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: **Akrion Systems LLC**
Facility Address: **6330 Hedgewood Drive, Suite 150, Allentown, PA 18106**
Facility EPA ID #: **PA0000928812**

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

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 EI 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).

Current Human Exposures Under Control
Environmental Indicator (EI) RCRIS code (CA725)

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		No known/documented releases to groundwater from historical/present operations.
Air (indoors)[2]		X		No known/documented releases to soil/groundwater from historical/present operations.
Surface Soil (e.g., <2 ft)		X		No known/documented releases to soil from historical/present operations.
Surface Water		X		No known/documented releases from historical/present operations.
Sediment		X		No documented discharges to sediment. No known releases to sediment. No known/documented releases from historical/present operations.
Subsurf. Soil (e.g., >2 ft)		X		No known/documented releases to soil from historical/present operations.
Air (outdoors)		X		Facility does not operate under an air permit. No known releases at the facility.

X 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.

___ 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 and Reference(s):
Akrion Systems is a leading supplier of advanced surface preparation systems used in the manufacture of solar, semiconductor and related devices. Their systems are used in numerous steps during the manufacturing process to remove

[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.

contaminants from the surface of the silicon wafers on which these devices are built. The facility (company headquarters) is ISO 9001:2000 and ISO 14001:2004 certified, and operates under a Permit-By-Rule (PBR). Current operations are conducted only at the 6330 Hedgewood Drive location, which is owned by Liberty Property Limited Partnership and leased to Akrion Systems. The facility is situated in an industrial/office complex at the corner of Hedgewood Drive and Hickory Lane. The property is surrounded by a complex of buildings, except toward the north/northeast, across Hickory Lane, where a recreational park and residential subdivisions are present. The facility is located approximately 0.35 miles north of Old US Route 22 and approximately 0.7 miles north of Interstate 78.

SubMicron Systems' (previous owner) Application Lab uses chemicals to conduct testing on the wafers. The chemicals are dispensed by hand into chemical dispense cabinets, which mixed the chemicals with deionized water into different solutions. Test chemicals used in 1993 (and expected in 1994) included:

- Hydrochloric acid (7 gallons)
- Hydrofluoric acid (4 gallons)
- Sulfuric acid (27 gallons)
- Hydrogen peroxide (171 gallons)
- Ammonium hydroxide (40 gallons)
- Isopropyl alcohol (40 gallons)

The test chemicals listed above are still currently used by Akrion Systems in the Applications Lab, although in smaller quantities. Other chemicals are used on an as-needed basis, depending on client needs. An inventory of chemicals provided during the 2011 site visit included:

- Acetic acid
- Organic amine
- Ammonium acetate
- Dimethylacetamide
- Methyl-2-pyrrolidinone, 1-
- Sulfuric acid
- Ammonium phosphate dibasic
- Hydrogen peroxide
- Nitric acid
- Anhydrous ammonia
- Tetrahydrothiophene, 1-dioxide
- 2-Hydroxypyridine
- Amine salt
- Boric acid
- Triethanolamine (TEA)
- Catechol
- Diethylene glycol monobutyl ether
- Tetramethyl ammonium hydroxide (TMA)
- Ammonium fluoride
- 1H-benzotriazole
- Hydrofluoric acid
- Propylene glycol
- Hydrochloric acid
- Isopropyl alcohol
- Phosphoric acid
- Potassium hydroxide
- Hydroxyethylidene-1,1-diphosphonic acid
- Glycerol
- Methyldiethanolamine (MDEA)
- Monoethanolamine (MEA)
- Alkanoamine
- Solvent

The solutions are then injected into chemical baths for processing. Once the baths reached their useful life and were considered "dirty", the baths were discharged via gravity to the elementary neutralization unit (ENU [waste treatment system]). Solutions are carried from the process baths into a 2,000-gallon aboveground holding tank (also identified as 1,500 gallons by a facility representative and 2,100 gallons in documents). On a periodic basis, the waste chemical solutions are transferred to a 500-gallon tank where 250 gallons of solution are adjusted (automatically) for pH using sulfuric acid and sodium hydroxide. Both waste tanks are monitored (automatically) for high level and pH.

The Application Lab also utilizes an exhaust system to control vapors coming off the hot bath. The exhaust passes through a scrubber and is also treated in the ENU.

There are no floor drains on the floor of the Applications Lab or the Applications Lab Mechanical Room. The Applications Lab has a raised floor approximately three feet off the epoxy coated cement flooring. The Applications Lab Mechanical Room is where the hazardous chemicals are stored, dispensed to the Applications Lab, treated for pH and discharged to the sanitary sewer. There are no process sludges generated at the facility for treatment and discharged into the sanitary sewer.

Spills in the Application Lab or the Application Lab Mechanical Room are cleaned up using absorbent or a vacuum. Absorbent materials are disposed of via a contracted hazardous waste hauler. Vacuumed materials are discharged into the ENU.

