UNITED STATES

ENVIRONMENTAL PROTECTION AGENCY

REGION III

STATEMENT OF BASIS

ORBITAL ATK
ELKTON, MARYLAND

EPA ID NO. MDD 003067121

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I. Introduction

The United States Environmental Protection Agency (EPA) has prepared this Statement of Basis (SB) to solicit public comment on its proposed remedy for the facility owned and operated by ATK Orbital Inc. (ATK) and located in Elkton, Maryland (Facility). EPA's proposed remedy for the Facility includes soil consolidation and capping, engineering controls consisting of fencing and controlled access, land use controls limiting groundwater use and managing soil exposure, and a monitoring program for groundwater and pore water.

The Facility is subject to EPA's Corrective Action Program under the Solid Waste Disposal Act, as amended, commonly referred to as the Resource Conservation and Recovery Act (RCRA), 42 U.S.C. Section 6901, et seq. The Corrective Action Program requires that owners/operators of facilities subject to certain provisions of RCRA investigate and address releases of hazardous waste and hazardous constituents, usually in the form of soil or groundwater contamination, that have occurred at or from their properties. Maryland is not authorized for the Corrective Action Program under Section 3006 of RCRA; therefore, EPA retains primary authority in the State of Maryland for the Corrective Action Program.

Concurrently with this SB, EPA is soliciting comments on a draft Corrective Action Permit (Permit). Pursuant to 40 C.F.R. § 124.7, EPA has prepared this SB to describe the background and basis for the draft Permit and the reasons supporting the proposed remedy. The draft Permit incorporates the remedies proposed in this SB. The components of EPA's proposed final remedy as described in this SB are contained in the Permit, and will be enforceable thereunder once the Permit is finalized and EPA issues a Final Decision and Response to Comments (FDRTC) in which EPA describes the final remedy that is selected for the Facility.

EPA is providing a forty-five (45) day public comment period on this SB and Permit. EPA may modify its proposed remedy based on comments received during this period. EPA will announce its selection of a final remedy for the Facility in a FDRTC after the public comment period has ended.

EPA will make a final decision on the draft Permit after considering any information submitted during the public comment period. If no comments are received during the public comment period on the draft Permit, the final Permit will be signed and will become effective upon signature. Otherwise, the final Permit will become effective thirty (30) days after the service of notice of the final decision or upon conclusion of any appeals filed. The FDRTC will be incorporated into the final Corrective Action Permit and made a part thereof.

Information on the Corrective Action Program as well as a fact sheet for the Facility can be found by navigating https://www.epa.gov/hwcorrectiveactionsites.

II. Facility Background

A. Site History

The Facility is located at 55 Thiokol Road approximately 1.5 miles west of Elkton, Maryland, on approximately 550 acres. The Facility is bounded on the south by U.S. Route 40, commercial properties, and residential areas; on the east by Little Elk Creek and Triumph Industrial Park; and on the north and west by agricultural areas. Industrial and commercial properties, including Triumph Industrial Park, Crouse Brothers, and a Young Men's Christian

Association (YMCA) facility, are located to the east. Agricultural areas, which are undergoing environmental cleanup and potential redevelopment, are located to the north and west.

Current land use includes active and inactive manufacturing operations, office space, warehousing, paved parking and service roads, rail lines, and undeveloped land serving as a buffer for the Facility. The Geigy Chemical Company (Geigy) owned and operated the Facility from 1947 to 1955 before selling to Olin Mathieson Chemical Corporation (Olin) in 1955. Geigy and Olin formulated pesticides (chiefly DDT) during their years of occupancy. The Facility was sold to Thiokol Corporation (Thiokol) in 1958. In 2001 Alliant Techsystems Inc. acquired Thiokol and in 2015 merged with Orbital Sciences Corporation to become Orbital ATK Inc. (ATK). ATK is the current owner and operator of the Facility.

Since the 1930s, the Facility has been primarily used for industrial purposes such as fireworks manufacturing, munitions production, pesticide production, research, and production of solid propellant rockets. In 1984, after discovery of contamination in two of its onsite groundwater production wells (W-1 and W-7), ATK conducted several investigations to identify the potential sources and to characterize the extent of trichloroethene (TCE), perchlorate, and other volatile organic compounds (VOCs) in groundwater. As part of the 1984 Hazardous and Solid Waste Amendments (HSWA) of RCRA, the EPA conducted a RCRA Facilities Assessment in 1986 that identified various Solid Waste Management Units (SWMU) at the Facility. In 1989, EPA issued Thiokol a RCRA Corrective Action Permit (effective October 8, 1989) under which Thiokol, now ATK, is required to address environmental conditions resulting from SWMU releases across the Facility. The SWMUs of concern are as follows:

- TCE Area SWMU;
- Abandoned Propellant Open Burn Area SWMU (A-Area SWMU);
- Buried Beryllium Waste SWMU (Beryllium SWMU);
- Solvent Recovery Still Bottoms Disposal Area SWMU (Still Bottoms SWMU);
- Closed Incinerator Feed Surface Impoundment SWMU (C-Area SWMU);
- Sand Pit Disposal Area SWMU (Sand Pit SWMU); and
- Pesticide Area SWMU.

B. Site Geology and Hydrogeology

Borings on and near the Facility reveal geology that is typical of a setting that is at or just east of the Fall Line (e.g. the line along which Coastal Plain sediments meet and overlie bedrock). The underlying bedrock at this location is a micaceous, feldspar gneiss. The bedrock surface is smoothly undulating with a general southeasterly dip. Irregularities in the bedrock surface are probably a result of differential weathering, as evidenced by the varying thickness of the overlying saprolite (weathered bedrock) encountered in well borings. The thickness of saprolite ranges from 5 to 64 ft. The saprolite is micaceous, silty, and friable, becoming more cohesive and resistant to drilling with depth.

The sediments of the Potomac Group overlie the bedrock/saprolite. Regionally and locally, the sediments of the Potomac Group are chiefly white to gray quartz or feldspar sands, interbedded with variegated clays and silts. Some clay layers contain abundant lignite and pyrite while others have yielded siderite, hematite or limonite. Above the weathered bedrock, quartz pebbles have been found intercalated with micaceous clay. Minor amounts of fine sand and clay

are interspersed throughout the silt, and occasionally quartz pebble gravel is also included. Thin beds of lignite are interstratified at most locations. The Potomac sediments are much more variable in composition. Interstratified sands, silts, and clays make up the majority of sediments, with occasional peat or gravel beds included. Lateral discontinuity within the Potomac Group renders correlation of most beds uncertain, even over short distances. Quaternary alluvium overlies the Potomac Group and is composed of heterogeneous mixtures of clay, silt, sand, and gravel. Alluvium is associated with river and estuary depositional environments and, at the Facility, occurs along Little Elk Creek (or Creek) and its tributaries. Data indicate an alluvial thickness of 0 to 40 feet, and these beds are extremely variable in their horizontal and vertical extent. Site topography is characteristic of a mature stream valley that traverses generally rolling hilly terrain. Low lying areas surround the meandering channel of Little Elk Creek and are flanked by relatively steep embankments rising up from the Creek in some locations. Total relief across the Facility spans approximately 75 ft.

