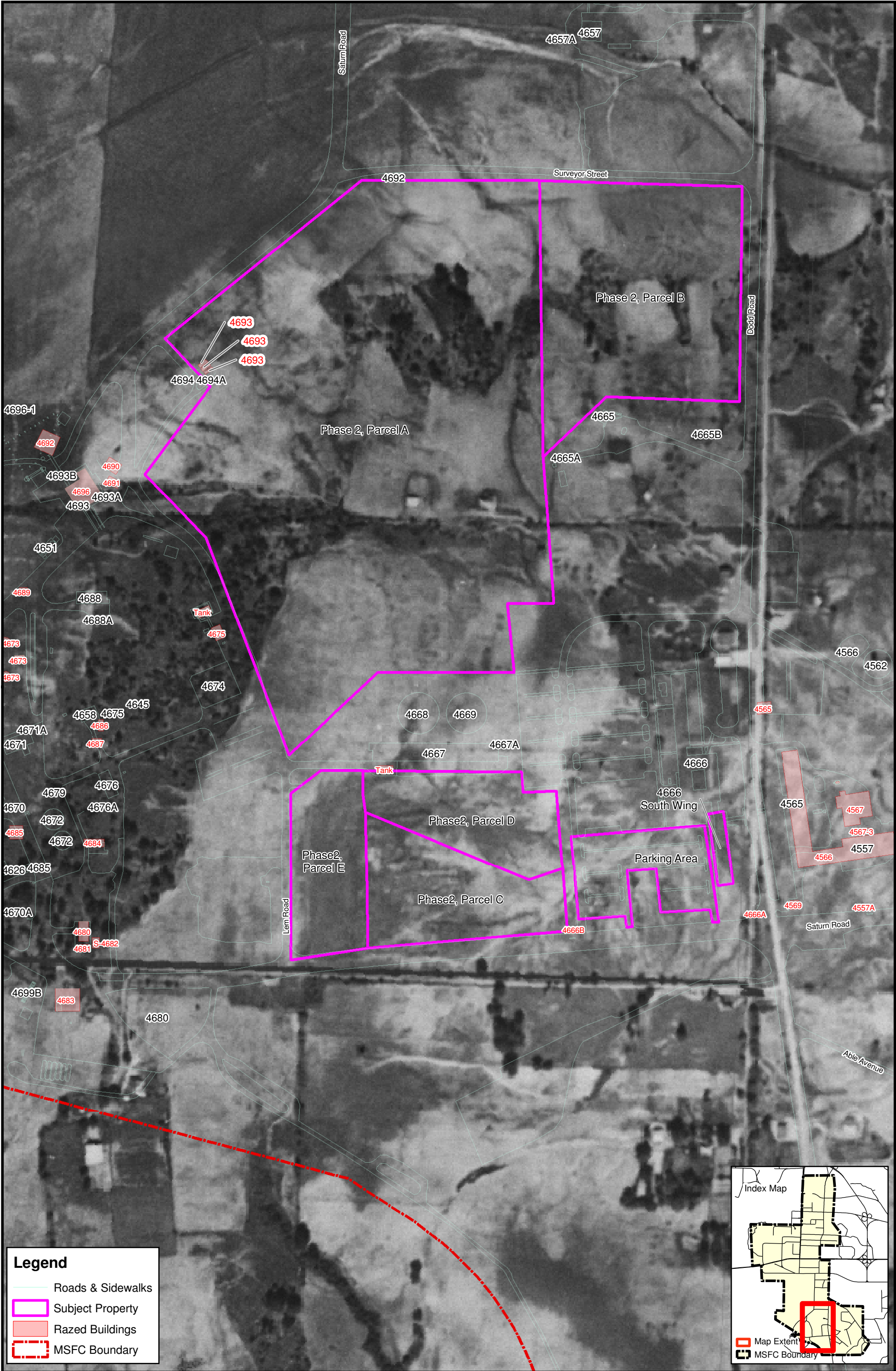




Appendix A

Historical Aerial Photographs

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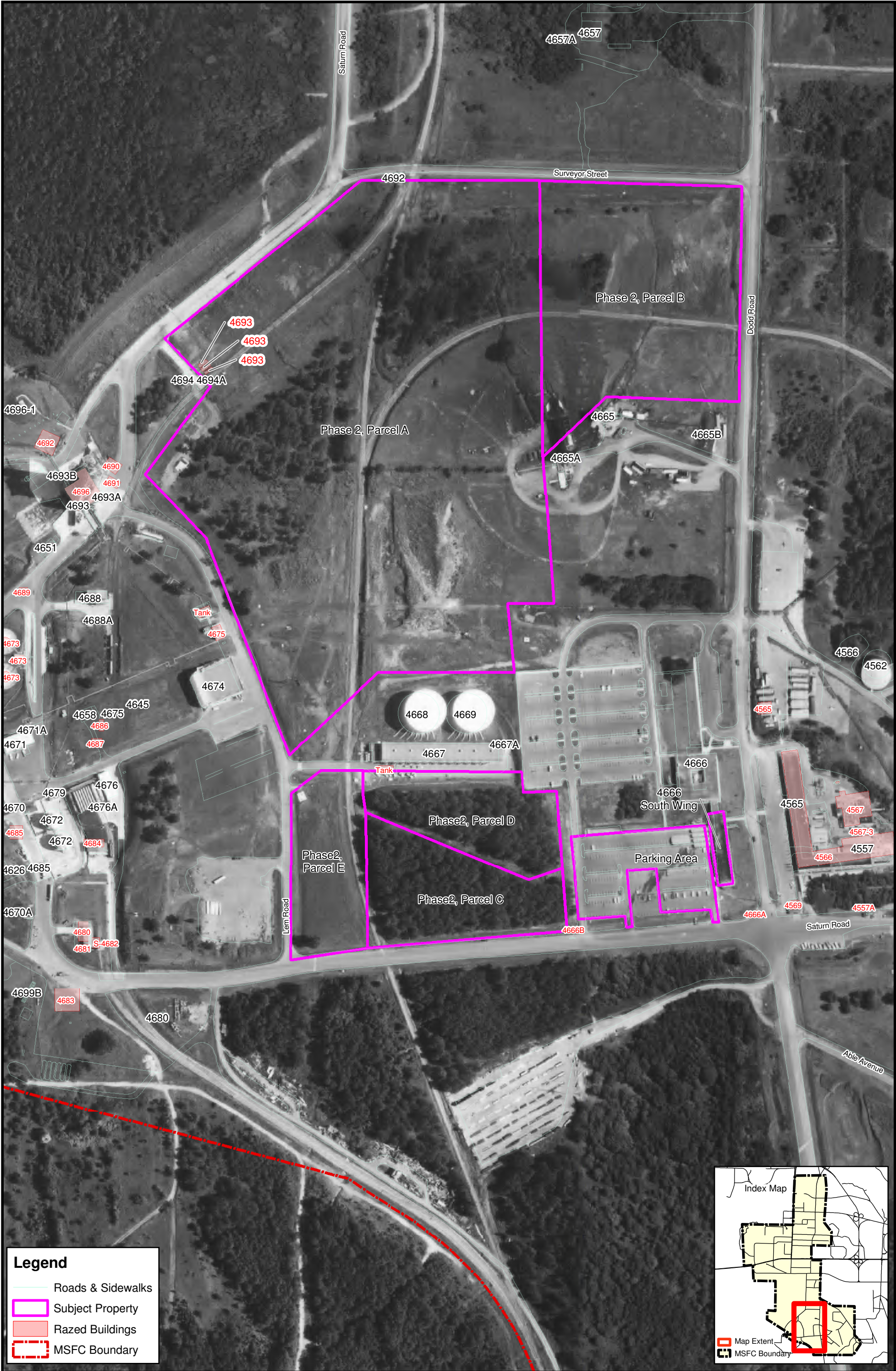


