DOCUMENTATION OF ENVIRONMENTAL INDICATOR DETERMINATION

Interim Final 2/5/99

RCRA Corrective Action
Environmental Indicator (EI) RCRIS code (CA725)

Current Human Exposures Under Control

Facility Name:	*Alliant Techsystems Operation (ATK Tactical Systems, Allegany Ballistics Laboratory*
Facility Address:	*210 State Route 956, Rocket Center, West Virginia 26726-3548*
Facility EPA ID#:	*WVO170023691*

1. Has **all** available relevant/significant information on known and reasonably suspected releases to soil, groundwater, surface water/sediments, and air, subject to RCRA Corrective Action (e.g., from Solid Waste Management Units (SWMU), Regulated Units (RU), and Areas of Concern (AOC)), been **considered** in this EI determination?

   _X_ If yes – check here and continue with #2 below.

   _____ If no – re-evaluate existing data, or

   _____ If data are not available skip to #6 and enter "IN" (more information needed) status code

BACKGROUND

Allegany Ballistics Laboratory (ABL) is located in Rocket Center, West Virginia, along the North Branch Potomac River. ABL is comprised of Plant 1 and Plant 2. The United States Navy (Navy) owns Plant 1; all solid waste management units (SWMUs) and areas of concern (AOCs) located within Plant 1 will be addressed pursuant to the January 1998 Federal Facilities Agreement (FFA) between the United States Environmental Protection Agency (EPA) and the Navy. Plant 2 is owned and operated by Alliant Techsystems Company LLC; the SWMUs and AOCs located within Plant 2 will be addressed under the RCRA Corrective Action Program.

Plant 2 comprises of about 56 acres, of which more than half are developed. The land surrounding the facility is primarily rural agricultural and forest. Several residences along US Route 220 in Maryland, 0.5 mile west of the facility, obtain potable water from private wells. In addition, approximately three residences across the North Branch Potomac River from Plant 1 and several residences south of ABL in West Virginia, obtain water from private wells. The latter private well users are separated from the facility by mountains. Potable water for ABL is obtained from water supply wells located in the undeveloped portions of Plant 1, approximately 0.5 mile south of Plant 2.

ABL's primary activities are the development and production of solid propellant rocket motors, gas generators, war heads, and laser initiation systems for the United States Department of Defense (DOD). Other activities conducted at ABL include development and production of metal parts, metal components, and filament wound composite structures, and testing of automobile component products.

In 1942, Kelly Springfield Engineering Company acquired the approximately 400-acres that the process and operations area are located on. The United States Army (Army) purchased the site in 1943. George Washington University assumed management of the facility for the Army Office of Scientific Research and Development in 1944 and conducted research and development activities until 1945. The Navy acquired ownership of the 400-acre Plant 1 portion of the facility in 1945 and the Aerospace Division of Hercules assumed management of the facility. In 1962, the Navy acquired an additional 1,177 acres of undeveloped land adjacent to Plant 1. In 1964, Hercules signed a Facilities Use Contract and began operating ABL under its own direction. In 1967, Hercules purchased 56-acres of land adjoining Plant 1 and built a propellant production facility, the Hercopel Plant (Plant 2). In 1995, Alliant Techsystems, Inc. acquired the Aerospace division of Hercules and assumed operation of ABL.

Currently, approximately 40 buildings exist at Plant 2. More than half of Plant 2 has been developed for operations that currently include rocket motor case preparation, propellant mixing, casting and machining, ammonium perchlorate grinding, and motor finishing. Load and pack operations and product and tooling storage also occur at Plant 2. Primary utilities at Plant 2 include two oil-fired boilers for steam generation and a small wastewater treatment plant for processing of onsite sanitary waste. Although the majority of Plant 2 is located in the 500-year floodplain of the North Branch Potomac River, a dike was constructed to prevent flooding in the event of a 500-year flood.

Definition of Environmental Indicators (for the RCRA Corrective Action)

Environmental Indicators (EI) are measures being used by the RCRA Corrective Action program to go beyond programmatic activity measures (e.g., reports received and approved, etc.) to track changes in the quality of the environment. The two EIs developed to-date indicate the quality of the environment in relation to current human exposures to contamination and the migration of contaminated groundwater. An EI for non-human (ecological) receptors is intended to be developed in the future.

Definition of "Current Human Exposures Under Control" EI

A positive "Current Human Exposures Under Control" EI determination ("YE" status code) indicates that there are no "unacceptable" human exposures to "contamination" (i.e., contaminants in concentrations in excess of appropriate risk-based levels) that can be reasonably expected under current land- and groundwater-use conditions (for all "contamination" subject to RCRA corrective action at or from the identified facility (i.e., site-wide)).

Relationship of EI to Final Remedies

While Final remedies remain the long-term objective of the RCRA Corrective Action program the EI are near-term objectives, which are currently being used as Program measures for the Government Performance and Results Act of 1993, GPRA). The "Current Human Exposures Under Control" EI are for reasonably expected human exposures under current land- and groundwater-use conditions ONLY, and do not consider potential future land- or groundwater-use conditions or ecological receptors. The RCRA Corrective Action program's overall mission to protect human health and the environment requires that Final remedies address these issues (i.e., potential future human exposure scenarios, future land and groundwater uses, and ecological receptors).

Duration / Applicability of EI Determinations

EI Determinations status codes should remain in RCRIS national database ONLY as long as they remain true (i.e., RCRIS status codes must be changed when the regulatory authorities become aware of contrary information).

2. Are groundwater, soil, surface water, sediments, or air **media** known or reasonably suspected to be **"contaminated"**[1] above appropriately protective risk-based "levels" (applicable promulgated standards, as well as other appropriate standards, guidelines, guidance, or criteria) from releases subject to RCRA Corrective Action (from SWMUs, RUs, or AOCs)?