Depending on the location of interest within the Facility, there may be either two or three groundwater flow regimes above bedrock. Three groundwater units exist under the majority of the Facility, specifically, the central, east, and southeast portions (including the TCE Area SWMU and A-Area SWMU). These units are a shallow unconfined water-table aquifer, the intermediate Potomac Group aquifer, and a deep saprolite unit. In the northwest and west portion (including the Still Bottoms SWMU and Beryllium SWMU), two hydrogeologic units exist: a shallow unconfined water-table aquifer and the saprolite unit.

Regional and site groundwater flow in the Potomac Group aquifer, the most significant aquifer onsite, is to the east/southeast. Groundwater flow is influenced by interaction with surface-water flow. Little Elk Creek meanders across the Facility, flowing generally to the south in the northwest part of the site, to the east in the central portion, and to the south in the southeastern portion of the site. Water level and water quality evidence suggest that groundwater discharges to Little Elk Creek along the entire length of the Creek. Water quality evidence in the southeastern part of the site suggests that virtually all of the groundwater in the shallow water table unit and in the intermediate Potomac Group aquifer ultimately discharge to the Creek.

A single active industrial water supply well provides potable water for the Facility subsequent to treatment for VOCs and perchlorate. In addition, many of the nearby residences have been connected to the public water supply since investigation began. A well survey was completed of nearby residences and businesses in 2002. The survey identified 21 wells as primary water sources and 11 wells as secondary sources or inactive wells. None of the active wells for primary use are within the current footprint of the off-site TCE or perchlorate plumes.

III. Summary of Environmental History

EPA identified a number of SWMUs requiring further characterization. A site-wide Corrective Measures Study (CMS) report was submitted in 2007 addressing five of the seven SWMUs identified in the Permit, which include the following SWMUs: TCE Area, A-Area SWMU, Beryllium, Still Bottoms Area, C-Area, Sand Pit, and Pesticide Area. The two SWMUs excluded from the 2007 CMS were the C-Area SWMU that is addressed under the Maryland Department of the Environment Controlled Hazardous Substances Permit No. A-052, and the Pesticide Area SWMU, addressed in separate reports as a result of different operators. The CMS presented the results of multiple investigations, an evaluation of corrective action alternatives,

and recommended corrective measures for the Facility.

EPA commented on the CMS report via email in February 2012 identifying data gaps. ATK subsequently addressed the data gaps with additional sampling in 2014 and presented the results in a Site Investigation Report Addendum dated February 2015 (RFI Addendum). EPA approved the RFI Addendum on March 30, 2015 concluding the investigation phase and requesting the submission of a CMS Addendum to address revisions to the 2007 CMS Report. The Draft CMS Report Addendum was submitted July 2015 with a summary of data collected since the submittal of the 2007 CMS Report, a focused human health and ecological risk-based evaluation of the newly collected data, and a re-evaluation of the selected remedies presented in the CMS Report.

The discovery of DDT contaminated material in 1988 in the Pesticide Area SWMU led to several environmental investigations. Studies in 1988 and 1990 attempted to characterize the waste and determine the nature and extent of pesticide contamination. Characterization continued through the 1990's into 2004 when groundwater characterization was completed with the installation of a number of groundwater monitoring wells. The "Technical Memorandum, Remedial Action Objectives Pesticide Areas" initially submitted in September 2001 utilized the data collected up to that date and assessed the risk from the pesticide contamination. An additional groundwater sampling event was conducted in 2014 and the final Updated Technical Memorandum Remedial Action Objectives Pesticide Areas (Technical Memorandum) was submitted July 2016. EPA approved the Technical Memorandum in a letter dated September 27, 2016 effectively concluding that site-wide RFI activities and Risk Assessments were completed. In December 2016 ATK submitted a Pesticide Area CMS evaluating remedies to mitigate risk.

A. TCE Area SWMU

The TCE Area SWMU consists of a groundwater plume containing elevated levels of TCE and perchlorate that occupies the southern and eastern extent of the main plant area and extends off site to the east and the south of U.S. Route 40. Due to the complicated history of land use with potential sources of TCE, the source(s) of TCE in groundwater have not been determined. Historical investigations indicate that former source areas (main plant and A-Area SWMU) were likely diffuse and are no longer contributing to groundwater contamination at the Facility.

The Conceptual Site Model (CSM) for the TCE Area SWMU considers three hydrogeologic units above bedrock: the shallow unconfined water-table aquifer, the intermediate Potomac Group aquifer, and the deep saprolite unit. Depth to groundwater ranges from near the ground surface at Little Elk Creek to greater than 30 feet (ft) below ground surface (bgs) near the Facility property line. Results of the 2014 investigations indicate shallow zone groundwater flow to the northeast, east, and southeast towards Little Elk Creek, with intermediate zone groundwater flow generally resembling that of the shallow flow regime. Flow patterns are locally affected in the vicinity of the ATK water supply well.

In the shallow zone, TCE concentrations are highest in a relatively narrow north-to-south area on the west side of Little Elk Creek in the eastern portion of the TCE SWMU. In the intermediate zone, TCE concentrations are highest in a larger east-to-west area extending from the west side of Little Elk Creek to the west, past Elkton Road. Concentrations of perchlorate in the shallow zone are lower than the concentrations of TCE, and follow the same general distributions, with the highest concentrations observed near Little Elk Creek.

Shallow zone investigations in the residential area and YMCA property south and east of the Facility have revealed the presence of a shallow perched water-bearing unit. Samples collected from this unit do not indicate the presence of any Site-related constituents; thus, the unit forms a natural clean water barrier to any upward vapor migration from the TCE plume. Lithologic data from wells and the topographic relief map were used to delineate the extent of the perched water zone in the off-site TCE plume area.

The results of the recent investigations confirm that the TCE plume is discharging to Little Elk Creek and not migrating through the deep saprolite unit; support shallow zone groundwater flow to the northeast, east, and southeast towards Little Elk Creek, with intermediate zone groundwater flow generally resembling that of the shallow flow regime; illustrate that groundwater flow patterns are locally affected in the vicinity of the ATK process water supply well and, confirm that there is no vapor intrusion from Site-impacted groundwater occurring off Site.

Results of the 2014 Monitored Natural Attenuation Evaluation indicate that, in areas where Total Organic Carbon is elevated the potential for biodegradation of perchlorate and TCE exists. Conditions conducive to biodegradation of perchlorate and TCE under reducing conditions are found close to Little Elk Creek due to the increased availability of reduced carbon near the Creek. A review of the data collected to date for the TCE Area SWMU indicates that attenuation of TCE, cis-1,2-DCE, 1,1,1-TCA, 1,1-DCE, and perchlorate is occurring. While the plume is attenuating as it discharges to Little Elk Creek, Little Elk Creek also acts as a hydraulic or discharge barrier that prevents downgradient migration of the TCE plume. In addition, concentrations of TCE discharging to Little Elk Creek were not shown to affect surface water quality. Since the Little Elk Creek Investigation was completed in 2000, concentrations of TCE discharging to the Creek are lower and will continue to decrease as supported by the decreasing to stable TCE concentrations upgradient.