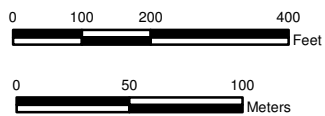
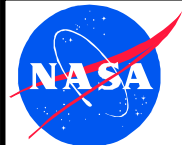
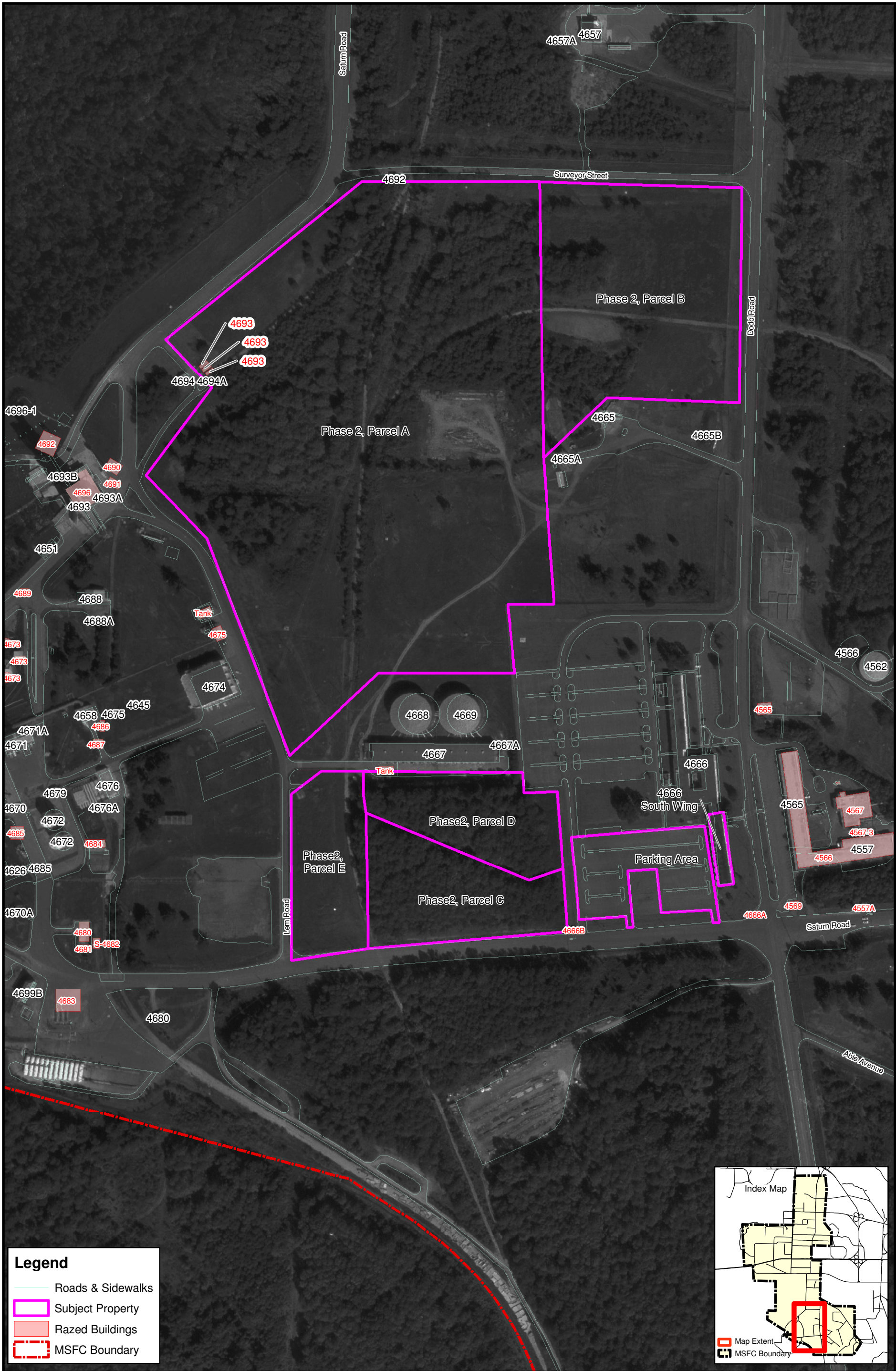
14-Dec-2022
Drawn By:
Erin Epling

Appendix A-1
1937 Aerial Photograph
NASA MSFC Building 4666 Area Environmental Baseline Survey



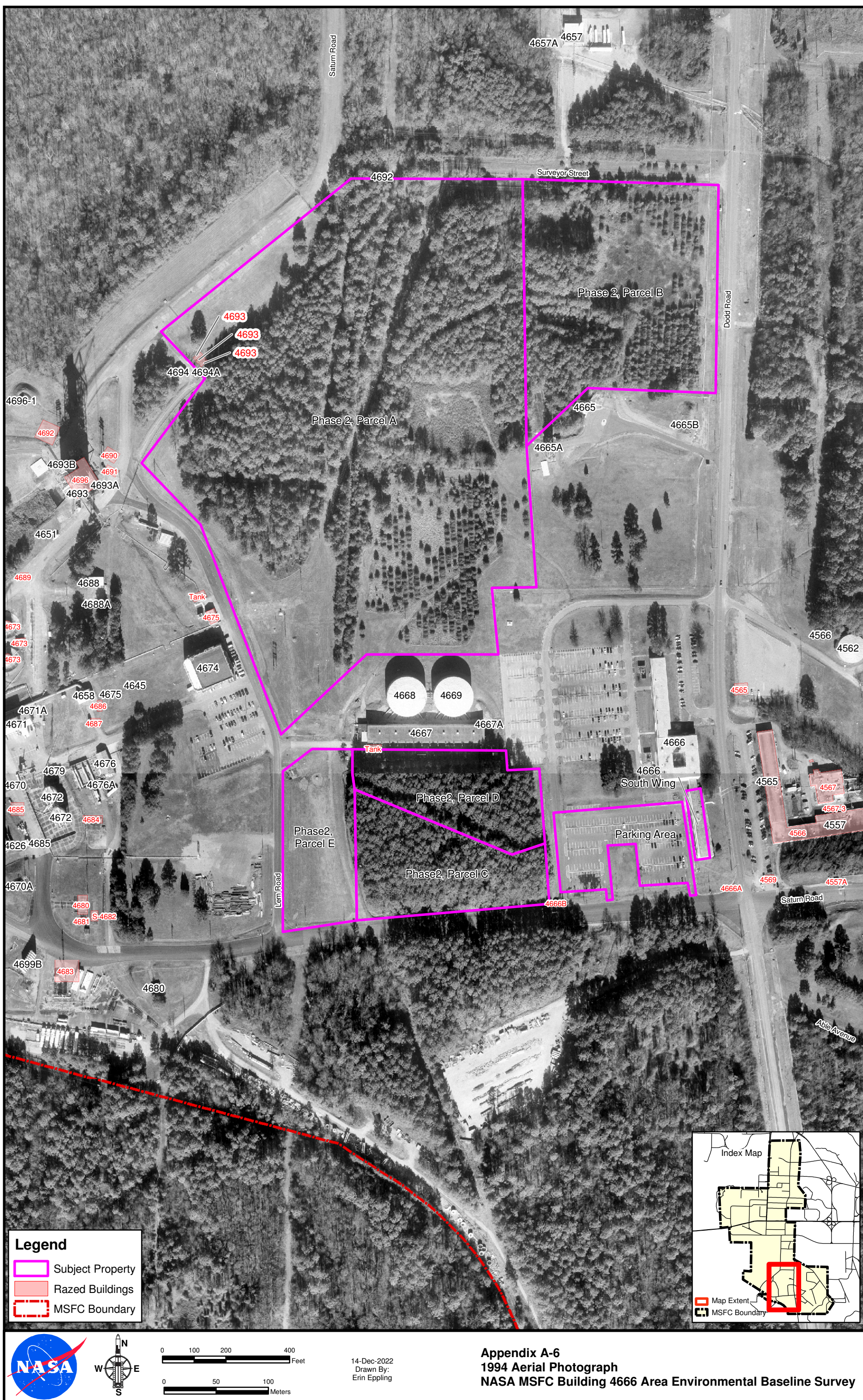


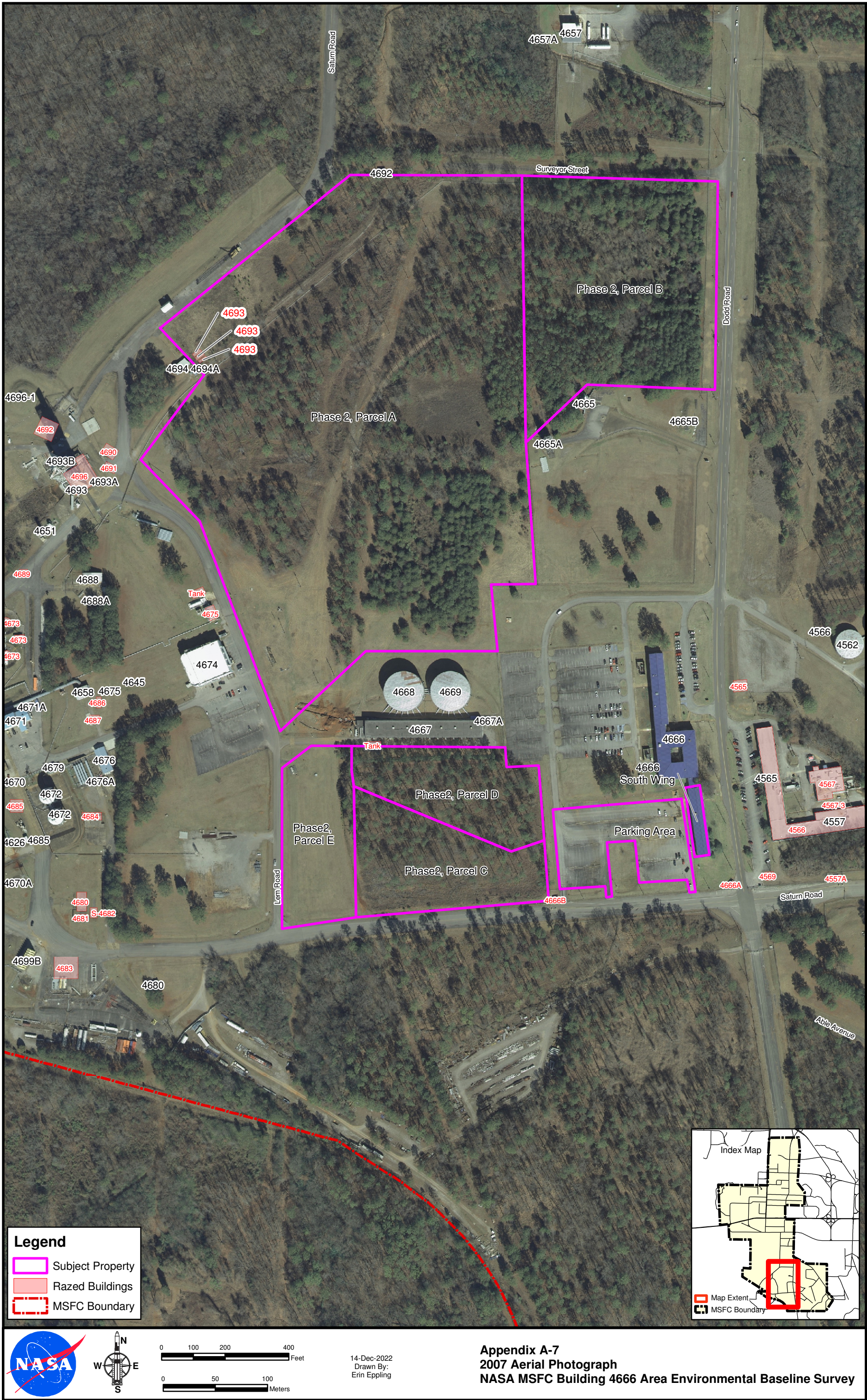




14-Dec-2022
Drawn By:
Erin Epling

Appendix A-5
1978 Aerial Photograph
NASA MSFC Building 4666 Area Environmental Baseline Survey





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Appendix B

Interview Records

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Appendix B-1
Interview with Mr. Roberson

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Interview Transcript

Interviewee: Brian Roberson

Position: NASA Remedial Project Manager for MSFC

Date: October 27, 2022

- 1) Was or is the area in question used as a gasoline station, motor repair facility, dry cleaners, photo developing laboratory, plating shop, medical or dental facility, junkyard or landfill, training area, or as a waste treatment, storage, disposal, processing, or recycling facility?