	Yes	No	?	Rationale/Key Contaminants
Groundwater	X			*Plant 2 - Chlorinated volatile organic compounds (VOC), perchlorate, and metals; Plant 1 SWMU 48 – potentially explosives and metals; See Rationale and Reference Section below*
Air (indoors)[2]	X			*Plant 2 - Trichloroethene (TCE) and vinyl chloride; See Rationale and Reference Section below.*
Surface Soil (e.g., <2 ft)	X			*Plant 2 – TCE and arsenic, Plant 1 SWMU 48– RDX; see Rationale and Reference Section below.*
Surface Water	X			*See Rationale and Reference Section below.*
Sediment	X			*See Rationale and Reference Section below.*
Subsurf. Soil (e.g., >2 ft)	X			*Plant 2 – TCE and arsenic; See Rationale and Reference Section below.*
Air (outdoors)	X			*Plant 2 –TCE; See Rationale and Reference Section below.*

_____ If no (for all media) - skip to #6, and enter "YE," status code after providing or citing appropriate "levels," and referencing sufficient supporting documentation demonstrating that these "levels" are not exceeded.

__X__ If yes (for any media) - continue after identifying key contaminants in each "contaminated" medium, citing appropriate "levels" (or provide an explanation for the determination that the medium could pose an unacceptable risk), and referencing supporting documentation.

_____ If unknown (for any media) - skip to #6 and enter "IN" status code.

Rationale:

Groundwater:
Groundwater concentrations from monitoring well samples collected in June and September, 2010, and January, 2012, were compared to United States Environmental Protection Agency (USEPA) Regional Screening Levels (RSL) for tap water and Maximum Contaminant Levels (MCLs). Lead concentrations in groundwater were compared to the USEPA Safe Drinking Water Act lead action level of 15 micrograms per Liter (µg/L). RSLs based on non-carcinogenic effects were divided by 10 to account for exposure to more than one non-carcinogenic constituent that affects the same target organ (i.e., kidney). The results of this comparison (the constituents that exceed the screening level) for Plant 2 groundwater are shown below in Table 1. The key constituent for groundwater criteria exceedances are: chlorinated VOCs; 3-nitrotoluene (detected in one sample); perchlorate; and metals. Although many of the constituents exceed the adjusted RSLs, only a few exceed the MCL (if available) or the unadjusted RSL. Therefore, based on consideration of the MCLs and unadjusted RSLs, the primary constituents for groundwater exceedences include cis-1,2-dichloroethene (cis-1,2-DCE), TCE, vinyl chloride, perchlorate, and metals.

Table 1
Constituents of Potential Concern in Plant 2 Groundwater that Exceed Risk-Based Screening Levels or MCLs

Chemical	Maximum Detection (µg/L)	Sample Qualifier	Location of Maximum Detection	USEPA RSL - Tap Water, Adjusted (µg/L)	MCL (µg/L)
1,1,2-Trichloroethane	3.5E-01	J	ATK-GW-10A-0610	4.1E-02	5.0E+00
Carbon disulfide	2.5E+02		ATK-GW-10A-0910	7.2E+01	NA
Chloroform	2.7E-01	J	ATK-GW-02A-0910	1.9E-01	8.0E+01
cis-1,2-Dichloroethene	5.5E+03		ATK-GW-10A-0112	2.8E+00	7.0E+01
trans-1,2-Dichloroethene	8.8E+01		ATK-GW-10A-0610	8.6E+00	1.0E+02
Trichloroethene	3.4E+03		ATK-GW-10A-0610	2.6E-01	5.0E+00
Vinyl chloride	4.7E+02		ATK-GW-10A-0610	1.50E-02	2.0E+00
Bis (2-ethylhexyl) phthalate	5.3E+00	J	ATK-GW-07B-S-0610	7.1E-02	6.0E+00
3-Nitrotoluene	9.1E-01	J	ATK-GW-05A-0112	1.3E-01	NA
Perchlorate	8.1E+00		ATK-GW-02A-0610	1.1E+00	NA
Aluminum, total	2.9E+04		ATK-GW-04A-0610	1.6E+03	NA
Antimony, total	5.6E+00		ATK-GW-04A-0610	6.0E-01	6.0E+00
Antimony, dissolved	8.1E-01	J	ATK-GW-01B-D-0910	6.0E-01	6.0E+00
Arsenic, total	1.8E+02		ATK-GW-04A-0610	4.5E-02	1.0E+01
Arsenic, dissolved	2.1E+01		ATK-GW-03A-0910	4.5E-02	1.0E+01
Barium, total	5.5E+04		ATK-GW-08B-D-0112	2.9E+02	2.0E+03
Barium, dissolved	4.2E+04		ATK-GW-08B-D-0112	2.9E+02	2.0E+03
Beryllium, total	3.1E+00		ATK-GW-04A-0610	1.6E+00	4.0E+00
Cadmium, total	1.1E+00	K	ATK-GW-05A-0112	6.9E-01	5.0E+00
Cadmium, dissolved	4.0E+00		ATK-GW-10B-D-0910	6.9E-01	5.0E+00
Chromium, total	6.8E+01		ATK-GW-04A-0610	3.1E-02	1.0E+02
Chromium, dissolved	4.5E+00	J	ATK-GW-10A-0910	3.1E-02	1.0E+02
Cobalt, total	3.2E+01		ATK-GW-04A-0610	4.7E-01	NA
Cobalt, dissolved	8.0E+00	J	ATK-GW-08B-D-0910	4.7E-01	NA
Iron, total	1.1E+05	J	ATK-GW-05A-0112	1.1E+03	NA
Iron, dissolved	2.2E+04		ATK-25F-GW03-0610	1.1E+03	NA
Lead, total	4.3E+01		ATK-GW-04A-0610	NA	1.5E+01
Manganese, total	1.5E+04		ATK-GW-10A-0910	3.2E+01	NA
Manganese, dissolved	1.5E+04		ATK-GW-10A-0910	3.2E+01	NA
Nickel, total	7.9E+01		ATK-GW-04A-0610	3.0E+01	NA
Selenium, dissolved	1.1E+01		ATK-GW-10A-0910	7.8E+00	5.0E+01
Thallium, total	2.5E+00		ATK-GW-04A-0610	1.6E-02	2.0E+00
Thallium, dissolved	7.6E-02	J	ATK-GW-09B-0112	1.6E-02	2.0E+00