Little Elk Creek

Water level data collected from the intermediate and shallow zones demonstrate an upward flow component within the vicinity of Little Elk Creek that indicates groundwater from both the shallow and intermediate zones discharge to the Creek, including impacted groundwater from the TCE Area SWMU. Investigations of local flow regimes beneath the Creek do not support any downward migration to the deep saprolite unit. Low levels of TCE have been detected on the far side of Little Elk Creek but appear to be the result of diffusion and transient stage fluctuation of water levels in the creek and do not suggest underflow beneath the creek under normal conditions. This is further supported by groundwater data obtained from two newly installed monitoring wells on the east side of Little Elk Creek. Little Elk Creek is characteristic of a high-gradient stream which meanders widely. Surface water velocity is relatively swift, but varies with the width and depth of the creek segment; velocities are swifter in narrower, shallow segments and more sluggish in pool areas. Creek flow is highly variable, and depends largely on precipitation.

Surface water samples historically collected from six surface water monitoring points in Little Elk Creek and at pore water locations along the discharge front for the TCE Area SWMU on Little Elk Creek demonstrate that discharge concentrations to Little Elk Creek are generally one to three orders of magnitude lower than concentrations measured in upgradient groundwater upgradient.

B. A-Area SWMU

The burn field in A-Area was used for disposal of waste solid fuel rocket propellant by open burning operations in the 1950s. It is located near the eastern boundary of the Site. Solid propellant during this period contained a chemical composition of oxidizers (ammonium perchlorate, potassium perchlorate, and ammonium nitrate), powdered aluminum or magnesium, rubber binders, polymeric hydrocarbons, and polysulfides, along with potential additional constituents including lead dioxide, maleic anhydride, and sulfur. The A-Area SWMU has been investigated as a possible source area for TCE in groundwater at the TCE Area SWMU. The A-Area was closed in 1958 and surface materials were removed.

The results of previous soil investigations, recent groundwater investigations discussed above, and the lack of exceedances in shallow well GM-1S, suggest that there is no continuing vadose zone source for groundwater contamination in the A-Area. The most recent groundwater monitoring of wells within and bordering the A-Area SWMU (GM-1S, GM-1B, GM-15M, GM-24, GM-25) indicated some constituent concentrations exceeded the screening criteria. Exceedances were limited to wells in the intermediate aquifer.

C. Beryllium SWMU

The Beryllium SWMU is an approximately 40 feet (ft) by 170 ft area located in the northern portion of the Facility adjacent to Little Elk Creek. Beryllium propellant waste articles were buried in several 6-ft deep trenches from 1962 to 1969. Buried waste was placed within the Beryllium SWMU in two trenches approximately 4 ft by 40 ft in area and in one trench 4 ft by 20 ft in area. Waste articles included hand utensils and empty rocket motor cases contaminated with trace amounts of beryllium propellant. The propellant had a general chemical composition of oxidizers and rubber binders. Investigation of the Beryllium SWMU has been limited by the potential explosive nature of the buried waste. The buried waste area was subsequently covered with soil in 1970. Currently, the Beryllium SWMU is heavily wooded and fenced to restrict access by Facility personnel and trespassers.

Subsurface investigation of the Beryllium SWMU has been limited by the potentially ignitable and hazardous nature of the buried waste. Hydrogeologic units in the Beryllium SWMU consist of a shallow unconsolidated unit and underlying saprolite. Recent investigations indicate that the groundwater model flow in both of the water-bearing units is west-southwest, eventually discharging to Little Elk Creek. Groundwater is encountered in the Beryllium SWMU at a depth of less than 10 ft bgs. Studies indicate that sufficient precipitation occurs to recharge groundwater at this SWMU. This recharge is evidenced by the presence of some Site-related constituents in the shallow water-bearing zone in the immediate vicinity of the SWMU.

Investigations have indicated the persistence of perchlorate in groundwater downgradient from the Beryllium SWMU. Recent investigations indicated screening level exceedances for perchlorate and, to a lesser degree, 1,1-DCE and thallium in downgradient groundwater. Based on the most recent investigation results, there are no SWMU-specific constituents exceeding screening levels at the downgradient sampling location BEGP-5. Perchlorate is the most mobile

SWMU-related constituent and it is only present at a concentration of 6.9 µg/L at BEGP-5. Given the age of the potential releases (> 50 years), and significant attenuation of perchlorate only 50 feet downgradient, it appears that dissolved constituents in groundwater are not likely to migrate and/or ever reach nearby surface water receptors such as Little Elk Creek. No impact to Little Elk Creek, stream, or ditch sediments from this SWMU has been found. The apparent low transmissivity of the hydrogeologic units encountered near the Beryllium SWMU suggests that the SWMU does not pose a significant threat to Little Elk Creek. The Beryllium SWMU is more significant as a physical hazard if disturbed, due to the potentially explosive and unstable characteristics of the buried waste.

D. Still Bottoms SWMU

The Still Bottoms SWMU is an approximately 100 ft by 200 ft area located in the northern portion of the Facility bordering the Maryland Cork Company property. ATK purchased this portion of the Facility property in 1973, at which time drums were stored along the property boundary. Former employees historically reported that approximately 30 to 50 drums were either buried or emptied into trenches in the Still Bottoms SWMU area. The drums were believed to have contained solvent recovery still bottoms.

In accordance with the 2005 Corrective Action Plan, excavation activities were conducted at the Still Bottoms SWMU in November 2005. The excavation activities included trenching, test pits, and confirmatory sampling. The proposed limits of excavation were 100 ft long by 50 ft wide by 6 ft deep, but actual limits were smaller based on the extent of visually impacted soil found during excavation. Approximately 126 tons of soil and drum carcasses were excavated and disposed off-site, effectively removing the potential source area. The excavation was backfilled with visually clean soil from the excavation area and approximately 91 cubic yards of soil from an on-Site borrow area.

Groundwater samples collected from push-probe borings adjacent and downgradient of the Still Bottoms SWMU did not indicate the presence of COCs along a downgradient profile on the Maryland Cork property. The results of recent investigations to determine the quality of backfill material used at the Still Bottoms SWMU, confirm soil exceedances of EPA RSL screening levels for Industrial Soils are within the background range for Eastern Maryland.

E. Sand Pit SWMU

The Sand Pit SWMU is located in the southwestern portion of the Site, south of Little Elk Creek and near the northeast boundary of the Pesticide Area SWMU. The Sand Pit SWMU consists of a sandy area of only 900 square feet. It received approximately 2000 gallons of photographic wastewater and boiler blowdown per year. This SWMU was abandoned in 1980. The related hydrogeologic units include the Potomac Group unit and a saprolite zone. Due to topography, the shallow unconfined aquifer is encountered between 50 and 90 ft bgs in this area. The groundwater in the shallow aquifer beneath the Sand Pit SWMU generally flows to the northeast toward Little Elk Creek with a component of flow to the east. Groundwater flowing locally to the northeast is intercepted by Little Elk Creek.

The Sand Pit SWMU has been investigated as an area of potential metals, VOC, and pesticide contamination. Groundwater sampled from a deep well installed within the SWMU disposal area (SP-1) did not display elevated constituent levels, nor did soil samples indicate levels in exceedance of screening criteria. Sampling of Little Elk Creek in 2000 also suggested that the Sand Pit SWMU has not impacted Little Elk Creek. The Sand Pit SWMU is not

believed to be a source for groundwater contamination.

