BEFORE THE ILLINOIS POLLUTION CONTROL BOARD

IN THE MATTER OF:	)	
	)	
PETITION OF APEX MATERIAL	)	
TECHNOLOGIES, LLC FOR AN	)	AS 14-
ADJUSTED STANDARD FROM	)	(Adjusted Standard – Land)
PORTIONS OF 35 ILL. ADM. CODE	)	
807.104 and 810.103, OR, IN THE	)	
ALTERNATIVE, A FINDING OF	)	
INAPPLICABILITY.	)	

Notice of Filing

TO:

Mr. John Therriault
Illinois Pollution Control Board
James R. Thomson Center
100 W. Randolph Street
Suite 11-500
Chicago, Illinois 60601-3218

Division of Legal Counsel
Illinois Environmental Protection Agency
1021 North Grand Avenue East
P.O. Box 19276
Springfield, IL 62974-9276

PLEASE TAKE NOTICE that on this 8th day of August 2014, I have filed with the Office of the Clerk of the Illinois Pollution Control Board the **Entry of Appearance of Joseph L. Pellis II, Trade Secret Claim Letter,** and the **Petition for a Finding of Inapplicability or, In the Alternative, For an Adjusted Standard**, which are attached and herewith served upon you.

Respectfully Submitted,

Apex Material Technologies, LLC

By: /s/ Joseph L. Pellis II
Joseph L. Pellis II
One of its Attorneys

Dated: August 8, 2014

Joseph L. Pellis II
PELLIS LAW GROUP, LLP
901 Warrenville Road, Suite 205
Lisle, IL 60532
t: (630) 442-5500
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CERTIFICATE OF SERVICE

I, Joseph L. Pellis II, the undersigned, an attorney, certify that I have served the attached **Entry of Appearance of Joseph L. Pellis II, Trade Secret Claim Letter,** and the **Petition for a Finding of Inapplicability or, In the Alternative, For an Adjusted Standard,** upon:

Mr. John Therriault
Illinois Pollution Control Board
James R. Thomson Center
100 W. Randolph Street
Suite 11-500
Chicago, Illinois 60601-3218

via Electronic Filing and U.S. Priority Mail on August 8, 2014; and upon:

Division of Legal Counsel
Illinois Environmental Protection Agency
1021 North Grand Avenue East
P.O. Box 19276
Springfield, IL 62974-9276

via U.S. Priority Mail deposited in the U.S. Post Office mailbox at 901 Warrenville Road, Lisle, Illinois on Friday, August 8, 2014.

/s/ Joseph L. Pellis II
Joseph L. Pellis II

BEFORE THE ILLINOIS POLLUTION CONTROL BOARD

IN THE MATTER OF:	)	
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PETITION OF APEX MATERIAL	)	
TECHNOLOGIES, LLC FOR AN	)	AS 14-
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INAPPLICABILITY.	)	

ENTRY OF APPEARANCE OF JOSEPH L. PELLIS II

The undersigned, Joseph L. Pellis II, of the law firm Pellis Law Group, LLP, enters his appearance in this matter on behalf of APEX Material Technologies, LLC.

Respectfully Submitted,

By: /s/ Joseph L. Pellis II
Joseph L. Pellis II

Dated: August 8, 2014

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August 8, 2014

Joseph L. Pellis II
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VIA U.S. PRIORITY MAIL

Mr. John Therriault
Clerk of the Board
Illinois Pollution Control Board
James R. Thompson Center, Suite 11-500
100 West Randolph Street
Chicago, Illinois 60601

Re: Petition of APEX Material Technologies, LLC
AS 14-___
Trade Secret Claim Letter

Dear Mr. Therriault,

Pursuant to the provisions of Sections 7 and 7.1 of the Environmental Protection Act (the "Act"), 415 ILCS 5/7, 7.1, and 35 Ill. Adm. Code Part 130 ("Part 130"), Petitioner APEX Material Technologies, LLC ("APEX") hereby makes a claim for trade secret protection of three exhibits to its *Petition of APEX Materials Technologies, LLC for an Adjusted Standard from Portions of 35 Ill. Adm. Code 807.104 and 810.103, or, in the Alternative, a Finding of Inapplicability* (the "Petition").