Table 1
Constituents of Potential Concern in Plant 2 Groundwater that Exceed Risk-Based Screening Levels or MCLs

Chemical	Maximum Detection (µg/L)	Sample Qualifier	Location of Maximum Detection	USEPA RSL - Tap Water, Adjusted (µg/L)	MCL (µg/L)
Vanadium, total	5.4E+01		ATK-GW-04A-0610	7.8E+00	NA
Vanadium, dissolved	9.3E+00	J	ATK-GW-01B-D-0910	7.8E+00	NA

µg/L – micrograms per Liter

Vapor Intrusion:
Vapor intrusion was evaluated for Plant 2 using USEPA's Vapor Intrusion Screening Level (VISL) Calculator Version 1 (November 2011 version). VISLs were calculated for the constituents detected in the shallow monitoring wells (monitoring wells with a maximum depth to the bottom of the screen of 23.5 feet below ground surface) that are considered to be volatile. The results of this comparison are shown below in Table 2 for the constituents that exceed the screening level.

Table 2
Constituents of Potential Concern in Plant 2 Groundwater that Exceed Risk-Based Screening Levels for Vapor Intrusion to Indoor Air

Chemical	Maximum Detection (µg/L)	Sample Qualifier	Location of Maximum Detection	Groundwater VISL (µg/L	MCL (µg/L)
Trichloroethene	3.4E+03		ATK-GW-10A-0610	3.4E+00	5.0E+00
Vinyl Chloride	4.7E+02		ATK-GW-10A-0610	3.2E+00	2.0E+00

µg/L – micrograms per Liter

A Phase I Vapor Intrusion (VI) investigation at Plant 2 was conducted in January 2013 to investigate the potential VI pathways under current and future industrial land use conditions. Buildings 2000, 2008, and 2011 were selected for VI sampling in Phase 1. Indoor air, outdoor air, and subslab soil gas samples were collected at each building to assess if the VI pathway is potentially complete and significant (i.e., resulting in indoor air VOC concentrations above regulatory screening levels) at the buildings. The investigation concluded that VI is not occurring and is not significant at Buildings 2000 and 2011 under current building use. Therefore, further investigation of the VI pathway is not recommended Buildings 2000 and 2011; however, VI is potentially occurring at Building 2008 under current building use and conditions. Additional indoor air sampling, involving one indoor air sample in the main portion of the building and one indoor air sample in the control room was recommended for Building 2008.

Building 2000: The building slab is approximately 20-inches-thick, which is more than three-times thicker than the standard 4 to 6-inch building slab. The building has a large interior volume created by the 20-foot-high ceiling, and outdoor air exchange occurs through the HVAC system, which generates observable air flow. One subslab soil gas sample was collected at Building 2000; trichloroethene (TCE) was measured at a concentration less than 1.1 times above the SGSL, based on a 10^{-6} estimated lifetime cancer risk (ELCR) and below the SGSL based on a 10^{-4} ELCR. Two indoor air samples were collected at Building 2000; there were no concentrations of VOCs that were measured above the IASLs in either of the indoor air samples. Even though TCE was measured in subslab soil gas above the lowest SGSL, the VI pathway is currently not complete or significant because TCE was not detected in either indoor air sample; additionally, there is not a significant soil gas source beneath the building.

Building 2008: The building slab is approximately 20-inches-thick, which is more than three times thicker than the standard 4 to 6-inch building slab. The building is one large interior space, and the ceiling is approximately

20-feet-high, creating a large interior volume. Outdoor air exchange occurs through the HVAC system, which generates observable air flow and the passive vent above the man-door on the west side. The roll-up bay door may be open while the building is being occupied, which would generate even more outdoor air exchange. One subslab soil gas sample was collected at Building 2008 ; TCE was measured at a concentration approximately 10-times greater than the SGSL based on a 10^{-4} ELCR, and approximately 340-times greater than the SGSL based on a HQ of 1. One indoor air sample was collected at Building 2008; TCE was measured at a concentration approximately 1.2-times above the IASL based on a 10^{-4} ELCR, and less than the IASL based on a HQ of 1. TCE was not detected in any of the three outdoor air samples.

Building 2011: The building has a large interior volume, created by the 23-foot high ceiling, and outdoor air exchange occurs through the HVAC system, which generates observable air flow. The roll-up bay doors may be open while the building is being occupied, which would generate even more outdoor air exchange. Two subslab soil gas samples were collected at Building 2011; neither sample had concentrations of VOCs that were above SGSLs. Two indoor air samples were collected at Building 2011; there were no concentrations of VOCs that were measured above the IASLs in either of the indoor air samples.

Surface Soil and Subsurface Soil:
Surface soil and subsurface soil samples were collected at Plant 2 in December 2005, January 2006, April 2006, and November 2006. Plant 2 surface soil and subsurface soil concentrations were compared to Industrial Soil RSLs. RSLs based on non-carcinogenic effects were divided by 10 to account for exposure to more than one non-carcinogenic constituent that affects the same target organ. The results of these comparisons for Plant 2 surface soil and subsurface soil are shown below in Tables 3 and 4, respectively. Surface soil and subsurface soil concentrations above the screening values are associated with TCE, arsenic, chromium, and thallium (subsurface soil only). Total chromium concentrations were conservatively compared to the hexavalent chromium RSL. Chromium occurs naturally in soil primarily in the trivalent and hexavalent states. The relative abundance of chromium in these different states depends upon several soil characteristics, including pH, reduction and oxidation potential, soil organic matter content, soil moisture content, and iron and manganese concentrations. In general, hexavalent chromium is less stable in soil than trivalent chromium, and in most soils, chromium is found primarily in the trivalent state. Arsenic was detected throughout the facility at similar concentrations, and is likely associated with background conditions at ABL. Thallium was not detected in the surface soil samples, and was only detected in 2 of the 20 subsurface soil samples. Therefore, the primary constituents of potential concern for worker exposure to Plant 2 soil include TCE and arsenic. TCE exceedences occurred in soil samples collected at Plant 2 SWMU 25F, SWMU 37S02, SWMU 37U02, and SWMU 37T02. Arsenic exceedences occur throughout Plant 2, and are likely associated with background conditions.