Finished product testing, fabricating, and shipping/receiving use only DI water.

No incidents of any releases have been reported by the facility. No SWMUs or AOCs have been identified at the facility.

Air: Akrion Systems currently does not operate under any air permits. Emission events are not anticipated under normal operating conditions. There is no documentation that any spills or releases occurred at the facility during operations that may have impacted soil and/or groundwater; therefore, vapor intrusion into the onsite and nearby structures from these media is not expected to be a potential exposure pathway at this time.

Groundwater: No site-specific geologic or hydrogeologic investigations have been conducted at the site and no known releases to groundwater have occurred. However, based on topography, groundwater flow would be expected to be to the southwest toward additional commercial and light industrial properties and potentially to the south toward water wells, as discussed below. The facility water is supplied by the City of Allentown. The Northampton Water Company began operating in 1820, and the City of Allentown purchased this water system in 1869.

The Allentown's Bureau of Water Resources (ABWR) serves 34,000 customers (with an average daily demand of 20 million gallons per day) within the city as well as most of Salisbury Township and portions of South Whitehall and Hanover (Lehigh County) townships. In addition, Whitehall Township Authority relies on Allentown during peak demand periods. The Bureau is responsible for water treatment, water distribution, sewage collection, and sewage treatment and storm water.

ABWR draws water from the Little Lehigh Creek, the Lehigh River, Schantz Spring and Crystal Spring. The ABWR owns and operates a 30-million-gallon-per-day water treatment plant that includes coagulation/flocculation, lamella plate clarification and dual media high-rate filtration for surface water. The treatment plant was upgraded from 1994 - 1997 and includes a state-of-the-art computerized process control system.

Based on information obtained from the Pennsylvania Groundwater Information System (PaGWIS, accessed February 10, 2011), there are 14 open hole groundwater wells located within a 0.5 mile radius of the facility. The wells range from 100 to 400 feet in depth. They include the following:

- Two public water supply wells are located approximately 0.4 miles northwest of the facility (owned by the Lehigh County Authority).
- One stock well is located approximately 0.3 miles east of the facility (owned by the Jaindls Turkey Farm). A second well on the property, noted as destroyed, was located 0.47 miles east/southeast of the facility. Note: The residential subdivision is present at this location (the turkey farm does not appear to exist).
- One public water supply well located approximately 0.4 miles southeast of the facility (owned by the Lehigh County Authority).
- Twelve wells are located approximately 0.4 to 0.46 miles south of the facility (on either side of Old US Route 22). They include four public water supply wells, three commercial wells, four domestic use wells, and a withdrawal well (owned by the Lehigh Valley Hospital).

- The reported water elevation from well number 187714, located approximately 1,800 feet to the northwest for the property was 84 feet bgs.

Surface Water/Sediment: The facility does not have any direct discharges to surface water. According to information obtained from the PADEP eMapPA application (accessed March 15, 2011), there are no surface water bodies located within 0.5 miles of the facility. However, recent aerial photography obtained from the Pennsylvania Spatial Data Access (PASDA) website (accessed March 15, 2011) indicates that a surface water body is located approximately 200 feet northwest of the facility. Several tributaries designated as high quality cold water fisheries are located within one mile northwest and east of the facility. These include tributaries to Haasen Creek located approximately 0.6 miles northwest of the facility and a tributary to Little Cedar Creek located approximately one mile east of the facility. The tributary to Haasen Creek is listed on the tentative streams integrated list as an attaining segment supporting aquatic life. The tributary to Little Cedar Creek is listed on the tentative streams integrated list as a non-attaining segment impaired for aquatic life resulting from suspend solids and water flow variability from urban runoff and storm sewers

Soil: The following soil data is based on information provided by the Unites States Department of Agriculture (USDA), Natural Resources Conservation Service (NRCS) web soil survey. The facility is situated entirely on soils classified as CmA, Clarksburg Silty Loam, which has 0 to 3 percent slopes. This soil has a hydrologic soil group rating of "C", soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

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							
Air (indoors)							
Soil (surface, e.g., <2 ft.							
Surface Water							
Sediment							
Soil (subsurface e.g., >2 ft.							
Air (outdoors)							

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).

_____ 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):

[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)?

_____ If no (exposures can not 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):

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

_____ 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):

[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.

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 **Akrion Systems LLC** facility, EPA ID # **PA0000928812**, located at **6330 Hedgewood Drive, Suite 150, Allentown, PA 18106** 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 10/13/11

(print) Tracey L. McGuirk

(title) Facilities Supervisor

Supervisor (signature) _____ Date 10/18/11

(print) Edward G. Dudick Jr.