APEX seeks trade secret protection for the entirety of Exhibits C, E, and F to its Petition. The documents are "trade secrets," as defined in 415 ILCS 5/3.490 and 35 Ill. Adm. Code 101.202. This letter serves as the claim letter required by 35 Ill. Adm. Code 130.200(b) and triggers the protections from disclosure set forth in Part 130.

APEX is a manufacturer of high-quality copper, cobalt, and nickel chemicals for the semiconductor, printed circuit board, catalyst, petrochemical, and battery industries. As part of its plans to better serve its current customers, and to expand its product offerings to new customers, APEX wants to begin a new service that will process copper-rich, copper ammonium chloride ("CAC") into two useful products, which will then be sold back into the economic mainstream.

APEX plans to purchase from printed circuit board manufacturers (the "Customers") CAC or "used etchant solution," which is an ammonia-based fluid that is used to strip away excess copper from printed circuit boards. APEX will then process the used etchant solution and separate the dissolved copper from the ammonia solution to make two useful products. APEX has the experience and existing machinery that is capable of easily separating the CAC within the used etchant solution. The business objective is to use CAC as a raw material feed to produce two products, copper oxide and ammonium chloride. APEX will then sell the copper oxide as a product into the pigment, frit and/or micronutrient industries. APEX will also sell the ammonium chloride as "fresh etchant solution" back to the original Customers to use in the same process that originally produced the "used etchant solution."

In order to fully comply with the "Petition Content Requirements" of 35 Ill. Adm. Code 104.406 and to give the Board a complete understanding of its contemplated process, APEX has attached numerous exhibits to its Petition. As more fully explained below, Exhibits C, E, and F represent trade secrets for which APEX seeks protection.

Exhibit C contains two documents related to the process utilized by APEX. The first document is a written description of the process titled, "Manufacture of Fresh Etchant and Copper Oxide from Spent Etchant." Briefly, the document provides both an overview and a step-by-step description of the process APEX will use to produce copper oxide and ammonium chloride from the CAC. The second document is a diagram titled, "Process Flow for Fresh Etchant and Copper Oxide Manufacture from Spent Etchant." This diagram is a schematic of the aforementioned process.

Exhibit E is a spreadsheet titled, "Equipment List and Engineering Information." The spreadsheet is a complete inventory listing of all proposed equipment and other infrastructure improvements that APEX intends to pursue in order to properly process the CAC material.

Exhibit F contains six documents related to APEX's Quality Assurance/Quality Control ("QA/QC") protocols. The documents are titled, "Ammonia Determination by Distillation," "Carbonate Test in Etchants," "Chloride Determination," "Copper Titration for Liquids," "Determination of pH," and "Specific Gravity and Braume Determination." Each document explains the procedure for determining the indicated value in samples of material.

Exhibits C, E, and F are "trade secrets" as defined in 415 ILCS 5/3.490 and 35 Ill. Adm. Code 101.202. More specifically, the materials are "scientific or technical information, design, process (including a manufacturing process), procedure, formula or improvement, or business plan which is secret in that it has not been published or disseminated or otherwise become a matter of general public knowledge, and which has competitive value." 415 ILCS 5/3.490; 35 Ill. Adm. Code 101.202. Thus, APEX claims trade secret protection for the entirety of Exhibits C, E, and F and asks that the Board protect these documents from disclosure.

APEX will provide a statement of justification upon request pursuant to 35 Ill. Adm. Code 130.201.

Enclosed is a copy of each exhibit marked as provided in 35 Ill. Adm. Code 130.302.

Should you have any questions, please do not hesitate to contact me directly at (630) 442-5505 or via email at jpellis@pellislaw.com.

Very truly yours,

PELLIS LAW GROUP, LLP

Joseph L. Pellis II

JLP/mjt
Enclosures

BEFORE THE ILLINOIS POLLUTION CONTROL BOARD

IN THE MATTER OF:	)	
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PETITION OF APEX MATERIAL	)	
TECHNOLOGIES, LLC FOR AN	)	AS 14-
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PETITION FOR A FINDING OF INAPPLICABILITY
OR, IN THE ALTERNATIVE,
FOR AN ADJUSTED STANDARD