Table 3
Constituents of Potential Concern in Plant 2 Surface Soil that Exceed Risk-Based Screening Levels

Chemical	Maximum Detection (mg/kg)	Sample Qualifier	Location of Maximum Detection	ABL Plant 1 Background Value (mg/kg)	USEPA RSL - Industrial Soil, Adjusted (mg/kg)
Trichloroethene	8.3E+01		ATK-37T02-SS06-0001	NA	2.0E+00
Arsenic	2.1E+01	L	ATK-24FF-SS07	1.09E+01	1.6E+00
Chromium	3.3E+01		ATK-24FF-SS07	1.3E+01	5.6E+00

mg/kg - milligrams per kilogram

Table 4
Constituents of Potential Concern in Plant 2 Subsurface Soil that Exceed Risk-Based Screening Levels

Chemical	Maximum Detection (mg/kg)	Sample Qualifier	Location of Maximum Detection	ABL Plant 1 Background Value (mg/kg)	USEPA RSL - Industrial Soil, Adjusted (mg/kg)
Trichloroethene	1.0E+02		ATK-37U02-SR-SS01	NA	2.0E+00

Table 4
Constituents of Potential Concern in Plant 2 Subsurface Soil that Exceed Risk-Based Screening Levels

Arsenic	1.9E+01	ATK-37S02-SR-SS01	1.09E+01	1.6E+00
Chromium	3.3E+01	ATK-37S02-SR-SS01	1.3E +01	5.6E+00
Thallium	3.5E+00	ATK-37T02-SR-SS03	NA	1.0E+00

mg/kg - milligrams per kilogram

Surface Water:
Surface water samples were collected from the drainage ditch system at Plant 2 in December 2005, January 2006, and November 2006 to evaluate if the potential source areas have resulted in contamination of surface water in the drainage ditch system. The surface water samples were conservatively compared to tap water RSLs divided by 10 for non-carcinogens to account for exposure to more than one non-carcinogenic constituent with the same target organ/effect and multiplied by 10 since exposure to surface water in drainage ditches is much less than exposure to groundwater used as a potable water supply, which is the basis for the tap water RSLs. The results of the comparison of the surface water data to these criteria are shown below in Table 5. The majority of the constituents listed in Table 5 as exceeding the screening criteria are generally within an order of magnitude of the criteria, with the exception of two metals: arsenic and chromium, which were detected throughout the drainage ditch system and are likely associated with background conditions.

Table 5
Constituents of Potential Concern in Plant 2 Surface Water that Exceed Conservative Risk-Based Screening Levels

Chemical	Maximum Detection (µg/L)		Location of Maximum Detection	USEPA RSL – 10 x Tap Water, Adjusted (µg/L)
Chloroform	7.3E+00	J	ATK-PL2-R2-SW18	1.9E+00
Dibromochloromethane	1.6E+00	J	ATK-PL2-SW05	1.5E+00
Trichloroethene	8.0E+00	J	ATK-PL2-R2-SW12	2.6E+00
bis(2-Ethylhexyl)phthalate	5.4E+00		ATK-PL2-SW02	7.1E-01
Perchlorate	5.7E+02		ATK-37T02-SW03	1.1E+01
Arsenic	6.2E+01		ATK-37T02-SW03	4.5E-01
Chromium	1.6E+01		ATK-37T02-SW03	3.1E-01
Cobalt	9.6E+00	J	ATK-37T02-SW03	4.7E+00
Iron	1.7E+04		ATK-37T02-SW03	1.1E+04
Lead	2.6E+01		ATK-37T02-SW03	1.5E+01
Manganese	2.9E+03		ATK-37T02-SW03	3.2E+02

µg/L – micrograms per Liter

Sediment Samples:
Sediment samples were collected from the drainage ditch system at Plant 2 in December 2005, January 2006, and November 2006 to evaluate if the potential source areas have resulted in contamination of sediment in the drainage ditch system at the site. The sediment samples were compared to Industrial Soil RSLs adjusted (divided) by 10 for non-carcinogens to account for exposure to more than one non-carcinogenic constituent with the same target organ. The results of the comparison of sediment data to these criteria are shown below in Table 6. Three metals were detected at a concentration above the screening level: arsenic, chromium, and cobalt. Arsenic was detected at concentrations above the screening level throughout the drainage ditch system and is likely associated with background conditions. Chromium concentrations were conservatively compared

to the hexavalent chromium RSL. The detected concentrations of chromium do not exceed the trivalent chromium (the likely form of the chromium) industrial soil RSL. Only 1 of the 12 detected concentrations of cobalt exceeds the screening level. Additionally, contact with sediment by current populations at Plant 2, industrial workers, is minimal. Use of the industrial soil RSL to screen the sediment data is very conservative since exposure to sediment in the drainage ditches is much less frequent than exposure to soil.