F. Pesticide Area SWMU

Ciba-Geigy, now Syngenta, and Olin Corp. have been performing environmental investigations at the Pesticide Area SWMU that includes the Ridge Area, Burn Pit Area, Tar and Ash Area, Sewer Line Area, and Incineration Area since 1988. The Pesticide Area SWMU is located on the southwestern portion of the Site south of Little Elk Creek. Contamination in the Pesticide Area SWMU is limited to chlorinated pesticides, primarily 4,4'-DDT and its metabolites, in surface soils. Subsurface contamination is observed only in the Burn Pit Area. Contaminated soils are located 50 to 90 feet above the groundwater table. Sampling of soils and ditch bottom materials south of the SWMU indicate the SWMU is not a source of off-site transport via runoff.

Low concentrations of pesticides are detected in a shallow unconsolidated groundwater zone immediately east of soil source areas. Groundwater elevation data indicates the groundwater flows to the northeast and east and is likely intercepted by Little Elk Creek. Extensive sampling of Little Elk Creek confirms that the Creek is not impacted by pesticides from the Pesticide Area SWMU.

G. Risk Assessment

Data were evaluated following EPA guidance for risk assessments (Risk Assessment Guidance for Superfund (RAGS): Volume I Human Health Evaluation Manual (Part A), 1989; Guidance for Data Usability in Risk Assessment (Part A), Office of Emergency and Remedial Response, 1992). Contaminants of Potential Concern (COPCs) were identified based upon the comparison of maximum detected concentrations of chemicals within each SWMU to conservative health-based screening levels. If the maximum detected concentration exceeded the relevant screening level, then the chemical was identified as a COPC. Detected chemicals for which a screening level was not available were also included as COPCs. The screening levels used for comparison to soil and groundwater data were the EPA Region III RBCs for industrial soil and tap water (USEPA, 2006, Human Health Risk Assessment Risk-Based Concentration Table, October.), respectively. EPA Region III RBCs for tap water and residential soil were used to identify COPCs in surface water and sediment, respectively. RBCs based on non-carcinogenic effects were adjusted by a factor of 0.1 to account for potential additivity of effects following exposure to multiple chemicals (Selecting Exposure Routes and Contaminants of Concern by Risk-Based Screening, Region III Technical Guidance Manual, 1993).

A conceptual site model was developed which identified potential receptors and characterized potentially complete or incomplete exposure pathways. Based on current industrial use and likely continued industrial land use in the future, the following receptors were identified as having potentially complete exposure pathways: future Site worker and future construction/utility worker exposure to soil and groundwater; current/future adult and youth visitor/trespasser exposure to soil; and adult and youth recreational exposures to surface water and sediment. Potential risks and hazards were evaluated for each receptor on SWMU by SWMU basis in order to guide remedial decisions in each SWMU.

The table below summarizes the cumulative excess lifetime cancer risk (ELCR) and Hazard Indices (HI) for each of the receptors evaluated by this HHRA for all Site SWMUs except the Pesticide Area SWMU. The risks and hazards discussed below are cumulative for each exposure scenario, summed across all COPCs, all media, and all exposure routes.

SWMU	Receptor	Exposure Medium	ELCR	Hazard Index
TCE Area	Current/future adult recreational user	Surface water, sediment	1×10^{-5}	0.2
	Current/future child recreational user	Surface water, sediment	3×10^{-6}	0.2
A-Area	Future site worker	Groundwater	5×10^{-6}	0.004
	Future construction/utility worker	Groundwater	8×10^{-5}	1
Beryllium Area	Future site worker	Soil	2×10^{-6}	0.02
	Future construction/utility worker	Soil, groundwater	2×10^{-7}	0.2
	Current/future adult visitor/trespasser	Soil	5×10^{-7}	0.004
	Current/future youth visitor/trespasser	Soil	2×10^{-7}	0.006

SWMU	Receptor	Exposure Medium	ELCR	Hazard Index
Still Bottoms	Future site worker	Soil, groundwater	2×10^{-6}	0.008
	Future construction/utility worker	Soil, groundwater	3×10^{-7}	0.04
	Current/future adult visitor/trespasser	Soil	5×10^{-7}	0.002
	Current/future youth visitor/trespasser	Soil	2×10^{-7}	0.003

Out of the exposure scenarios evaluated in 2007, none result in unacceptable risk or hazard estimates.

Given the extended period of time to complete the Site characterization process subsequent to submittal of the CMS Report, 2007 to 2015, EPA requested the Facility review the HHRA in light of constantly updated RSLs and recent guidance on vapor intrusion risk. In summary:

- the human health risk evaluation conclusions for the TCE Area SWMU that were reached in the 2007 SWRA remain valid;
- while current conditions in the A-Area SWMU are acceptable for future site workers, additional measures should be taken to reduce potential exposures for future construction workers to volatile constituents in trench air;
- current surface soil (0-4 ft bgs), sediment, groundwater, and surface water conditions in the Beryllium SWMU are acceptable for the potential current and future receptors evaluated. Due to the potential for physical hazards associated with the Beryllium SWMU (i.e., potentially ignitable nature of the waste remaining in place and the potential for the release of emissions including dust containing beryllium or beryllium compounds if the waste is disturbed), fencing and signage to prevent entry into the SWMU is required;

- under the current conditions within the Still Bottoms SWMU, constituents in soil and groundwater do not pose an unacceptable risk to human health under the exposure scenarios evaluated in 2007; and
- under the current conditions within the Sand Pit SWMU, constituents in soil and groundwater do not pose an unacceptable risk to human health under the exposure scenarios evaluated in the 2007.

Pesticide SWMU

The 2016 Technical Memorandum presented site-specific risk-based Preliminary Remediation Goals (PRGs) for surficial soils for human health and ecological receptors of concern based on current and expected future use of the Site. Human health receptors include current and future Site workers and construction workers. PRGs were developed for subsurface soils for construction workers solely. The human health PRGs were developed for conservative assumptions regarding potential contact with soils by current and future workers, including potential construction workers engaged in a long-term (one year) construction project. Assumptions concerning future industrial land use are consistent with the Site's location in an active industrial park, as well as current and planned operations and buffer requirements. Ecological PRGs were developed for sensitive receptors using USEPA methodology for dose modeling. Overall PRGs for the Pesticide Area SWMU surface soils for a target cancer risk of $1x10^{-6}$ and a HI equal to 1 (Corrective Measures Study Pesticide and Sewer Line Areas, 2016).

H. Ecological Risk Assessment

Risks were characterized for terrestrial and aquatic ecological receptors at the Site based on Hazard Quotients (HQs) (direct contact exposure and food web modeling) with emphasis on the weight of evidence, such as conservatism of the Ecological Screening Level (ESL), EcoSSLs (Ecological Soil Screening Levels (EcoSSLs) for Silver, Office of Emergency and Remedial Response, October, 2006), National Oceanic and Atmospheric Administration (NOAA) values (NOAA, 1999), Oakridge National Laboratory (ORNL) values (Jones et al., 1997; Suter and Tao, 1996), and other screening values, the spatial extent of elevated HQs, background levels relative to site-related concentrations, and the quality of the available habitat.

Risks to terrestrial ecological receptors from exposure to soil are not likely to occur via direct contact or via the food web for the majority of the COPCs evaluated in the Ecological Risk Assessment (ERA). The ERA indicates that potentially unacceptable direct contact risks may result from exposure to soil impacted with 4,4'-DDT, dieldrin and cadmium at a few locations in the Still Bottoms SWMU and 4,4'-DDT and silver at a few locations in the Sand Pit SWMU; however, they would be limited in spatial extent and limited to just the few individual animals exposed to maximum detected constituent concentrations.