Response: No.

- 2) Has there been any damaged or discarded automotive or industrial batteries, or pesticides, paints, or other chemical or individual containers stored or used in the area in question?

Response: Chemicals and waste were stored, and paints were used (possibly containing PCB/lead).

- 3) Are there drums, sacks, cartons, or other containers of chemicals located on the property in question?

Response: No. Hydraulic oil for elevators and a generator are present in Building 4666, adjacent to the subject property.

- 4) Was or is the area in question used for any waste generation or disposal activities?

Response: No.

- 5) Was or is the area in question used as a firing or bombing range, or both?

Response: No.

- 6) Have there been or are there storage tanks containing hazardous substances or petroleum products located on the property in question?

Response: Tanks with hydraulic oil for elevators and a generator are present in Building 4666, adjacent to the subject property.

- 7) Have spills, leaks, or other releases of hazardous substances or petroleum products occurred to the best of your knowledge?

Response: No.

- 8) Have unidentified waste materials, tires, automotive or industrial batteries, ordnance, or any other waste materials been dumped, buried, or burned, or a combination thereof, in the area in question?

Response: MSFC-003 (a UXO CERCLA site) is adjacent to and overlaps part of the subject property. This is a site the Army is currently remediating.

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Appendix B-2
Mr. Smith Communication

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① | 1/4 3 / 3 | X

From: Smith, Gregory D. (MSFC-AS10)[GREAT SOUTHERN ENGINEERING] <gregory.d.smith@nasa.gov>
Sent on: Tuesday, October 25, 2022 3:15:06 PM
To: Hansen, Jestina <Jestina.Hansen@jacobs.com>
CC: Butler, Morgan Camp (MSFC-AS10)[KBR] <morgan.c.butler@nasa.gov>; Davis, Farley (MSFC-AS10) <farley.davis@nasa.gov>; Thaxton, David L. (MSFC-AS10) <david.l.thaxton@nasa.gov>
Subject: RE: [EXTERNAL] Asbestos and lead survey information for Bldg 4666
Attachments: S1701768522102507590.pdf (760.3 KB)

Follow up: Follow up
Start date: Tuesday, October 25, 2022 12:00:00 AM
Due date: Tuesday, October 25, 2022 12:00:00 AM

Hi Jestina,

Yes. I recall helping with some test area data awhile back.

As for Bldg. 4666, I can gladly report that in the 2013 timeframe a building wide renovation took place. The building was completely gutted. The remaining asbestos material in the building was abated at that time. I attached some documentation, abatement plan and waste shipment records, from that project. Mainly what was left to be abated was floor tile. Much of the other had previously been removed prior to 2013. If there are any asbestos containing materials remaining, they would be hidden and unknown and not visible during a complete bldg. renovation.

For lead paint; since there was a major reno of the building, most if not all the interior building structure was removed. The interior portions of the building was new construction and most likely painted with latex non-lead containing paint. In addition, the exterior of the building was also part of the renovation project. The building was repainted at that time. The likelihood of encountering lead paint on the interior would be very slim. However, we have found many of our older buildings have lead containing orange primer on the steel structural beams above the ceiling. If they did not have a reason during the renovation to affect or remove any of the structural members, then there could be lead coatings on them.

Hope this info helps. Get back with us if we can be of further assistance.



Gregory D. Smith, MS, CIH, CSP, CHMM
GSE, Inc.
IH Manager- MSFC EEOH
Bldg. 4249
MSFC, AL 35812
Office: 256-544-5739

Please let us know how we are doing! Click on link below to fill out our survey.

[Industrial Hygiene / Radiation Services](#)

From: Hansen, Jestina <Jestina.Hansen@jacobs.com>
Sent: Tuesday, October 25, 2022 8:30 AM
To: Smith, Gregory D. (MSFC-AS10)[GREAT SOUTHERN ENGINEERING] <gregory.d.smith@nasa.gov>
Subject: [EXTERNAL] Asbestos and lead survey information for Bldg 4666

Hello Greg,

I believe you helped Dave Patterson with asbestos and lead survey information to support the west test area environmental baseline survey (EBS) report earlier this year. NASA has requested an addendum to the original area included in the EBS, now to include the southern portion of Bldg 4666 and the parking lot south of it. Attached are the emails you provided to Dave (you provided some individual building reports as well) and this level of detail was perfect. Would you be able to provide similar information for Bldg 4666? NASA has requested the addendum by next week so if you could possibly send this information to me this week, that would be greatly appreciated.

Thank you,

Jestina A. Hansen, P.G.* | [Jacobs](#) | Geologist
M:+01.618.535.8509 | jestina.hansen@jacobs.com
501 North Broadway Street | St. Louis, IL 63102 | USA
* Professional Geologist - Alabama

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ASBESTOS PLAN

1.0 SITE SPECIFIC OVERVIEW

This asbestos abatement plan is a site specific overview of the operating procedures and equipment for the removal of asbestos containing floor tile and mastic **Building 4666, Marshall Flight Center, AL**.

1.1 SUMMARY

Ark Builders, Inc. shall be responsible for removing and disposing of approximately 20,000 square feet of asbestos containing floor tile and mastic. We will contain the area, put signs at all entrances and keep materials wet during the abatement process.

Ark Builders, Inc. shall be responsible for removing and disposing of the asbestos containing floor tile and mastic from Bldg. 4666. The entire area has floor tile and mastic. Ark Builders, Inc. will seal all openings with 6 mil poly. At the entrance we will set up a chamber decontamination room with 6 mil poly with flaps. Negative pressure will be established. Ark Builders, Inc. will wet floor tile. The floor tile will be removed using 3.5" scraper on bar. As tile is removed workers will constantly bag materials. Ark Builders, Inc. will install a splash guard on walls. We will then start the removal of the mastic by spraying solvent on floor, agitate with a broom scrubbing the floor. After material becomes liquefied we will use squeegees to push material up to be bagged. Material will then be loaded out. All workers will wear suits and respirators during the whole process.

1.2 QUALITY ASSURANCE

- A. Maintain on site a superintendent and a supervisor, each having not less than one year of full-time experience and has been the responsible person in charge of asbestos removal operations in similar scope and magnitude to this Project within the two year period preceding start of project. The superintendent and supervisor will be approved by the Owner and shall not be changed without prior approval of the Owner. Supervisor shall remain inside the work area at all times while work is in progress.

Superintendent – Clinton F. Peoples

Supervisor – Terry L. Jones

1.3 WORKSITE CONDITIONS

- A. Worker and Visitor Procedures: Ark Builders, Inc. is hereby advised that asbestos has been determined by the U.S. Government to be a **CANCER-CAUSING AGENT** and shall provide workers and visitors with respirators which, at a minimum, shall meet the requirements of OSHA 29 CFR 1926.1101(h)(2); and protective clothing during

preparation of the system of enclosures, prior to commencing, during actual asbestos removal, and until final air clearance test results comply with the requirement of the Contract Documents.

1.4 PERSONNEL PROTECTION

- A. Prior to commencement of work, all workers shall be instructed in, and shall be knowledgeable of, the appropriate procedures of personnel protection and asbestos removal.
- B. Provide workers with personal issued and marked respiratory equipment approved by NIOSH and OSHA to be suitable for the asbestos exposure level in the work areas according to OSHA Standard 29 CFR 1910.1001 or as more stringently specified elsewhere in the Contract Document.
- C. Where respirators with disposable filters are used, provide sufficient filters for replacement as necessary by the workers, or as required by applicable regulations.
- D. Provide respiratory protection at all times which is in compliance with or in excess of the Occupational Safety and Health Administration guidelines for respiratory protection.
- E. Provide respiratory protection from the time the first operation involved in the Project requires contact with asbestos-containing materials until acceptance of final air test results indicate that other respiratory protection is acceptable. Contractor shall be solely responsible for scheduling necessary air sampling with an independent testing laboratory to determine acceptability of other respiratory protection. Ark Builders, Inc. shall pay all costs associated with such testing and shall submit copies of such test results to the Project Engineer for approval prior to changing type of respiratory protection.
- F. Provide emergency backup air supply for each worker in work area at all times when supplied air respirators are required. Provide emergency backup equipment with air supply of sufficient duration for all workers to safely exit work area. Locate emergency equipment so that it is readily accessible to each work area following interruption of normal air supply.
- G. Permit no visitors, except for governmental inspectors having jurisdiction, or as authorized by the Project Engineer or Owner, in the work areas after commencement of asbestos disturbance or removal. Provide authorized visitors with suitable respirators and protective disposable clothing.
- H. Provide workers that are working inside the containment areas with sufficient sets of protective disposable clothing, consisting of full-body coveralls, head covers, gloves and foot covers; of sizes to properly fit individual workers.