Table 6
Constituents of Potential Concern in Plant 2 Sediment that Exceed Risk-Based Screening Levels

Chemical	Maximum Detection (mg/kg)	Sample Qualifier	Location of Maximum Detection	USEPA RSL - Industrial Soil, Adjusted (mg/kg)
Arsenic	1.5E+01		ATK-PL2-R2-SD18	1.6E+00
Chromium	2.4E+01		ATK-PL2-SD04	5.6E+00
Cobalt	4.1E+01		ATK-PL2-SD07	3.0E+01

mg/kg - milligrams per kilogram

Table 7
Constituents of Potential Concern in Plant 1, Building 344 Area Sediment that Exceed Risk-Based Screening Levels

Chemical	Maximum Detection (mg/kg)	Sample Qualifier	Location of Maximum Detection	USEPA RSL - Industrial Soil (mg/kg)
Arsenic	4.3E+02		27A-40SD	1.6E+00
Chromium	6.4E+01		27A-40SD	5.6E+00

mg/kg - milligrams per kilogram

Table 8
Constituents of Potential Concern in Plant 1, former Building 252 Area (SMWU 34A) Sediment that Exceed Risk-Based Screening Levels

Chemical	Maximum Detection (mg/kg)	Sample Qualifier	Location of Maximum Detection	USEPA RSL - Industrial Soil, Adjusted (mg/kg)
Benzo(a)pyrene	2.5E+00		27A-47-SD	2.1E-01
Benzo(b)fluoranthene	2.4E+00		27A-47-SD	2.1E+00
Dibenz(a,h)anthracene	7.9E-01		27A-47-SD	2.1E-01
Indeno(1,2-cd)pyrene	2.5E+00		27A-47-SD	2.1E+00
Arsenic	9.8E+00		27A-47-SD	1.6E+00
Chromium	2.3E+01		27A-47-SD	5.6E+00

mg/kg - milligrams per kilogram

Outdoor Air:

Outdoor air (ambient air) concentrations in fugitive dust and volatile emissions from soil were modeled from the maximum concentrations detected in soil using methods in EPA's Soil Screening Guidance: Technical Background Document (USEPA, 1996). These modeled values were compared with Industrial Air RSLs, adjusted for non-carcinogens by dividing the RSLs based on non-carcinogenic effects by 10. The results of this comparison (the constituents that exceed the screening level) are shown below in Table 9. Only the modeled ambient air concentration of TCE at Plant 2 was above the Ambient Air RBC.

Table 9
Constituents of Potential Concern in Plant 2 Modeled Ambient Air Concentrations that Exceed Risk-Based Screening Levels

Chemical	Maximum Detection (ug/m^3)	Location of Maximum Detection	USEPA RSL - Industrial Soil, Adjusted (ug/m^3)
Trichloroethene	3.7E+01	ATK-37U02-SR-SS01	8.8E-01

ug/m^3 – micrograms per cubic meter

Reference(s):

Footnotes:

[1] "Contamination" and "contaminated" describes media containing contaminants (in any form, NAPL and/or dissolved, vapors, or solids, that are subject to RCRA) in concentrations in excess of appropriately protective risk-based "levels" (for the media, that identify risks within the acceptable risk range).

[2] Recent evidence (from the Colorado Dept. of Public Health and Environment, and others) suggest that unacceptable indoor air concentrations are more common in structures above groundwater with volatile contaminants than previously believed. This is a rapidly developing field and reviewers are encouraged to look to the latest guidance for the appropriate methods and scale of demonstration necessary to be reasonably certain that indoor air (in structures located above (and adjacent to) groundwater with volatile contaminants) does not present unacceptable risks.

3. Are there **complete pathways** between "contamination" and human receptors such that exposures can be reasonably expected under the current (land- and groundwater-use) conditions?

Summary Exposure Pathway Evaluation Table

	Potential **Human Receptors** (Under Current Conditions)						
Contaminated Media	Residents	Workers	Day-Care	Construction	Trespassers	Recreation	Food[3]
Groundwater	***No***	***No***	***No***	***Yes***	***No***	***No***	***No***
Air (indoors)	***No***	***Yes***	***No***	***No***	***No***	***No***	***No***
Soil (surface, e.g., <2 ft)	***No***	***Yes***	***No***	***Yes***	***No***	***No***	***No***
Surface Water	***No***	***Yes***	***No***	***Yes***	***No***	***No***	***No***
Sediment	***No***	***Yes***	***No***	***Yes***	***No***	***No***	***No***
Soil (subsurface e.g., >2 ft)	***No***	***No***	***No***	***Yes***	***No***	***No***	***No***
Air (outdoors)	***No***	***Yes***	***No***	***Yes***	***No***	***No***	***No***

Instructions for Summary Exposure Pathway Evaluation Table:

1. Strike-out specific Media including Human Receptors' spaces for Media which are not "contaminated" as identified in #2 above.
2. Enter "yes" or "no" for potential "completeness" under each "Contaminated" Media – Human Receptor combination (Pathway).

Note: In order to focus the evaluation to the most probable combinations some potential "Contaminated" Media - Human Receptor combinations (Pathways) do not have check spaces ("___"). While these combinations may not be probable in most situations they may be possible in some settings and should be added as necessary.

_____ If no (pathways are not complete for any contaminated media-receptor combination) - skip to #6, and enter "YE" status code, after explaining and/or referencing condition(s) in-place, whether natural or man-made, preventing a complete exposure pathway from each contaminated medium (e.g., use optional Pathway Evaluation Work Sheet to analyze major pathways).

__X__ If yes (pathways are complete for any "Contaminated" Media - Human Receptor combination) - continue after providing supporting explanation.

_____ If unknown (for any "Contaminated" Media - Human Receptor combination) - skip to #6 and enter "IN" status code

Rationale and Reference(s):

Plant 2 is fenced and access to ABL is through a guarded gate. Trespassers would not be able to access the site since the facility is surrounded by a fence with a guarded gate and security cameras. The only potential receptors are site workers (including potential construction workers) and visitors. These are the only human receptors that could be exposed variously to site soil, surface water, sediment, groundwater, indoor air, or outdoor air.