There is sufficient information to conclude that adverse impacts are unlikely for aquatic organisms that may be exposed to the surface water in Little Elk Creek. There is adequate information to conclude that adverse impacts to wildlife exposed to surface soil, surface water, and sediment are not considered likely at the Facility.

IV. Corrective Action Objectives

For all SWMUs evaluated, except for the Pesticide Area SWMU, the results of the site-specific HHRA show that COPCs in groundwater, surface water, soil, and sediment do not pose

an unacceptable risk to human health or the environment under current and presumed future industrial land-use scenarios. Potential human health carcinogenic risks are within the EPA target risk range of $1x10^{-4}$ to $1x10^{-6}$, assuming that the future land-use is solely industrial. Potential risks associated with exposure to groundwater in the TCE Area SWMU discharging to the Little Elk Creek are outside the Facility property boundary and corrective action alternatives for this SMWU are evaluated herein. EPA has identified the following Corrective Action Objectives (CAO) for soils and groundwater at the Facility:

1. Soils

EPA's CAO for soil is to prevent human exposure to contaminants concentrations above the EPA allowable risk range of $1x10^{-4}$ to $1x10^{-6}$ and non-cancer HI of 1 for an industrial exposure scenario.

- Manage future Site use to restrict residential land use of areas within the property boundary.
- Manage exposure to in-situ waste remaining in the Beryllium SWMU that poses a potential physical hazard to workers.
- Maintain no unacceptable population-level ecological risks.
- Prevent human exposure to soils in the Pesticide Area SWMU with COPC exceeding applicable PRGs presented in the CMS, as calculated based on the 95% upper confidence limit (UCL) on the mean, for samples collected from unremediated locations in the Pesticide Area SWMU and Sewer Line Area.
- Prevent ecological exposures to soil in the Pesticide Area SWMU with chemical concentrations exceeding the PRGs (based on the 95% UCL for unremediated soils).
- Prevent off-site migration of soils in the Pesticide Area SWMU exceeding the PRGs via wind and water erosion (based on the 95% UCL for unremediated soils).

2. Groundwater

EPA expects final remedies to return usable groundwater to its maximum beneficial use within a timeframe that is reasonable given the particular circumstances of the project. For projects where aquifers are either currently used for water supply or have the potential to be used for water supply, EPA will use drinking water standards, known as federal Maximum Contaminant Levels (MCLs), promulgated pursuant to Section 42 U.S.C. §§ 300f et seq. of the Safe Drinking Water Act (SDWA) and codified at 40 CFR Part 141. Therefore, EPA's CAO for Facility-wide groundwater is to:

- Restore groundwater to drinking water standards, MCLs.
- Minimize and/or manage exposure to groundwater until groundwater is restored to MCLs.
- Ensure that groundwater containing elevated concentrations of COPCs will not impact ecological receptors nor adjacent surface water bodies until groundwater is restored to MCLs.

V. Proposed Remedy

The remedial technologies evaluated in the CMS and considered potentially capable of meeting the CAO goals for groundwater and soil at SWMUs requiring remedies include:

- Land Use Controls – Groundwater and soil use restrictions within the respective SWMUs;

- Monitored Natural Attenuation (MNA) – Long term groundwater monitoring following the technical protocols governing the natural degradation of contaminants in or from the TCE Area SWMU;

- Containment, treatment, and disposal – Hydraulic containment by pump-and-treat (P&T) to prevent further migration of groundwater, ex-situ treatment of contaminated groundwater and disposal, i.e. Publicly Operated Treatment Works;

- In-situ treatment – In-situ treatment of groundwater includes physical, chemical, and biological methods;

- Removal & disposal – Excavation of contaminated soil for either on-site consolidation or off-site disposal of waste;

- Capping – The placement of impermeable materials in an engineered design to restrict contact and restrict infiltration of precipitation.

EPA considered these alternatives and determined, that the following remedial technologies provide the best relative combination of attributes most likely to achieve CAOs for the facility:

1) Monitored Natural Attenuation of contaminated groundwater from the TCE and A-Area SWMUs; and

2) Site-wide land (residential use restriction) and groundwater use restrictions.

3) Engineering Controls and Long Term Monitoring as the presumptive remedy for the Beryllium SWMU.

4) Excavation, consolidation, and capping of contaminated soil at the Pesticide SWMU.

A. Groundwater TCE-Area and A-Area SWMUs – Monitored Natural Attenuation

The 2014 Monitored Natural Attenuation Evaluation has shown that the COPCs in groundwater are effectively being addressed by natural attenuation. Specifically, the extent of contamination in groundwater is not increasing and concentrations of contaminants are declining over time. Therefore, the proposed remedy for contaminated groundwater at the Facility consists of monitored natural attenuation until MCLs are met, and compliance with and maintenance of groundwater use restrictions to prevent exposure to contaminants while concentrations remain above drinking water standards. See Paragraph B of this Section, for a list of the use restrictions EPA proposes for the Facility.

B. Land and Groundwater Use Restrictions

Because COPCs remain in the groundwater at the Facility above drinking water standards and in the soils above levels appropriate for residential use, EPA's proposed remedy requires land and groundwater use restrictions for activities that may result in exposure to those contaminants.

EPA is proposing the following land and groundwater use restrictions be implemented at the Facility:

1) All earth moving activities at the A-Area SWMU and the Pesticide Area SWMU, including excavation, drilling and construction activities, shall be conducted in compliance with Facility-specific health and safety protocols and an EPA-approved Soil Management Plan (that includes appropriate Personal Protective Equipment requirements sufficient to meet EPA's acceptable risk and complies with all applicable OSHA requirements and practices to prevent off-site migration of soils;
2) Site-wide access restrictions through the use and maintenance of fencing and controlled access (security gate);
3) Groundwater at the Facility shall not be used for any purpose, including, but not limited to, use as a potable water source without treatment to achieve MCLs, other than to conduct the maintenance and monitoring activities required by EPA; and
4) The Facility shall not be used in a way that will adversely affect or interfere with the integrity and protectiveness of the final remedy.

The land and groundwater use restrictions necessary to prevent human exposure to contaminants at the Facility will be implemented through the Permit and/or an Environmental Covenant pursuant to the Maryland Environmental Covenant Act (Maryland Environment Code Annotated § 1-800 et. seq.). If EPA determines that additional maintenance and monitoring activities, land use controls, or other corrective actions are necessary to protect human health or the environment, EPA has the authority to require and enforce such additional corrective actions through an enforceable mechanism i.e. the Permit, provided any necessary public participation requirements are met.

C. Beryllium SWMU

The proposed remedy for the Beryllium SWMU consists of maintenance of a fence around the unit with appropriate signage, and a monitoring program ensuring the integrity of the existing cover system. Alternative remedies screened for the Beryllium SWMU involve disturbance of the potentially ignitable waste representing an increased risk to workers; other alternatives result in the increased possibility of exposure to emissions including dust containing beryllium or beryllium compounds; and groundwater impacts are highly localized and groundwater velocity in this area is very low and currently poses no risk.