- I. Provide eye protection and hard hats as required for job conditions or by applicable safety regulations. Leave reusable footwear, hard hats, and eye protection devices in the contaminated equipment room until the end of the asbestos abatement work, at which time such items shall be disposed of as asbestos waste or decontaminated for reuse.
- J. Provide authorized visitors with a set of suitable protective disposable clothing, headgear, eye protection, and footwear of sizes to properly fit visitors whenever they are required to enter the work area, to a maximum of six sets per day.
- K. Provide, in addition to respirators and protective clothing for authorized visitors, protective clothing and respirators for use by the Project Engineer or Engineer's representative. Furnish protective clothing in as many sets as required for full time monitoring by the Project Engineer.
- L. Post in the Equipment Room and the Clear Room the asbestos removal decontamination and work procedures to be followed by workers. Also post the sign-in / sign-out log.

2.0 PRODUCTS

2.1 MATERIALS

- A. Plastic Sheetting – Shall be of the thickness specified, in sizes to minimize the frequency of joints.
- B. Tape – Shall be glass fiber or other type capable of sealing joints of adjacent sheets of plastic and for attachment of plastic sheet to finished or unfinished surfaces of dissimilar materials under both dry and wet conditions.
- C. Surfactant (wetting agent) – Shall consist of resin materials in water base which have been tested to indicate material is nontoxic and nonirritating to skin and eyes, and noncarcinogenic.

Material Safety Data Sheets (MSDS) will be attached.

- D. Impermeable Containers – Shall be suitable to receive and retain any asbestos-containing or contaminated material until disposal at an approved site and shall be labeled in accordance with OSHA Regulation 29 CFR 1910.1001. Containers must be both airtight and watertight. Use a minimum of two types of impermeable containers: 1) 6 mil plastic bags and/or 2) metal or fiber drums with tightly fitting lids.
- E. Warning Labels and Signs – Shall be as required by OSHA Standard 29 CFR 1910-1001.

- F. Other Materials – Provide all other materials, such as lumber, nails and hardware, which may be required to construct the decontamination area and the barriers that isolate the work area(s).
- G. Spray Adhesives – Shall be 3M 76, 77, 99 or approved equivalent.
- H. Glove Bag – Shall consist of heavy 6 – 12 mil clear plastic with preprinted asbestos hazard warning.

2.2 TOOLS AND EQUIPMENT

- A. Provide suitable tools for asbestos removal:
 - 1. Water Sprayer – utilize airless or other low pressure sprayer for amended water application.
 - 2. Air Purifying Equipment (for internal recirculation in the work area) – Shall be HEPA Filtration Systems or Electronic Precipitators. Ensure that no air movement system or purification equipment exhausts contaminated air from the work area(s) to outside the work area.
 - 3. Transportation – As required for loading, temporary storage, transit, and unloading of contaminated waste without exposure to persons or property.

3.0 EXECUTION

3.1 PREPARATION

- A. Coordinate sequence of work with Owner in order to properly segregate work areas from areas that must remain fully or partially occupied or operational or in which other special considerations are required.
- B. Ark Builders, Inc. supervisor and an environmental representative will walk thru the job site and verify where negative pressure and exhaust for the negative pressure will be located prior to beginning work and decontamination unit.
- C. Conditioned air will be isolated in the work area prior to beginning work.

3.2 GROSS REMOVAL OF ASBESTOS-CONTAINING VINYL FLOOR TILE AND MASTIC

- A. Remove tile using techniques that will minimize tile breakage.
- B. Do not saw or abrade tiles.
- C. Place tile and debris in sealable plastic bags of 6 mil minimum thickness or other sealable impermeable container.

- D. In compliance with NESHAPS label bags or containers and dispose of as contaminated waste.
- E. Remove asbestos-containing floor tile mastic indicated on drawings down to prevailing surface of concrete.

3.3 CLEAN UP AND CLEARANCE TESTING

A. Clean Up

1. Remove all visible accumulations of asbestos materials and debris.
2. Clean all surfaces in the work area.
3. Clean all sealed impermeable containers and all equipment (excluding that needed for further cleaning) used in the work area and remove from work area via the equipment decontamination enclosure system.

B. Final Observation

1. A final observation of the cleaning work of this Section will be performed by an Ark Builders, Inc. representative. Final inspection and determination will be made by an AHERA Certified Asbestos Building Inspector or equivalent as required and is outside the scope of contract specifications.

3.4 DISPOSAL OF CONTAMINATED WASTE

A. Remove sealed and labeled containers of contaminated materials and dispose of accordingly to an approved sanitary landfill as follows:

1. Pass sealed 6 mil plastic bags of contaminated materials from work area into decontamination enclosure washroom. All gross materials shall be removed from outside surfaces of bags in the work area prior to passing the bags into the decontamination enclosure washroom.
2. Double-bag any split, torn or punctured debris bags.
3. Clean plastic bags (using HEPA vacuum or wet wipe methods) while in the decontamination enclosure washroom.
4. Pass cleaned plastic bags into decontamination enclosure holding area.
5. Seal asbestos waste in leak-proof impermeable containers labeled in accordance with Title 29, Code of Federal Regulations, Section 1926 or applicable local standards.

6. Use only enclosed or covered trucks to haul impermeable containers to prevent loss or damage to container en route to sanitary landfill.
7. Allow only sealed plastic bags or impermeable containers to be deposited in landfill. Leave damaged, broken or leaking plastic bags in the impermeable container and deposit entire container in landfill.
8. Ensure that there are no visible emissions to the outside air from where materials and waste are deposited.
9. Contractor may recycle uncontaminated impermeable containers.
10. Submit receipts including date, quantity of material and signature from authorized representative of landfill.

3.5 FIELD QUALITY CONTROL

- A. Prior to removal and throughout the removal and cleaning operations, visual observations and air monitoring will be conducted on a daily basis.
- B. Tests will be made both in work areas and outside of work areas, the results of which will be available to Ark Builders, Inc. If Ark Builders, Inc. should make interpretation from the test results, opinions and conclusion will be formed and drawn solely by Ark Builders, Inc.
- C. Test results will be reported in terms of fibers per cubic centimeter (f/cc) and collected in accordance with EPA and NIOSH recommended sampling volumes for appropriate detection limits.

4.0 PLANNED AIR MONITORING STRATEGIES- AIR MONITORING WILL BE PERFORMED.

4.0.1 Monitoring: Monitoring of airborne concentrations of asbestos fibers shall be performed by in accordance with 29 CFR 1926.1101 and as specified herein. Flow rates of up to 12 liters per minute may be used for the collection of area samples. Unless otherwise specified, aggressive collection procedures shall be used. For PCM samples, unless precluded by non-asbestos dust or made unnecessary by existing asbestos fiber level, a sufficient volume of air shall be taken to give a calculated detection limit of approximately 0.01 f/cc.

4.0.2 Monitoring During Asbestos Work: Work area air monitoring shall continue until Clearance Air Monitoring is completed unless otherwise specified herein.

4.0.2.1 Personnel Air Monitoring

4.0.2.1.1 Perform initial and daily personnel monitoring to ensure that no abatement workers are exposed to airborne concentrations of asbestos in excess of the OSHA Permissible

Exposure Limit (PEL) of 0.1 f/cc of air determined as an eight hour Time Weighted Average (TWA) without regard for the prescribed respiratory protection.

4.0.2.1.2 Such initial and daily personnel monitoring is conducted to represent the exposure of each employee assigned to work in the regulated area. Daily area monitoring employees may be assigned to work in the regulated area. Daily personnel monitoring may be discontinued while full-face piece, pressure-demand Type Respirators are worn by all persons in a Containment or Limited-Containment Work Area. OSHA required personnel monitoring will continue through the duration of the abatement activities. If the type of work or the type of Asbestos Containing Material changes, area air monitoring shall be reinstituted.

4.0.2.2 Work Area Air Monitoring – Containment Work Areas: Collect daily samples while work is in progress in the following locations:

- Work area inside containment
- Equipment room
- Clean room
- Discharge of ventilation unit

4.0.2.3 Response Actions to Air Monitoring Results:

4.0.2.3.1 Asbestos fiber levels in areas adjacent to the Work Area or in any part of the building impacted by the abatement activities shall not exceed 0.01 f/cc or measured background (whichever is higher) as determined by Phase Contrast Microscopy (PCM). Cease all work immediately in any Work Area causing or contributing to such a condition. Take remedial action (e.g. wet cleaning, misting, repair of containment, etc.) to reduce fiber concentrations to acceptable levels.

4.0.2.3.2 Asbestos fiber levels for area samples inside the Work Area will not exceed 0.1 f/cc as determined by phase contrast microscopy. If such levels occur, take immediate action to reduce airborne fiber concentrations.

4.0.2.4 Monitoring for Final Clearance by Phase Contrast Microscopy:

4.0.2.4.1 After the asbestos removal site has passed the visual inspection and the work area is dry with no visible pools of water or condensation, and/or any lock down material used in final clearance is dry, air monitoring shall be conducted.

4.0.2.5 Collection and Analysis Procedure: Conduct the clearance air sampling using collecting media and procedures in accordance with 29 CFR 1926.1101 except that sample flow rates up to 12 liters per minute may be used during sample collection. The sample collection will be passive. Collect five samples per homogeneous area or one per room, whichever is greater. An

air volume that provides a detection limit of 0.01 f/cc or less shall be collected. The sampling zone shall be representative of the building occupants' breathing zone.