Plant 2 is currently an operating facility; therefore, industrial workers could come in contact with surface soil, surface water, sediment, indoor air, and ambient air at the SWMUs/AOCs. Although industrial workers could be exposed to surface water and sediment, based on the activities they perform at the site, exposure to surface water and sediment would likely be minimal. Industrial workers are not involved in activities that would result in exposure to subsurface soil. There are buildings at Plant 2 within 100 feet of contaminated shallow groundwater; therefore, there is the potential for vapor intrusion from shallow groundwater into these buildings and potential exposure by the workers to indoor air.

There is no current ongoing construction work at any of the areas evaluated in the EI; however, if construction were to occur, the construction workers could be exposed to contaminants in shallow groundwater, surface soil, subsurface soil, ambient air, surface water, and sediment depending on the types of construction activities and the location of the construction.

There are no potable water supply wells at Plant 2.

[3] Indirect Pathway/Receptor (e.g., vegetables, fruits, crops, meat and dairy products, fish, shellfish, etc.)

4 Can the **exposures** from any of the complete pathways identified in #3 be reasonably expected to be **"significant"**[4] (i.e., potentially "unacceptable" because exposures can be reasonably expected to be: 1) greater in magnitude (intensity, frequency and/or duration) than assumed in the derivation of the acceptable "levels" (used to identify the "contamination"); or 2) the combination of exposure magnitude (perhaps even though low) and contaminant concentrations (which may be substantially above the acceptable "levels") could result in greater than acceptable risks)?

_X_ If no (exposures cannot be reasonably expected to be significant (i.e., potentially "unacceptable") for any complete exposure pathway) - skip to #6 and enter "YE" status code after explaining and/or referencing documentation justifying why the exposures (from each of the complete pathways) to "contamination" (identified in #3) are not expected to be "significant."

_____ If yes (exposures could be reasonably expected to be "significant" (i.e., potentially "unacceptable") for any complete exposure pathway) - continue after providing a description (of each potentially "unacceptable" exposure pathway) and explaining and/or referencing documentation justifying why the exposures (from each of the remaining complete pathways) to "contamination" (identified in #3) are not expected to be "significant."

_____ If unknown (for any complete pathway) - skip to #6 and enter "IN" status code

Rationale and Reference(s):

On-Site Worker Scenario:

Surface Soil - Three constituents were detected in Plant 2 surface soil at concentrations greater than the industrial soil RSLs: arsenic, chromium, and TCE. Of these three, TCE is the only site-related constituent; the other two are most likely associated with background conditions. Concentrations of TCE detected in subsurface soil samples collected at SWMUs 25F, 37S02, 37T02, and 37U02 exceed the screening level. Non-carcinogenic hazards and carcinogenic risks were calculated for an industrial worker exposed to these three constituents following standard EPA risk assessment methodology and practices. Current toxicity values (non-carcinogenic reference doses and carcinogenic slope factors) from Integrated Risk Information System (IRIS) and New Jersey Department of Environmental Protection (hexavalent chromium carcinogenic slope factor) and default exposure parameters from EPA exposure factors guidance documents were used to calculate the risk. The 95 percent upper confidence limit (UCL) on the mean concentration using all of the Plant 2 surface soil samples was calculated as the exposure point concentration. The calculated non-carcinogenic hazard index (HI = 0.2) and carcinogenic risk (CR = $2x10^{-5}$) for an industrial worker exposed to the surface soil through incidental ingestion and dermal contact are below EPA's acceptable non-carcinogenic hazard index of 1 and within the acceptable carcinogenic risk range of 10^{-6} to 10^{-4}.

Indoor Air - At Building 2000, one subslab soil gas sample was collected and trichloroethene (TCE) was measured at a concentration less than 1.1 times above the SGSL, based on a 10^{-6} estimated lifetime cancer risk (ELCR) and below the SGSL based on a 10^{-4} ELCR. Two indoor air samples were collected and there were no concentrations of VOCs that were measured above the IASLs in either of the indoor air samples. VI is not occurring and is not significant at Buildings 2000 under current building use. At Building 2011, two subslab soil gas samples were collected and neither sample had concentrations of VOCs that were above SGSLs. Two indoor air samples were collected and there were no concentrations of VOCs that were measured above the IASLs in either of the indoor air samples. VI is not occurring and is not significant at Buildings 2011 under current building use. At Building 2008, the building is one large interior space and the building slab is approximately 20-inches-thick. The ceiling is approximately 20-feet-high, creating a large interior volume. Outdoor air exchange occurs through the HVAC system, which generates observable air flow and the passive vent above the man-door on the west side. Additionally, the roll-up bay door may be open while the building is being occupied, which would generate even more outdoor air exchange.

Outdoor Air –Outdoor air (ambient air) concentrations in fugitive dust and volatile emissions from soil were modeled from the maximum concentrations detected in soil using methods in EPA's Soil Screening Guidance. These modeled values were compared with EPA Industrial Air RSLs, adjusted for non-carcinogens by dividing the RSLs based on non-carcinogenic effects by 10. Only the modeled ambient air concentration of TCE at Plant 2 was above the Ambient Air RSL, and only for 2 of the 19 surface soil samples, one collected at SWMU

37U02 and the other at SWMU 37T02. Buildings, gravel, asphalt, and/or concrete cover a large portion of the facility, which inhibits the release of particulates and volatiles associated with soil into the atmosphere. Based on the small number of exceedences and the limited area for release of particulates and volatiles, outdoor air in not expected to result in any unacceptable exposures.