D. Excavation, Consolidation, and Capping Pesticide SWMU

The proposed remedy for the units that make up the Pesticide Area SWMU consists of the excavation of soil from the Ridge Area and Tar and Ash Area for consolidation beneath a low permeability cap consisting of Geosynthetic Clay Liner (GCL) and overlying drainage/clean soil cover to be located over the Burn Pit and Incineration Areas. As necessary and/or appropriate, soils from other areas at the Facility may be placed under the cap. It is estimated

that the GCL cap would cover approximately 2 acres. An additional asphalt cap is to be constructed over the Sewer Line Area where soils do not meet the PRGs.

VI. Evaluation of Proposed Remedy

This section provides a description of the criteria EPA used to evaluate the proposed remedies consistent with EPA guidance, "Corrective Action for Releases from Solid Waste Management Units at Hazardous Waste Management Facilities; Proposed Rule," 61 Federal Register 19431, May 1, 1996. The criteria are applied in two phases. In the first phase, EPA evaluates three decision threshold criteria as general goals. In the second phase, for remedies meeting the threshold criteria, EPA evaluates seven balancing criteria to determine which proposed remedy alternative provides the best relative combination of attributes.

A. Threshold Criteria

1. Protect Human Health and the Environment - No unacceptable human health or population-level risks are present at the Facility; however, by implementing controls for land use and restricting groundwater use protection from these unacceptable risks are insured. The use of a soil management plan for the A-Area SWMU and Pesticide Area SWMU, and land disturbance restrictions at the Beryllium SWMU in addition to the site-wide residential use restriction and groundwater use prohibition are equally protective and meet the criterion.

2. Achieve Media Cleanup Objectives - EPA's proposed remedies meet the cleanup objectives appropriate for current and reasonably anticipated future land use, which are risk-reduction. The objectives are to protect workers (hypothetical future construction worker) from potential exposures to Facility-related soil or groundwater constituents at levels that may result in risks of adverse health effects. Given the controlled access, excavations and capping, use restrictions and MNA described in Section V, the proposed remedy will attain soil and groundwater objectives. Groundwater is not used for potable purposes within one mile of the Facility. The proposed remedy will meet groundwater MCLs that would allow for the beneficial use of groundwater at the Facility. The use restrictions will eliminate current and future unacceptable exposures to both soil and groundwater.

3. Control the Source of Releases – The RCRA Corrective Action Program seeks to eliminate or reduce further releases of hazardous wastes or hazardous constituents that may pose a threat to human health and the environment. Controlling the sources of contamination relates to the ability of the proposed remedy to reduce or eliminate, to the maximum extent practicable, further releases. Current site conditions demonstrate that there are no continuing sources in the TCE Area and A-Area SWMUs. Closure of the Beryllium SWMU with waste-in-place is the best alternative because other alternatives present risk of exposure to COPCs. Moreover, by implementing the usage and engineering controls, access to the Beryllium SWMU will be eliminated thereby controlling the source. In addition, consolidating and capping contaminated soils at the Pesticide SWMU meets the criterion.

B. Balancing/Evaluation Criteria

1. Long-Term Reliability and Effectiveness - The proposed remedy will maintain protection of human health and the environment over time by controlling exposure to the hazardous constituents remaining in soils and groundwater. The long term effectiveness is high, as use restrictions are readily implementable and easily maintained. Similarly, MNA is not an active remedy and monitoring groundwater for the long term is completely reliable. Capping is

completely reliable subject to proper maintenance and historically effective. Given the historical, industrial uses of the Facility groundwater use restrictions are expected to continue in the long term.

2. Reduction of Toxicity, Mobility, or Volume of Waste - The completion of the soil excavation in the Still Bottoms SWMU has reduced toxicity, mobility, and the volume of soil COPCs. Similarly, excavation, consolidation and capping reduces the mobility of contaminants at the Pesticide SWMU. The proposed remedy will not actively further reduce the toxicity, mobility, or volume of the soil COPCs. Groundwater COPCs have generally demonstrated a stable or decreasing trend in concentrations with time and this trend is likely to continue. The proposed remedy will avoid the risks associated with excavation of the Beryllium SWMU.

3. Short-Term Effectiveness - The excavation and consolidation of Pesticide Area SWMU soils would occur on-site. There is an increased potential for releases to occur via wind and water erosion during soil excavation and consolidation, although dust control and erosion control plans would be developed as part of the remedial design. The total duration of the construction phase is estimated to be approximately 3 months. EPA's proposed remedy does not involve any additional activities posing short-term risks to workers, residents, and the environment. The Facility is located in a mixed use area, both industrial and some residential, although not densely populated, and the nature of contamination does not pose a risk to surrounding residents or onsite worker. There are existing engineering control measures in place, and once the groundwater use restrictions and Facility-specific Soil Management Plan, are in place the proposed remedy's short-term effectiveness is high.

4. Implementability - EPA's proposed remedy is readily implementable. Excavation and relocation of the Ridge Area soils from the Pesticide Area SWMU poses a technical challenge with respect to slope stability and erosion control during excavation. The Tar and Ash Area poses no significant implementability concerns as the area is accessible and relatively flat and the excavation would be less than 2 feet deep. Personnel coming into contact with impacted soil would be required to follow the Site-Specific Health and Safety Plan. The remainder of the remedy will be implemented using existing monitoring wells. ICs are easily implemented through the use of the RCRA Permit or an Environmental Covenant because access is already restricted. Some of the control measures included in the proposed remedy, including State groundwater use restrictions where public water supply is available and Facility-specific health and safety protocols and Soil Management Plan are easily implementable. The proposed control measures are compatible with current Facility uses and operations, and can be implemented, maintained, and monitored effectively with a well-designed control plan.

5. Cost - The major cost components for the proposed remedy include the implementation of a monitoring and reporting program, implementation and maintenance of control programs, and cost of excavation and capping (approximately $1.4M). ATK will develop a cost estimate for the EPA-approved corrective measures for the Facility as part of the design for Corrective Measures Implementation and to provide a basis for demonstrating financial assurance compliance. Based on EPA's best professional judgment, the proposed remedy is cost effective for the Facility.

6. Community Acceptance - There have been no known issues raised by the community regarding RCRA investigation efforts. Community acceptance of the proposed remedy will be

evaluated based on comments received during the public comment period and will be described in EPA's Final Decision and Response to Comments.

7. State/Support Agency Acceptance - MDE has been involved throughout the Facility investigation process and maintains a separate permit for the C-Area SWMU. The proposed use restrictions included in the proposed remedy are already in place and are generally recognized as commonly employed measures for long-term stewardship. Ultimately State/MDE support will be evaluated based on comments received during the public comment period.

VII. Environmental Indicators

Under the Government Performance and Results Act (GPRA), EPA has set national goals to address RCRA corrective action facilities. Under GPRA, EPA evaluates two key environmental clean-up indicators for each facility: (1) Current Human Exposures Under Control and (2) Migration of Contaminated Groundwater Under Control. The Facility met these indicators on September 1, 1999, and July 12, 1999, respectively. The environmental indicators are available at https://www.epa.gov/hwcorrectiveaction/hazardous-waste-cleanup-alliant-techsystems-operations-llc-elkton-md.

VIII. Financial Assurance

ATK will be required to demonstrate and maintain financial assurance on an amount included in the Corrective Measures Implementation Plan for completion of the remedy pursuant to the standards contained in Federal regulations 40 C.F.R. § 264.145 and 40 C.F.R. § 264.143.