4.0.2.5.1 If the area fails to meet the clearance requirements, re-clean the entire Work Area by using wet methods and providing a HEPA filtered exhaust system during the re-cleaning process.

4.1 DISPOSAL PLAN

4.1.1 Containment of Asbestos-Containing Waste Material: Prior to abatement, check with the landfill to be used for disposal about specific containerization and disposal requirements at that site, and be responsible for meeting these requirements. Redstone Arsenal has a landfill that will be used.

4.1.2 Storage Requirements: Provide a securely locked, covered dumpster, or secured area for storage of the Asbestos-Containing Waste Material. This secured dumpster or area must be approved by the Government.

4.1.2.1 Bagged Asbestos-Containing Material: If bagged Asbestos-Containing Waste Material is to be stored, provide and use polyethylene lined dumpsters for this purpose. Do not store un-bagged asbestos waste or non-asbestos waste in these dumpsters. Also, ensure that the bags in the dumpsters are not damaged. Post warning signs on the dumpsters as specified in OSHA requirement 29 CFR 1926.1101(k)(1).

4.1.3 Transportation of Asbestos-Containing Waste Material: (for asbestos waste hauler)

4.1.3.1 Preparation of the Cargo: Prepare the Asbestos-Containing Material for transportation, as required by Department of Transportation (DOT) and EPA regulations (including Federal NESHAPS-Part 61 Subparts A and M and Revised Subpart B).

4.1.3.2 Handling and Loading Requirements

4.1.3.2.1 Procedure for hauling shall comply with 40 CFR 61, Subpart M, 40 CFR 241 and 257, and state regional, and local standards.

4.1.3.2.2 Clean the enclosed cargo area of the truck of debris and line the cargo area with one layer of 6 mil polyethylene sheeting to prevent contamination from damaged or leaking containers. First, floor sheeting shall be installed to extend up the sidewalls a minimum of two feet. Then, wall sheeting shall be overlapped and taped into place.

4.1.3.2.3 Place the cargo on level surfaces in the cargo area of the truck and pack tightly together to prevent shifting and tipping. Do not throw the cargo into the truck cargo area.

4.1.3.2.4 Any debris or residue observed on containers or surfaces outside of the Work Area shall be removed using HEPA filtered vacuum equipment and/or wet methods, as appropriate.

4.1.3.3 Shipping Papers (Manifest): Ark Builders, Inc. and the appropriate government representative shall sign and date manifests for each truck load of Asbestos-Containing Waste Material prior to leaving Fort Rucker. The manifest shall use chain-of-custody form, which will include, the landfill operator and the waste hauler, and information on the type and number of asbestos waste containers.

4.1.3.4 Transportation Requirements: Transport Asbestos-Containing Waste Material from the abatement site directly to the specified disposal site.

130 REGULATED ASBESTOS MATERIAL WASTE SHIPMENT RECORD

Asbestos Abatement and
Spill Management

GENERATOR SECTION

1. Facility Name: Building 4666
Address: Dec 1st Road
City: Huntsville State: AL Zip Code: 35898
Telephone: ()

Owner's Name: Marshall Space Flight
Address: 4522 Marshall Road
City: Huntsville State: AL Zip Code: ()
Telephone: ()

2. Operator's Name: Tri-State Management
Address: 15237 Houston Loop Road
City: Birmingham State: AL Zip Code: 35244 Telephone: (256) 321-5506

3. Waste Disposal Site (WADS) Name: Redstone Arsenal Landfill "On-site" disposal Yes ☒
Physical Location: Redstone Arsenal
Address: Huntsville State: AL Zip Code: 35898
City: Huntsville State: AL Zip Code: ()
Telephone: ()

4. Responsible Agency: (Local, District, State, or EPA Office where notification was sent)
Name: HOE M
Address: 1400 Coliseum Blvd
City: Mobile State: AL Zip Code: 36688

5. Description of Materials: Flux Tile & Mastic

6. Containers	7. Total Quantity (Cu. Y)
Number	Type
<u>800</u>	<u>BA Bags</u>
	<u>20</u>

8. Special Handling Instructions and Additional Information:
Do Not Tear Bags

Emergency Response Phone Number: (205) 454-7822

9. Generator's Certification: I hereby declare that the contents of this consignment are fully and accurately described above by proper shipping name and are properly packed, marked and labeled, and are in all respects in proper condition for transport by highway according to applicable international and government regulations.

Signature: [Signature] Date: 1-6-2014 Type/Print Name and Title: Sam Johnson Supervisor

TRANSPORTER SECTION (Acknowledgment of receipt of materials)

10. Transporter One	11. Transporter Two
Name	Name
Address	Address
City	City
State	State
Zip Code	Zip Code
Telephone: ()	Telephone: ()
Signature	Signature
Date	Date
Type/Print Name and Title	Type/Print Name and Title

DISPOSAL SITE SECTION

12. Discrepancy indication space

13. Waste disposal site owner or operator: Certification of receipt of asbestos materials covered by this manifest except as noted in item 12.

Date

Type/Print Name and Title



REGULATED ASBESTOS MATERIAL WASTE SHIPMENT RECORD

GENERATOR SECTION

1. Facility Name: <u>NASA Bldg 4666 MSFC</u>		Owner's Name: <u>NASA Marshall Space</u>	
Address: <u>4666 Dade Rd</u>		Address:	
City: <u>Huntsville</u>	State: <u>AL</u> Zip Code: <u>35894</u>	City: <u>Huntsville</u>	State: <u>AL</u> Zip Code: <u>35894</u>
Telephone: ()		Telephone: ()	
2. Operator's Name: <u>Tri-State Asbestment</u>			
Address: <u>15371 Houston Loop Road</u>			
City: <u>Brookwood</u>	State: <u>AL</u> Zip Code: <u>35494</u>	Telephone: <u>(205) 331-576</u>	
3. Waste Disposal Site (WADS) Name: <u>Redstone Arsenal Services Co.</u> On-site disposal Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>			
Physical Location:		Mailing Address:	
Address: <u>Bldg 5649 Mills Rd</u>		Address:	
City: <u>Huntsville</u>	State: <u>AL</u> Zip Code: <u>35894</u>	City: <u>Redstone</u>	State: <u>AL</u> Zip Code: <u>35894</u>
Telephone: <u>(256) 876-4199</u>		Telephone: ()	
4. Responsible Agency: (Local, District, State, or EPA Office where notification was sent)			
Name: <u>ADEM</u>			
Address: <u>1400 Coliseum Boulevard</u>		City: <u>Montgomery</u>	State: <u>AL</u> Zip Code: <u>36110</u>
5. Description of Materials:		6. Containers:	
<u>Floor Tile</u>		Number: <u>1500</u> Type: <u>Bag</u>	
		<u>6 in 1</u>	
		Total Quantity (Cu. Yds.) <u>30 yd</u>	

Special Handling Instructions and Additional Information:

Do Not Tear Bags

Emergency Response Phone Number:

8. Generator's Certification: I hereby declare that the contents of this consignment are fully and accurately described above by proper shipping name and are classified, packed, marked and labeled, and are in all respects in proper condition for transport by highway according to applicable international and government regulations.

Signature

Date

Type/Print Name and Title

TRANSPORTER SECTION (Acknowledgment of receipt of materials)

10. Transporter One		11. Transporter Two	
Name:		Name:	
Address:		Address:	
City:	State: Zip Code:	City:	State: Zip Code:
Telephone: ()		Telephone: ()	
Signature		Signature	
Date		Date	
Type/Print Name and Title		Type/Print Name and Title	

DISPOSAL SITE SECTION

12. Discrepancy Indication space

13. Waste disposal site owner or operator: Certification of receipt of asbestos materials covered by this manifest except as noted in Item 12.

Signature

Date

Type/Print Name and Title



REGULATED ASBESTOS MATERIAL WASTE SHIPMENT RECORD

GENERATOR SECTION

1. Facility Name: <u>Building 4666</u>		Owner's Name: <u>US Army Garrison</u>	
Address: <u>Dodd Rd</u>		Address: <u>4488 Martin Road</u>	
City: <u>Huntsville</u>	State: <u>AL</u> Zip Code: <u>35898</u>	City: <u>Huntsville</u>	State: <u>AL</u> Zip Code: <u>35898</u>
Telephone: ()		Telephone: ()	
2. Operator's Name: <u>Tri-State Abatement</u>			
Address: <u>15237 Highway Loop Rd</u>			
City: <u>Brookwood</u>	State: <u>AL</u> Zip Code: <u>35111</u>	Telephone: <u>(205) 331-5506</u>	
3. Waste Disposal Site (WADS) Name: <u>Redstone Arsenal Landfill</u>		"On-site" disposal Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	
Physical Location:		Mailing Address:	
Address: <u>Redstone Arsenal</u>		Address:	
City: <u>Huntsville</u>	State: <u>AL</u> Zip Code: <u>35898</u>	City:	State: Zip Code:
Telephone: ()		Telephone: ()	
4. Responsible Agency: (Local, District, State, or EPA Office where notification was sent)			
Name: <u>ADAM</u>			
Address: <u>1400 Coliseum Blvd</u>		City: <u>Montgomery</u>	State: <u>AL</u> Zip Code: <u>36110</u>
5. Description of Materials:		6. Containers:	7. Total Quantity (Cu. Yds.)
Floor Tiles & Mastic		Number: <u>1200</u> Type: <u>BA Bags</u>	<u>30</u>
Special Handling Instructions and Additional Information: <u>Do Not Tear Bags</u>			
Emergency Response Phone Number: <u>(205) 434-7832</u>			
9. Generator's Certification: I hereby declare that the contents of this consignment are fully and accurately described above by proper shipping name and are classified, packed, marked and labeled, and are in all respects in proper condition for transport by highway according to applicable international and government regulations.			
Signature: <u>[Signature]</u>		Date: <u>1-6-2014</u>	Type/Print Name and Title: <u>Sean Johnson Supervisor</u>