Surface Water – Eleven constituents were detected in Plant 2 surface water at concentrations greater than the conservative screening level: chloroform, dibromochloromethane, TCE, bis(2-ethylhexyl)phthalate, perchlorate, arsenic, chromium, cobalt, iron, lead, and manganese. The exposure frequency (number of days per year exposed), ingestion rate of surface water, and dermal contact rate for surface water by Plant 2 industrial workers would result in exposures to surface water much lower than one tenth of the rate of exposure for groundwater used as a potable water supply (or the tap water RSL multiplied by 10), which was the surface water screening values. An industrial worker at ABL would only be exposed to the surface water for a few days per year, when performing maintenance on the ditches. Assuming exposure for a maximum of 2 weeks per year (compared to 350 days per year assumed for potable groundwater), ingestion of 0.01 liters of surface water a hour (ingestion rate more applicable to surface water while wading or swimming) for 8 hours per day (compared to the 2 liters per day assumed for potable groundwater ingestion), and dermal contact of the legs, feet, lower arms, and hands with the surface water (compared to the full body surface area assumed for groundwater while bathing), exposure to surface water would not result in non-carcinogenic hazards or carcinogenic risks above EPA acceptable levels.

Sediment – Three constituents were detected in Plant 2 sediment at concentrations greater than the conservative sediment screening value, the EPA industrial soil RSLs: arsenic, chromium, and cobalt. Based on the conservative nature of the screening levels as they apply to sediment in the drainage ditches, the more realistic level of exposure expected for the sediment, and that the concentrations in sediment are only slightly above the screening level, the concentrations present in drainage ditch sediment are expected to be below levels of concern for potential site workers. The screening levels are based on a carcinogenic risk of 10^{-6} and a non-carcinogenic hazard index of 0.1. Only two of the three constituents are carcinogenic: arsenic and chromium, and their maximum detected concentrations are within an order of magnitude of the screening level, indicating the carcinogenic risk would fall within EPA's acceptable carcinogenic risk range of 10^{-6} to 10^{-4}, even when using the conservative screening levels. All three of the constituents have different target organs, indicating that the cumulative non-carcinogenic hazard to a target organ would be below EPA's acceptable hazard index of 1.

Construction Worker Scenario:

Surface Soil - Three constituents were detected in Plant 2 surface soil at concentrations greater than the EPA industrial soil RSLs: arsenic, chromium, and TCE. Of these three, TCE is the only site-related constituent, the other two are most likely associated with background conditions. As shown in Table 2, the maximum detected chromium concentration is below the WVDEP background chromium concentration. The maximum detected arsenic concentration exceeds the WVDEP background arsenic concentration. Concentrations of TCE detected in subsurface soil samples collected at SWMUs 25F, 37S02, 37T02, and 37U02 exceed the screening level. Non-carcinogenic hazards and carcinogenic risks were calculated for a construction worker exposed to these three constituents in surface soil following standard EPA risk assessment methodology. Current toxicity values (non-carcinogenic reference doses and carcinogenic slope factors) from EPA's IRIS database and New Jersey Department of Environmental Protection (hexavalent chromium carcinogenic slope factor) and default exposure parameters from EPA exposure factors guidance documents were used to calculate the risk. The 95 percent upper confidence limit on the mean concentration using all of the Plant 2 surface soil samples was calculated as the exposure point concentration. The calculated non-carcinogenic hazard index (HI = 0.5) and carcinogenic risk (CR = $2x10^{-6}$) for a construction worker exposed to the surface soil through incidental ingestion and dermal contact are below EPA's acceptable non-carcinogenic hazard index of 1 and within the acceptable carcinogenic risk range of 10^{-6} to 10^{-4}.

Subsurface Soil – Four constituents were detected in Plant 2 subsurface soil at concentrations greater than the EPA industrial soil RSLs: arsenic, chromium, thallium, and TCE. Of these four, TCE is the only site-related constituent, the other three are most likely associated with background conditions. As shown in Table 2, the maximum detected chromium concentration is below the WVDEP background chromium concentration. The maximum detected arsenic concentration exceeds the WVDEP background arsenic concentration. Thallium was detected in 2 of the 20 subsurface soil samples and was not detected in any of the surface soil samples. Concentrations of TCE detected in subsurface soil samples collected at SWMUs 25F, 37S02, 37T02, and 37U02 exceed the screening level. Non-carcinogenic hazards and carcinogenic risks were calculated for a construction worker exposed to these four constituents in surface soil following standard EPA risk assessment

methodology. Current toxicity values (non-carcinogenic reference doses and carcinogenic slope factors) from EPA's IRIS database, EPA's Provisional Peer Reviewed Toxicity Values database (thallium non-carcinogenic reference dose) , and New Jersey Department of Environmental Protection (hexavalent chromium carcinogenic slope factor), and default exposure parameters from EPA exposure factors guidance documents were used to calculate the risk. The 95 percent upper confidence limit on the mean concentration using all of the Plant 2 subsurface soil samples was calculated as the exposure point concentration. The calculated non-carcinogenic hazard index (HI = 1) and carcinogenic risk (CR = $2x10^{-6}$) for a construction worker exposed to the subsurface soil through incidental ingestion and dermal contact does not exceed USEPA's acceptable non-carcinogenic hazard index of 1 and is within the acceptable carcinogenic risk range of 10^{-6} to 10^{-4}.

Outdoor Air – As discussed for Question 2, outdoor air (ambient air) concentrations in fugitive dust and volatile emissions from soil were modeled from the maximum concentrations detected in soil using methods in USEPA's Soil Screening Guidance. These modeled values were compared with USEPA Industrial Air RSLs, adjusted for non-carcinogens by dividing the RSLs based on non-carcinogenic effects by 10. The modeled ambient air concentration of TCE at Plant 2 was above the Ambient Air RSL for 2 of the 19 surface soil samples and 9 of the 30 subsurface soil samples. Buildings, gravel, asphalt, and/or concrete cover a large portion of the facility, which inhibits the release of particulates and volatiles associated with soil into the atmosphere. Based on the small number of exceedences and the limited area for release of particulates and volatiles, outdoor air in not expected to result in any unacceptable exposures.