IX. Public Participation

Interested persons are invited to comment on EPA's proposed remedy. The public comment period will last forty-five (45) calendar days from the date that notice of the start of the comment period is published in a local newspaper. Comments may be submitted by mail, fax, e-mail, or phone to Mr. Erich Weissbart at the address listed below.

A public hearing will be held upon request. Requests for a public hearing should be made to Mr. Erich Weissbart of the EPA Region III Office (410 305-2779). A hearing will not be scheduled unless one is requested.

EPA may modify the proposed remedy based on new information and/or public comments. Therefore, the public is encouraged to review the Administrative Record and to comment on the proposed remedy presented in this document.

The Administrative Record contains all the information considered by EPA for the proposed remedy at this Facility. The Administrative Record is available to the public for review and can be found at the following location:

U.S. EPA Region III
1650 Arch Street
Philadelphia, PA 19103
Contact: Mr. Erich Weissbart (3LC20)
Phone: (410) 305-2779

Fax: (215) 814-3113
Email: weissbart.erich@epa.gov

Signature: Catherine A Libertz

Date: 3-22-17

Catherine Libertz, Acting Director
Land and Chemicals Division
USEPA, Region III

Attachment 1 Administrative Record File Index of Documents
Figure 1 Facility Location Map
Figure 2 Facility Map

ATTACHMENT 1

ORBITAL ATK
ELKTON, MARYLAND
STATEMENT OF BASIS
ADMINISTRATIVE RECORD FILE
INDEX OF DOCUMENTS

1. Geraghty & Miller, May 1988. Phase II Report: Investigation of Ground-Water Quality On and Near the Morton Thiokol, Inc. Elkton Division Facility.

2. FWA Environmental Science, Inc. October 1992. Results from Environmental Sampling Program A-Area Burn Field.

3. Woodward-Clyde Consultants. June 1992. Additional Data Collection, Final Report. Volumes I and II.

4. Woodward-Clyde Consultants. August 1993. Data Gap Analysis Report, Pesticide Area SWMU and Sewer Line Area.

5. ARCADIS Geraghty & Miller, April 1999. Perchlorate Investigation. Thiokol Propulsion, Elkton, Maryland.

6. USEPA. September 1999. Documentation of Environmental Indicator Determination. Current Human Exposures Under Control.

7. USEPA. July 1999. Documentation of Environmental Indicator Determination. Migration of Contaminated Groundwater Under Control.

8. ARCADIS Geraghty & Miller, Inc. December 2000. Little Elk Creek Investigation Report. Thiokol Propulsion.

9. URS. September 2001. Remedial Action Objectives (RAO) Technical Memorandum.

10. ARCADIS. September 2004. Site-Wide Investigation Report. ATK Elkton Facility.

11. URS. February 2005. Letter - Results of Additional Geoprobe Sampling.

12. ARCADIS. May 2005. Corrective Action Plan – Soil Removal. ATK Elkton Facility, Still Bottoms SWMU.

13. ARCADIS. July 2006. Groundwater Monitoring Work Plan. ATK Elkton Facility.

14. ARCADIS. February 2007. Corrective Measures Study Report. ATK Elkton Facility.

15. ARCADIS. February 2014. Supplemental Site Characterization Work Plan – Revision 3. ATK Elkton, Facility.

16. ARCADIS. August 2014. Monitored Natural Attenuation. ATK Elkton Facility.

17. Letter from Erich Weissbart, EPA, to Rich Zambito, ATK, George Crouse, Syngenta, Garland Hilliard, Olin, dated 24 April 2014, eliminating homeowner sampling from the EPA approved Supplemental Site Characterization Work Plan – Revision 3.

18. ARCADIS. February 2015. Site Investigation Report Addendum. ATK Elkton Facility.

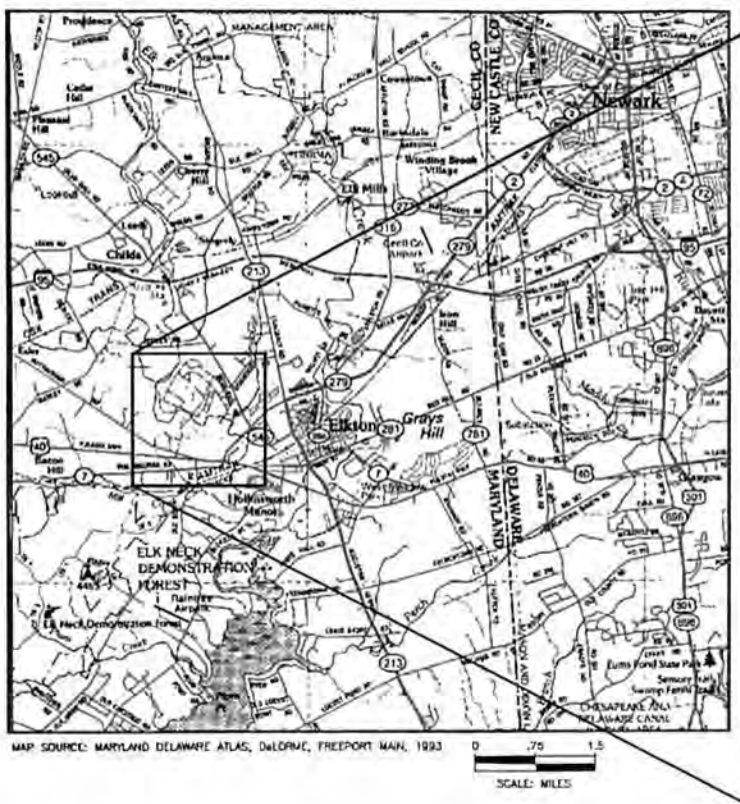
19. Letter from Erich Weissbart, EPA, to Rich Zambito, ATK, dated 30 March 2015, approving Facility-wide RFI.