TRANSPORTER SECTION (Acknowledgment of receipt of materials)

10. Transporter One		11. Transporter Two	
Name:		Name:	
Address:		Address:	
City:	State: Zip Code:	City:	State: Zip Code:
Telephone: ()		Telephone: ()	
Signature:		Signature:	
Date:		Date:	
Type/Print Name and Title:		Type/Print Name and Title:	

DISPOSAL SITE SECTION

12. Discrepancy Indication space	
13. Waste disposal site owner or operator: Certification of receipt of asbestos materials covered by this manifest except as noted in item 12.	
Signature: <u>[Signature]</u>	Date: <u>1-6-14</u> Type/Print Name and Title: <u>Tracey Clark</u>



REGULATED ASBESTOS MATERIAL WASTE SHIPMENT RECORD

GENERATOR SECTION

1. Facility Name: <u>Bushnell 41401</u>		Owner's Name: <u>Marshall Space Flight Center</u>	
Address: <u>Dalh Road</u>		Address: <u>4488 Marshall Road</u>	
City: <u>Huntsville</u>	State: <u>AL</u> Zip Code: <u>35898</u>	City: <u>Huntsville</u>	State: <u>AL</u> Zip Code: <u>35898</u>
Telephone: <u>() NA</u>		Telephone: <u>()</u>	
2. Operator's Name: <u>Tri-State Abatement</u>			
Address: <u>15237 Houston Loop Road</u>			
City: <u>Brookwood</u>	State: <u>AL</u> Zip Code: <u>35445</u>	Telephone: <u>(205) 331-5506</u>	
3. Waste Disposal Site (WADS) Name: <u>Redstone Arsenal Landfill</u>		"On-site" disposal Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	
Physical Location:		Mailing Address:	
Address: <u>Redstone Arsenal</u>		Address: _____	
City: <u>Huntsville</u>	State: <u>AL</u> Zip Code: <u>35898</u>	City: _____	State: _____ Zip Code: _____
Telephone: <u>()</u>		Telephone: <u>()</u>	
4. Responsible Agency: (Local, District, State, or EPA Office where notification was sent)			
Name: <u>ADEN</u>			
Address: <u>1460 Coliseum Blvd</u>		City: <u>Montgomery</u>	State: <u>AL</u> Zip Code: <u>36102</u>
5. Description of Materials:		6. Containers:	
<u>Flame retardant material</u>		Number: <u>8</u> Type: <u>BA</u>	
		Type: <u>Drum</u>	
		7. Total Quantity (Cu. Yds.): _____	
Special Handling Instructions and Additional Information: <u>Do Not Touch Bags</u>			
Emergency Response Phone Number: <u>205-454-7882</u>			
8. Generator's Certification: I hereby declare that the contents of this consignment are fully and accurately described above by proper shipping name and are classified, packed, marked and labeled, and are in all respects in proper condition for transport by highway according to applicable international and government regulations.			
Signature: <u>[Signature]</u>		Date: <u>1-23-2014</u> Type/Print Name and Title: <u>Calvin R. Smith, Sr. Advisor</u>	

TRANSPORTER SECTION (Acknowledgment of receipt of materials)

10. Transporter One		11. Transporter Two	
Name: _____		Name: _____	
Address: _____		Address: _____	
City: _____	State: _____ Zip Code: _____	City: _____	State: _____ Zip Code: _____
Telephone: <u>()</u>		Telephone: <u>()</u>	
Signature _____ Date _____		Signature _____ Date _____	
Type/Print Name and Title: _____		Type/Print Name and Title: _____	

DISPOSAL SITE SECTION

12. Discrepancy indication space	
13. Waste disposal site owner or operator: Certification of receipt of asbestos materials covered by this manifest except as noted in item 12.	
Signature: <u>[Signature]</u>	Date: <u>1-24-14</u> Type/Print Name and Title: <u>Tracy Clark</u>

Appendix C

Ecological Resources Report

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Memorandum

Subject Ecological Resources Report

Project Name Environmental Baseline Survey for Building 4666 Area,
Marshall Space Flight Center (MSFC),
Huntsville, Alabama, EPA I.D. # AL 1800013863

Attention National Aeronautics and Space Administration (NASA)

From Jacobs Engineering Group (Jacobs)

Date January 5, 2022

This technical memorandum (TM) presents the results of an ecological resources survey conducted on November 10, 2022. The TM intends to support the leasing of subject property, which covers the south wing of Building 4666, a parking lot west of the Building 4666 south wing, and Phase 2 Parcels A through E (Figure 1) for mixed commercial and industrial use. Building 4666 is located northwest of the intersection of Dodd Road and Saturn Road and was constructed by NASA in 1961 as the Test Division Engineering Building. The building has functioned as an office building from 1980 to the present.

1. Project Description

An ecological survey to identify the presence of potential protected species habitat within the property subject to the Building 4666 Area environmental baseline survey was conducted by qualified personnel on November 10, 2022. The results of these ecological resources are summarized in this ecological resource TM. In addition, major drainages noted during the survey were evaluated to assess whether disturbance of the drainage during future land development might be restricted or require permitting.

2. Ecological Resource Considerations

For the purposes of this report, ecological resources include habitats that may be used by protected species that are subject to federal, state, or local jurisdiction.

2.1 Protected Species

The Endangered Species Act (ESA) was enacted to protect critically imperiled species from extinction as a consequence of growth and development, with the purposes of preventing extinction and recovering species to the point where the law's protections are no longer needed. Administration of the ESA is under the guidance of U.S. Fish and Wildlife Service (USFWS) and the National Marine Fisheries Service (NMFS). USFWS is responsible for terrestrial, freshwater, and catadromous species, whereas NMFS is responsible for marine and anadromous species. Federally endangered and threatened species administration and consultation in Alabama is carried out through the Alabama Ecological Services Field Office in Daphne, Alabama.

2.2 Aquatic Resources

Aquatic resources include streams, wetlands, and open-water features (e.g., lakes, ponds, and reservoirs) regulated by federal, state, and local agencies. The U.S. Army Corps of Engineers (USACE) regulates jurisdictional waters of the United States (WoUS) under Section 404 of the Clean Water Act (CWA). The current ruling (posted April 21, 2020) defines WoUS to include the following for categories:

Ecological Resources Report

- The territorial seas and traditional navigable waters
- Tributaries of such waters
- Certain lakes, ponds, and impoundments of jurisdictional waters
- Wetlands adjacent to other jurisdictional waters (other than waters that are themselves wetlands)

USACE (December 28, 2022) and U.S. Environmental Protection Agency (EPA) (December 29, 2022) signed a final rule Revised Definition of "Waters of the United States" that will take effect 60 days after it is published in the *Federal Register*. EPA has issued a pre-publication copy of the final rule, but the date of publication in the *Federal Register* is not known. Once effective, this final rule will define WoUS as follows:

- Traditional navigable waters, the territorial seas, and interstate waters ("paragraph (a)(1) waters")
- Impoundments of "waters of the United States" ("paragraph (a)(2) impoundments")
- Tributaries to traditional navigable waters, the territorial seas, interstate waters, or paragraph (a)(2) impoundments when the tributaries meet either the relatively permanent standard or the significant nexus standard ("jurisdictional tributaries")
- Wetlands adjacent to paragraph (a)(1) waters, wetlands adjacent to and with a continuous surface connection to relatively permanent paragraph (a)(2) impoundments, wetlands adjacent to tributaries that meet the relatively permanent standard, and wetlands adjacent to paragraph (a)(2) impoundments or jurisdictional tributaries when the wetlands meet the significant nexus standard ("jurisdictional adjacent wetlands")
- Intrastate lakes and ponds, streams, or wetlands not identified in paragraphs (a)(1) through (4) that meet either the relatively permanent standard or the significant nexus standard ("paragraph (a)(5) waters")

The new definition is unlikely to affect the USACE interpretation of the jurisdictional status of features identified on the parcel.

In addition, drainage features could be considered jurisdictional if they contain a defined bed and bank and ordinary high water mark (OHWM), or if it flows to and connects with historical drainage features. An OHWM is a line on the shore established by fluctuations of water and indicated by physical characteristics such as a clear, natural line impressed on the bank, shelving, changes in soil character, destruction of terrestrial vegetation, the presence of litter or debris, or other appropriate means that consider the characteristics of the surrounding areas.

3. Ecological Resource Survey Methodology

The protected species survey was conducted wholly by observations; no species-specific or habitat-specific protocol surveys were completed as part of the effort. The entire area within the survey boundary was walked to determine dominant vegetation species, overall habitat structure, and for significant observations such as obvious nests, dens, and suitable wildlife habitat. Particular attention was given to areas that might provide suitable habitat for the listed species. Site visits were conducted by a qualified ecologist (Bo Hanan/Jacobs) on November 10, 2022.