Groundwater - Comparison of constituent concentrations in groundwater to screening levels indicated exceedences of the screening levels. The screening levels were based on potable use of groundwater, which is very conservative for a construction worker exposure scenario. However, due to the elevated concentrations of TCE in groundwater, there are some locations at Plant 2, such as near MW-10A, where exposure to groundwater by construction workers in an open excavation could result in unacceptable risks if proper health and safety precautions are not observed during construction activities. However, proper health and safety precautions could easily be taken to mitigate the unacceptable risks.

Surface Water –As discussed for the industrial worker, 11 constituents were detected in Plant 2 surface water at concentrations greater than the conservative screening level: chloroform, dibromochloromethane, TCE, bis(2-ethylhexyl)phthalate, perchlorate, arsenic, chromium, cobalt, iron, lead, and manganese. The exposure frequency (number of days per year exposed), exposure duration (number of years exposed), ingestion rate of surface water, and dermal contact rate for surface water by Plant 2 construction workers would result in exposure much lower than one tenth of the rate of exposure for groundwater used as a potable water supply (the tap water RSL multiplied by 10), which was the surface water screening values. A construction worker at ABL would be exposed to surface water for less than 1 year, and would only be exposed to the surface water for a few weeks per year when performing construction activities near the ditches. Assuming exposure for 8 hours per day for 4 weeks (instead of 350 days per year assumed for potable groundwater), exposure for 1 year (instead of the 24 assumed for potable groundwater), ingestion of 0.01 liters of surface water an hour (based on ingestion of surface water while wading or swimming) for 8 hours per day (instead of the 2 liters per day assume for potable groundwater ingestion), and dermal contact with the legs, feet, lower arms, and hands (instead of the full body assumed for groundwater while bathing), exposure to surface water would not result in any non-carcinogenic hazard or carcinogenic risks above EPA acceptable levels.

Sediment – As discussed above for the industrial worker, three constituents were detected in Plant 2 sediment at concentrations greater than the conservative sediment screening value, the USEPA industrial soil RSLs, as presented in Question 2: arsenic, chromium, and cobalt. Based on the conservative nature of the screening levels as they apply to sediment in the drainage ditches, the more realistic level of exposure expected, and that the concentrations in sediment are only slightly above the screening level, the concentrations present in drainage ditch sediment are expected to be below levels of concern for potential construction workers. The screening levels are based on a carcinogenic risk of 10^{-6} and a non-carcinogenic hazard index of 0.1. Only two of the three constituents, arsenic and chromium, are carcinogenic, and their maximum detected concentrations are within an order of magnitude of the screening level, indicating the carcinogenic risk would fall within USEPA's acceptable carcinogenic risk range of 10^{-6} to 10^{-4}. All three of the constituents have different target organs, indicating that the cumulative non-carcinogenic hazard for all target organs would be below USEPA's acceptable hazard index of 1.

[4] If there is any question on whether the identified exposures are "significant" (i.e., potentially "unacceptable") consult a human health Risk Assessment specialist with appropriate education, training and experience.

5 Can the "significant" **exposures** (identified in #4) be shown to be within **acceptable** limits?

X If yes (all "significant" exposures have been shown to be within acceptable limits) - continue and enter "YE" after summarizing and referencing documentation justifying why all "significant" exposures to "contamination" are within acceptable limits (e.g., a site-specific Human Health Risk Assessment).

_____ If no (there are current exposures that can be reasonably expected to be "unacceptable") - continue and enter "NO" status code after providing a description of each potentially "unacceptable" exposure.

_____ If unknown (for any potentially "unacceptable" exposure) - continue and enter "IN" status code

Rationale and Reference(s):

The foreseeable use of Plant 2 will continue to be industrial. Additionally, there are no potable water supply wells at Plant 2; therefore, groundwater at the facility is not used as a potable water resource. The buildings at Plant 2 are not "typical" industrial buildings (e.g., many have bay doors that are often open) and these buildings are all not occupied 8 hours per day for 5 days per week.

On-site workers can be potentially exposed to constituents in groundwater in the event of a construction project, utility repair, or other activity that requires excavation. Although some VOCs, SVOCs, metals exceed RSLs for groundwater, the limited duration and frequency of exposure result in the potential exposure being considered insignificant. Proactive measures such as a Health and Safety Plan (HASP) and site health and safety practices adhered to by on-site workers and excavation workers would greatly reduce the possibility of exposure to impacted groundwater.

Construction workers/contractor can be potentially exposed to constituents in groundwater during subsurface excavations during a construction project, utility repair, or during groundwater sampling. Adherence to safe work practices established in site-specific health and safety plans and implementation of administrative controls (e.g., personal protective equipment) would ensure that potential exposures are within acceptable limits.

6. Check the appropriate RCRIS status codes for the Current Human Exposures Under Control EI event code (CA725), and obtain Supervisor (or appropriate Manager) signature and date on the EI determination below (and attach appropriate supporting documentation as well as a map of the facility):

X YE - Yes, "Current Human Exposures Under Control" has been verified. Based on a review of the information contained in this EI Determination, "Current Human Exposures" are expected to be "Under Control" at the ***Allegany Ballistics Laboratory*** facility, EPA ID ***WVO170023691***, located at ***210 State Route 956, Rocket Center, West Virginia 26726-3548*** under current and reasonably expected conditions. This determination will be re-evaluated when the Agency/State becomes aware of significant changes at the facility.

_____ NO - "Current Human Exposures" are NOT "Under Control."

_____ IN - More information is needed to make a determination.

Completed by: (signature) _____ Date: _____

(print) Catherine Guynn

(title) Project Manager

Supervisor: (signature) _____ Date: 8/13/2013

(print) Charles Armstead

(title) RCRA CA Program Manager

(State) West Virginia

Locations where References may be found:

West Virginia Department of Environmental Protection
601 57th St. S.E.
Charleston, WV 25304
(304) 926-0499

Contact telephone and e-mail numbers

(name) Catherine Guynn

(phone #) (304) 926-0499 ext. 1288

(e-mail) catherine.n.guynn@wv.gov