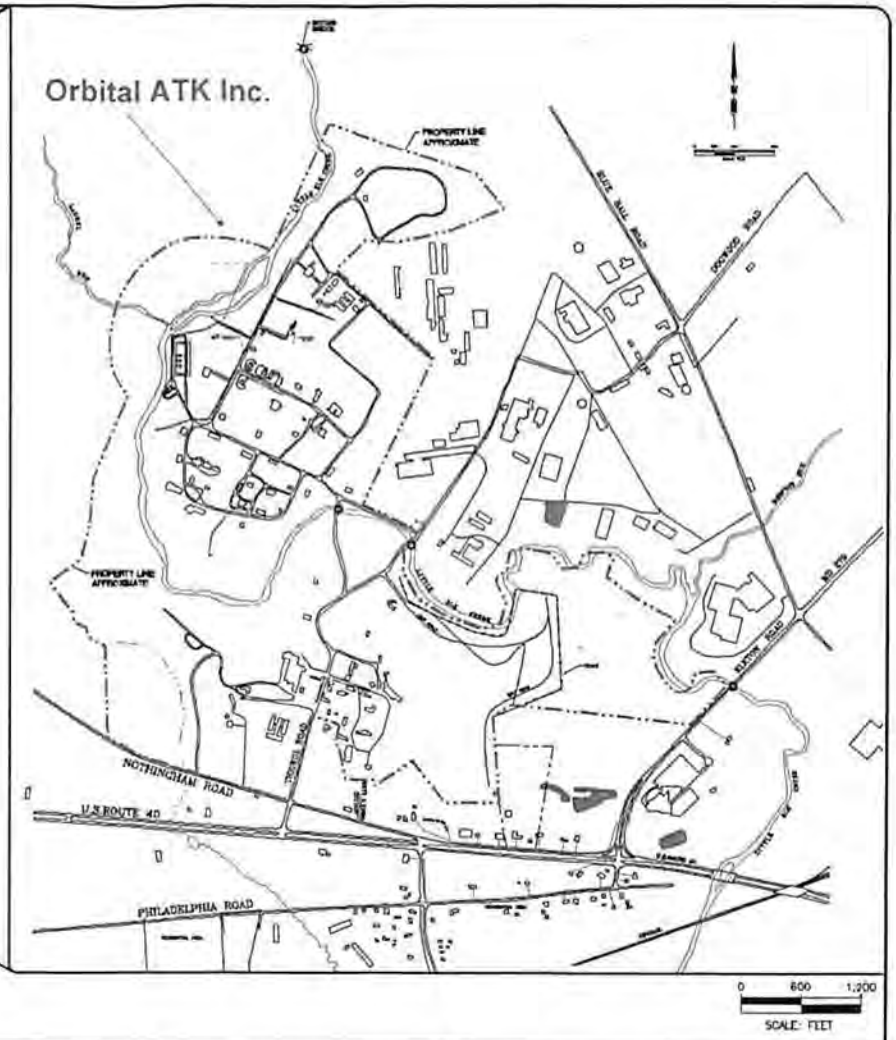
20. ARCADIS. September 2015. Corrective Measures Study Report Addendum. ATK Orbital Elkton Facility.

21. URS. July 2016. Updated Technical Memorandum Remedial Action Objectives Pesticide Areas.

22. Letter from Erich Weissbart, EPA, to George Crouse, Syngenta, and Garland Hilliard, Olin Corp., dated 27 September 2016, approving 2016 Updated Technical Memorandum Remedial Action Objectives Pesticide Areas.

23. GEI Consultants. December 2016. Corrective Measures Study Report Pesticide and Sewer Line Areas. Thiokol Site, Elkton, Maryland.





ARCADIS

SITE LOCATION

Orbital ATK Inc., Elkton, Maryland

FIGURE 1-1

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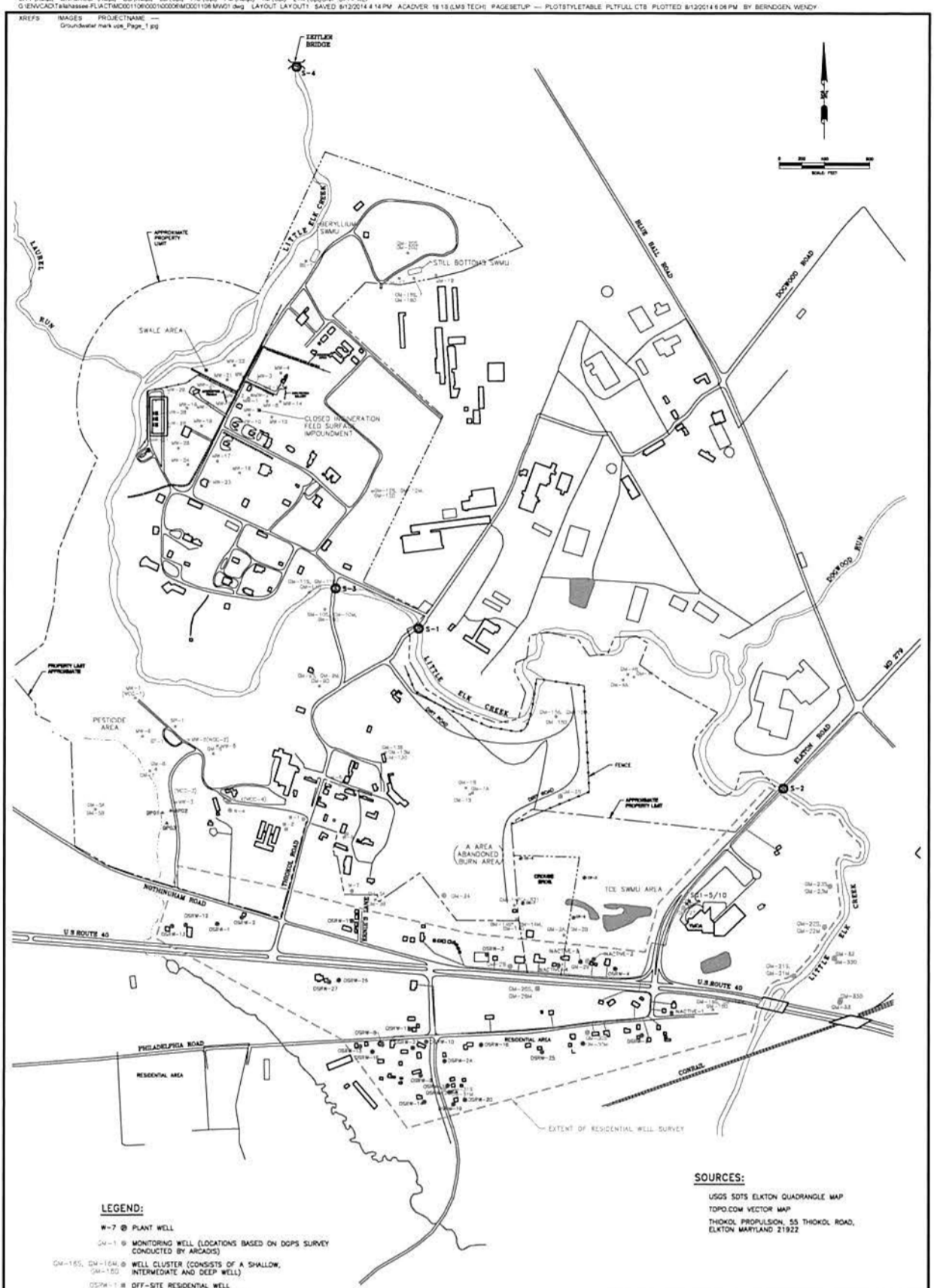

LEGEND:

- W-7 ⊕ PLANT WELL
- GM-1 ⊕ MONITORING WELL (LOCATIONS BASED ON DGPS SURVEY CONDUCTED BY ARCADIS)
- GM-16S, GM-16M, GM-16D ⊕ WELL CLUSTER (CONSISTS OF A SHALLOW, INTERMEDIATE AND DEEP WELL)
- OSPW-1 ⊕ OFF-SITE RESIDENTIAL WELL
- OSPW-20 ● APPROXIMATE LOCATION OF RESIDENTIAL WELL
- APPROXIMATE LOCATION OF WATER LINE
- CR-1 ⊕ APPROXIMATE LOCATION OF MONITORING WELLS ON CROUSE PROPERTY
- S-1 ⊕ SURFACE WATER GAUGE

SOURCES:

USGS 5DTS ELKTON QUADRANGLE MAP

TDPO.COM VECTOR MAP

THIOKOL PROPULSION, 55 THIOKOL ROAD, ELKTON MARYLAND 21922

ATK ELKTON LLC
ELKTON, MARYLAND

MONITORING WELL LOCATIONS

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FIGURE 2