4. Ecological Resource Survey Results

4.1 Protected Species and Potential Habitat

Habitats within Phase 2, Parcels A through D, were generally similar, with a few differences: Trees tended to be more mature and pine-dominant in Phase 2, Parcels A and B. Forested areas throughout these four parcels consist of mixed pine-hardwood forest with a relatively sparse and brushy understory. Tree species include loblolly pine (*Pinus taeda*), tulip tree (*Liriodendron tulipifera*), water oak (*Quercus nigra*), willow oak (*Quercus phellos*), red oak (*Quercus rubra*), sweetgum (*Liquidambar styraciflua*), sugarberry (*Celtis laevigata*), box elder (*Acer negundo*), winged elm (*Ulmus alata*), black cherry (*Prunus serotina*), and eastern red cedar (*Juniperus virginiana*). Understory plants include yaupon holly (*Ilex vomitoria*), brambles (*Rubus spp.*), common greenbrier (*Smilax rotundifolia*), smooth sumac (*Rhus glabra*), devil's walking stick (*Aralia spinosa*), Chinese privet (*Ligustrum sinense*), and various saplings. A transmission right-of-way runs through Phase 2, Parcel A, providing open, brushy habitat otherwise not found in Phase 2, Parcels B, C, or D. Phase 2, Parcel E consists of a large, mowed lawn with a narrow strip of forest on the eastern boundary adjacent to Phase 2, Parcels C and D. The parking area and south wing consisted of paved and developed areas devoid of suitable habitat for listed species.

Suitable habitat for multiple listed species was observed in Phase 2 Parcels A through E (refer to Table 1). Bachman's sparrow (*Peucaea aestivalis*) and golden-winged warbler (*Vermivora chrysoptera*) may use various habitats within Phase 2, Parcels A, B, C, and D, including brushy understory areas, open rights-of-way, and interior glades with ample herbaceous and shrub coverage. Unmowed brushy areas within and adjacent to Phase 2, Parcels A, B, C, D, and E may provide suitable feeding habitat during spring and fall migrations for monarch butterflies as well as suitable breeding habitat if milkweed species are present. It should be noted that although species-specific surveys were not performed, monarch butterflies were the only listed species visually observed during ecological resource surveys on November 10, 2022.

Nineteen listed and sensitive species (Table 1) were identified with potential to occur within the selected subject property. Seven species were determined to potentially be affected by development of the proposed parcels, including the gray bat (*Myotis grisescens*), Indiana bat (*Myotis sodalis*), northern long-eared bat (*Myotis septentrionalis*), tricolored bat (*Perimyotis subflavus*), Bachman's sparrow (*Peucaea aestivalis*), golden-winged warbler (*Vermivora chrysoptera*), and monarch butterfly (*Danaus plexippus*). Another seven species, including the bald eagle (*Haliaeetus leucocephalus*), peregrine falcon (*Falco peregrinus*), whooping crane (*Grus americana*), American ginseng (*Panax quinquefolius*), dwarf trillium (*Trillium pusillum* var. *alabamicum*), Harper's umbrella plant (*Eriogonum longifolium* var. *harperi*), and Price's potato bean (*Apios priceana*), are unlikely to be affected by the proposed activities. A determination of no effect is proposed for the Tuscumbia darter (*Etheostoma tuscumbia*), American alligator (*Alligator mississippiensis*), green salamander (*Aneides aeneus*), Alabama cave shrimp (*Palaemonias alabamiae*), and engraved elimia (*Elimia perstriata*).

Table 1. Listed and Sensitive Species with the Potential to Occur within Selected Parcels

NASA MSFC Environmental Baseline Survey for Building 4666 Area Ecological Resources Report

Common Name	Scientific Name	Federal Status	State Status	Habitat	Potential Occurrence
Mammals					
Gray Bat	<i>Myotis grisescens</i>	E	P	Obligate cave-dweller, both for hibernating and summer roosting. Does not use abandoned structures similar to other bats. Forages over water and in surrounding riparian habitats.	Phase 2 Parcels A–D

Ecological Resources Report

Table 1. Listed and Sensitive Species with the Potential to Occur within Selected Parcels

NASA MSFC Environmental Baseline Survey for Building 4666 Area Ecological Resources Report

Common Name	Scientific Name	Federal Status	State Status	Habitat	Potential Occurrence
Indiana Bat	<i>Myotis sodalis</i>	E	P	Hibernates predominantly in limestone caves. Summer roosts include under the bark of large trees, and summer habitats consist of wooded or semi-wooded areas, often along streams. Foraging habitats include riparian zones, upland forests, ponds, and fields.	Phase 2 Parcels A–D
Northern Long-eared Bat	<i>Myotis septentrionalis</i>	T	P	Generally associated with old-growth forest, relying on intact interior forest with low edge-to-interior ratios. Forages within forests, along forest edges, over clearings, and occasionally over water. Hibernation primarily in caves and other suitable structures.	Phase 2 Parcels A–D
Tricolored Bat	<i>Perimyotis subflavus</i>	UR	--	Associated with forested landscapes (including perimeters) where they forage near trees and along waterways. Roosts might include mature stands or buffer zones near perennial streams, including dead or live tree foliage, tree cavities, caves, mines, rock crevices, and human-made structures. Sometimes roosts in open sites not tolerated by other bat species. Hibernation sites are often caves, mines, or cavelike tunnels, also box culverts under highways and dams.	Phase 2 Parcels A–D
Birds					
Bachman's Sparrow	<i>Puecae aestivalis</i>	--	P	Dense, layered ground vegetation and open mid-stories with scattered shrubs and saplings, including young clearcuts, grassy areas, oak-scrub, and powerline cuts.	Phase 2 Parcels A–D
Bald Eagle	<i>Haliaeetus leucocephalus</i>	--	--	Widespread distribution in North America. Breeding habitat commonly includes areas close to waterbodies, and nests are usually in tall trees or on pinnacles or cliffs near water. Tree species used for nesting vary regionally and might include pine, spruce, fir, cottonwood, poplar, willow, sycamore, oak, beech, or others. May associate with waterfowl concentrations or congregate in areas with abundant dead fish in winter. Wintering areas are commonly associated with open water, and wintering eagles tend to avoid areas with high levels of nearby human activity and development.	Unlikely to Affect

Table 1. Listed and Sensitive Species with the Potential to Occur within Selected Parcels

NASA MSFC Environmental Baseline Survey for Building 4666 Area Ecological Resources Report

Common Name	Scientific Name	Federal Status	State Status	Habitat	Potential Occurrence
Golden-winged Warbler	<i>Vermivora chrysoptera</i>	UR	--	Uses a wide variety of plant communities but prefers habitat with low to moderate canopy cover and a high density of shrub and herbaceous cover. Breeding habitat includes deciduous woodlands, usually in dry uplands or areas of thick undergrowth in swampy areas, woodland edges, overgrown pastures, right-of-ways, and recently logged sites. Migration and winter habitats include open woodlands, pine-oak, and scrub, often in foothill regions.	Phase 2 Parcels A–D
Peregrine Falcon	<i>Falco peregrinus</i>	--	P	Wide variety of habitats, including mountains, open forested regions, and human population centers. When not breeding, tends to occur in areas where prey concentrate, including farmlands, marshes, lakeshores, river mouths, tidal flats, dunes and beaches, broad river valleys, cities, and airports. Ideal nesting locations include undisturbed areas with a wide view, near water, and close to plentiful prey. Substitute man-made sites include tall buildings, bridges, rock quarries, and raised platforms.	Unlikely to Affect
Whooping Crane	<i>Grus americana</i>	T (XN)	P	Nesting occurs in dense emergent vegetation in shallow ponds, freshwater marshes, wet prairies, or along lake margins. Habitat during migration and winter includes marshes, shallow lakes, lagoons, salt flats, grain and stubble fields, and barrier islands.	Unlikely to Affect
Fish					
Tuscumbia Darter	<i>Etheostoma tuscumbia</i>	UR	P	Vegetated spring pools and runs with slow current, usually associated with watercress (<i>Nasturtium officinale</i>) or other aquatic plants or algae over clean substrates of fine gravel, sand, and silt. Water is generally clear in high-quality habitats and between 15°C–17°C.	No Effect
Reptiles and Amphibians					
American Alligator	<i>Alligator mississippiensis</i>	T (S/A)	--	Fresh and brackish marshes, ponds, lakes, rivers, swamps, bayous, canals, and large spring runs. Often basks on partially submerged logs or on land next to water. Digs dens in river or lake margins or in marshes, spending cold winter and drought periods within den.	No Effect

Ecological Resources Report

Table 1. Listed and Sensitive Species with the Potential to Occur within Selected Parcels

NASA MSFC Environmental Baseline Survey for Building 4666 Area Ecological Resources Report

Common Name	Scientific Name	Federal Status	State Status	Habitat	Potential Occurrence
Green Salamander	<i>Aneides aeneus</i>	UR	P	Damp (but not wet) crevices in shaded rock outcrops and ledges, beneath loose bark, and in cracks of standing or fallen trees.	No Effect
Crustaceans					
Alabama Cave Shrimp	<i>Palaemonias alabamiae</i>	E	P	Subterranean aquatic pools with fine silt bottoms. Known only from two caves in Madison County, Alabama.	No Effect
Molluscs					
Engraved Elimia	<i>Elimia perstriata</i>	UR	--	Sand, gravel, or cobble substrate in springs and small streams; little tolerance for silty conditions. Known from Indian Creek.	No Effect
Insects					
Monarch Butterfly	<i>Danaus plexippus</i>	UR	--	Habitat is highly variable, and a wide variety of flowering plants are used throughout migration and breeding, including Coreopsis, Viburnum, Phlox, Solidago, Symphyotrichum, Eurybia, Liatris, and Echinacea. Egg laying and larval feeding occurs only on milkweed (Asclepias).	Phase 2 Parcels A–E
Plants					
American Ginseng	<i>Panax quinquefolius</i>	--	R	Cool, moist deciduous woods with deep, rich, well-drained soils and ample calcium and organic matter. Often occurs on north or east facing hills. Prefers full shade environments underneath hardwood tree species.	Unlikely to Affect
Dwarf Trillium	<i>Trillium pusillum</i> var. <i>alabamicum</i>	--	--	Alluvial woods, savannah/non-riverine swamp forest ecotones, savannahs, upland woods, mixed mesophytic hardwood forests, rocky soils of open fields, low moist woods, bogs, and streambanks, damp woods, wooded swamps, and thickets in well-drained soils. Typically grows on acidic soils.	Unlikely to Affect
Harper's Umbrella Plant	<i>Eriogonum longifolium</i> var. <i>harperi</i>	--	--	Sand to gravelly, often calcareous flats, bluffs, outcrops, and slopes, oak and conifer woodlands, and limestone glades and exposed edges of limestone bluffs with nutrient-poor shale soils. Typically found between 100- to 300-meter elevations.	Unlikely to Affect