(title) Env. Eng. Manager

(EPA Region or State) PA

11-3-11

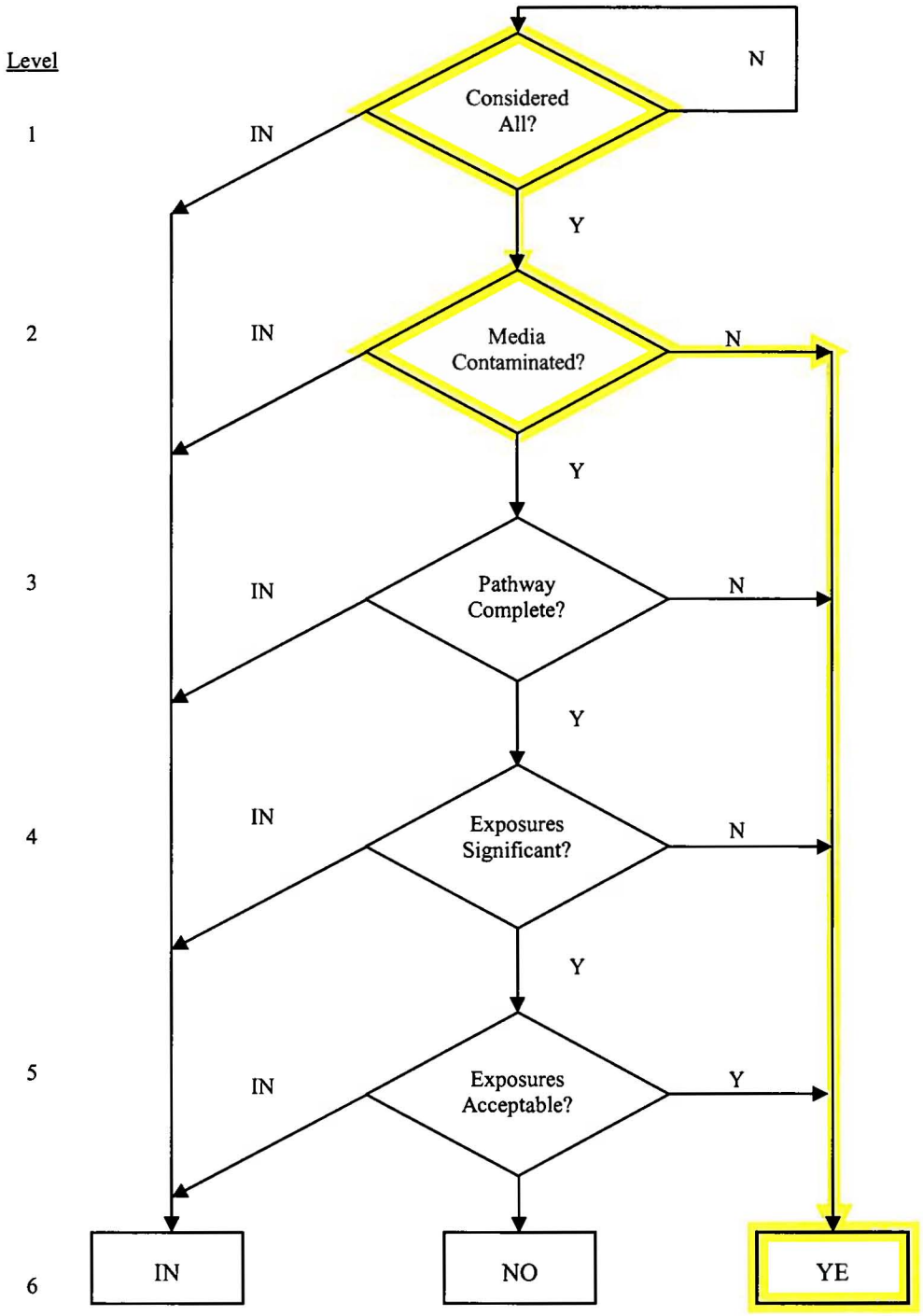
Locations where References may be found:

USEPA Region III
Waste and Chemical Mgmt. Division
1650 Arch Street
Philadelphia, PA 19103

PADEP
North East Regional Office
2 Public Square
Wilkes-Barre, PA 18701

Contact telephone and e-mail numbers
(signature) _____
(print) _____
(title) _____

FINAL NOTE: THE HUMAN EXPOSURES EI IS A QUALITATIVE SCREENING OF EXPOSURES AND THE DETERMINATIONS WITHIN THIS DOCUMENT SHOULD NOT BE USED AS THE SOLE BASIS FOR RESTRICTING THE SCOPE OF MORE DETAILED (E.G., SITE-SPECIFIC) ASSESSMENTS OF RISK.

Facility Name: **Akrion Systems LLC**
EPA ID# **PA0000928812**
City/State **Allentown, PA 18106**

CURRENT HUMAN EXPOSURES UNDER CONTROL (CA725)