Table 1. Listed and Sensitive Species with the Potential to Occur within Selected Parcels

NASA MSFC Environmental Baseline Survey for Building 4666 Area Ecological Resources Report

Common Name	Scientific Name	Federal Status	State Status	Habitat	Potential Occurrence
Price's Potato Bean	<i>Apios priceana</i>	T	--	Open, rocky, wooded slopes and floodplain edges. Sites are usually under mixed hardwoods in associated forest clearings, often where bluffs or ravine slopes meet creek or river bottoms. Soils are often well-drained and loamy, formed on alluvium or over calcareous boulders. Inhabits open, mixed-oak forests, forest edges, and clearings on river bottoms or ravines; unable to tolerate deep shade.	Unlikely to Affect

Notes:

Northern long-eared bat is currently in the process of being uplisted to endangered status.

°C = degree(s) Celsius

E = endangered

P = protected

R = regulated by permit

S/A = similarity of appearance

T = threatened

UR = under review

XN = species listed as experimental and nonessential (The experimental nonessential population of the endangered whooping crane is treated as a threatened species based on its occurrence on public land [Wheeler National Wildlife Refuge].)

It should be noted that although the Tuscumbia darter and engraved elimia are listed as having no effect from the proposed activity, and no suitable habitat was observed within the selected parcels, both species are known to be present in Indian Creek within MSFC. Improperly contained sediment from proposed clearing and development activities could potentially runoff and harm these species if it reaches the Indian Creek system.

Forested areas within Phase 2, Parcels A, B, C, and D may provide summer refugia for the listed bat species that might be impacted by development of the subject property, and tree removal activities should occur during the winter season (November 1 to March 31). It is also recommended that consultation with the local USFWS office be conducted before cutting trees in these parcels because of the presence of habitat suitable for endangered bat species.

As a candidate species, monarch butterfly is not yet listed or proposed to be listed; therefore consultation with USFWS is not required. However, USFWS recommends taking advantage of any opportunity to conserve the species, and, if unmowed, brushy areas within the parcels of occurrence can be maintained, it would benefit the species to do so.

Neither Bachman's sparrow nor the golden-winged warbler are currently listed; therefore, USFWS consultation regarding these two species is not required. Golden-winged warblers are migratory species and might use the area for stopover habitat on their way to breeding grounds further north. Therefore, tree and brush clearing activities should be completed outside of the Bachman's sparrow's breeding season (February through September). Additionally, native bird species and their nests are protected under the Federal Migratory Bird Treaty Act, which prohibits the taking (including killing, capturing, selling, trading, and transport) of protected migratory bird species without prior authorization by USFWS. Under this act, it

Ecological Resources Report

is illegal to destroy a nest that has eggs or chicks in it or if there are young birds that are still dependent on the nest for survival. As such, nesting bird surveys should be conducted before any tree or brush clearing activities take place. If active nests are observed, stop-work orders should be put in place and the area around the nest cordoned off until the birds are fully fledged and nest sites are no longer active.

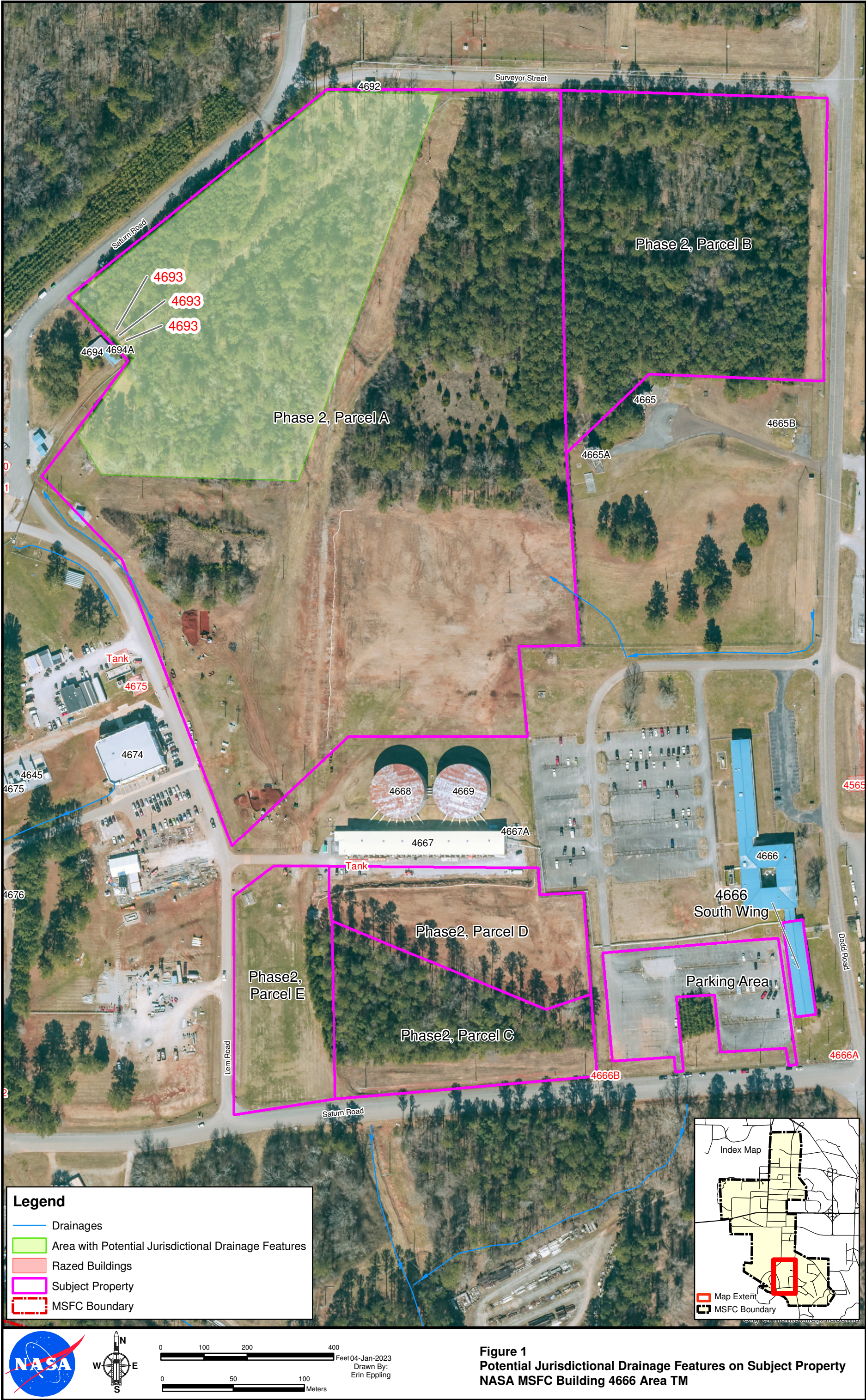
4.2 Aquatic Resources

While specific aquatic resource surveys were not conducted during the November 10, 2022, baseline survey, a preliminary evaluation of drainage features identified within the surveyed parcels was conducted to assess whether the drainages might be considered wetland drainages or other jurisdictional waters. Based on the presence of wetlands in the vicinity, the site visit, and a follow-up phone call with Mr. David Medina of the USACE field office in Decatur, Alabama on December 22, 2022, any drainage features within the area shown on Figure 1 are likely to be considered jurisdictional. Any proposed activities within jurisdictional waters and a 25-foot buffer zone around the jurisdictional features would require the appropriate permitting from the USACE Nashville District. Section 401 of the CWA also requires that certain types of activities in jurisdictional waters obtain a State Water Quality Certification through Alabama Department of Environmental Management.

The jurisdictional status of any aquatic feature within the selected parcels should be considered preliminary until final concurrence with the USACE Nashville District is obtained.

Figure

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Appendix D

Site Inspection Photo Log

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Photo 1 – Building 4666 Parking Area (facing northeast)



Photo 2 – Building 4666 Parking Area (facing northwest)



Photo 3 – Building 4666 Parking Area (facing southeast)



Photo 4 – Building 4666 South Wing (facing south-southwest)



Photo 5 – Building 4666 South Wing (facing southwest)



Photo 6 – Parcel A (facing north)



Photo 7 – Parcel A (facing northeast)



Photo 8 – Parcel A (facing northwest)



Photo 9 – Parcel B (facing north)



Photo 10 – Parcel C (facing north)



Photo 11 – Parcel C (facing northwest)



Photo 12 – Parcel D (facing southeast)



Photo 13 – Parcel E (facing north)



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Appendix E
Future Impacts/Information
(Forthcoming)

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