Petitioner, APEX Material Technologies, LLC ("APEX"), by and through its attorneys, Pellis Law Group, LLP, and pursuant to Section 28.1 of the Environmental Protection Act, 415 ILCS 5/28.1 (the "Act"), and 35 Ill. Adm. Code, Part 104, Subpart D, respectfully petitions the Illinois Pollution Control Board (the "Board") for a finding of inapplicability or, in the alternative, for an adjusted standard from portions of 35 Ill. Adm. Code Sections 807.104 and 810.103. APEX seeks a determination that the material used in its contemplated production process, Copper Ammonium Chloride Etchant, is not a "waste" and, therefore, APEX does not need waste permits pursuant to 35 Ill. Adm. Code Parts 807 and 810. In the alternative, if the Board disagrees that the material is not a "waste," APEX seeks an adjusted standard from portions of 35 Ill. Adm. Code 807.104 and 810.103. In support of its petition, APEX states as follows:

I. FACTS

a. Overview

APEX is a manufacturer of high-quality copper, cobalt, and nickel chemicals for the semiconductor, printed circuit board, catalyst, petrochemical, and battery industries. APEX

operates a production facility at 10 Industry Avenue, Joliet, Will County, Illinois. As part of its plans to better serve its current customers, and to expand its product offerings to new customers, APEX wants to begin a new service that will process copper-rich, Copper Ammonium Chloride Etchant ("CAC") into two useful products, which will then be sold back into the economic mainstream as detailed below.

b. Business Objective

APEX plans to purchase from printed circuit board manufacturers (the "Customers") CAC or "used etchant solution," which is an ammonia-based fluid that is used to strip away excess copper from printed circuit boards. APEX will then process the used etchant solution and separate the dissolved copper from the ammonia solution to make two useful products. APEX has the technical experience and existing machinery that is capable of easily separating the CAC within the used etchant solution. The business objective is to use CAC as a raw material feed to produce two products, copper oxide and ammonium chloride. APEX will then sell the copper oxide as a product into the pigment, frit, and/or micronutrient industries. APEX will also sell the ammonium chloride as "fresh etchant solution" back to the original Customers, to use in the same process that originally produced the "used etchant solution." APEX plans to sign long term contracts to purchase the copper-rich CAC from Customers at a unit price based on its copper content.

The market to process the used etchant solution is significant, and is currently being underserved in Illinois, and throughout the Midwest. APEX is only aware of two other companies in America that process used etchant solution, Phibro-Tech, Inc. from Santa Fe Springs, California, and Micronutrients from Indianapolis, Indiana.

c. Production Process

A summary of APEX's proprietary production model is outlined in the Process Flow Diagram and Material Balance, which is attached hereto as Exhibit A.

Regarding the CAC handling and storage, APEX anticipates the following process:

1. INCOMING: CAC coming into the APEX facility is brought in via truck in drums, totes, and/or tankers. Drums and totes are stored in segregated areas marked "Container Storage Area" and "East Warehouse." Tankers are brought into the area marked "Tank Storage/Tanker Unloading 2." From there the material is pumped from the tanker into Storage Tanks D37 and D38, located in "Tank Storage Area 1." Attached as Exhibit B is a map showing the segregated areas at the APEX facility that will be used for the incoming material.

2. STORAGE: Material can stay in the existing Storage Tanks (D37 and D38) for a period of up to a week prior to processing. Drums and totes will stay in the East Warehouse no more than 7 days until they are pumped into tanks D37 and D38 or directly into processing tanks.

3. PROCESSING: From storage in tanks D37 and D38, the CAC material will move into processing starting with Reaction Vessels H73 and G65. The actual process by which APEX manufactures fresh etchant and copper oxide from used etchant solution is fully described in the Process Description and accompanying Flow Diagram, which is attached hereto as Exhibit C.

4. PROJECTED VOLUMES INCOMING: APEX expects to process approximately 1 tanker truck per day, or approximately 3,500 gallons of CAC.

5. PROJECTED VOLUME OUTGOING: APEX expects to process approximately ½ tanker load per day of finished products, or approximately 3,500 to 4,375 pounds of copper every 2 days. APEX anticipates fully turning over all inventories of raw feeds and finished products on at least a 30 day cycle, and most likely on a 10-15 day cycle.

As demonstrated in the Process Flow Diagram and Material Balance (Exhibit A), the APEX process uses 100% of the incoming CAC material, and will not result in any adverse impact on human health or the environment. In addition, the process generates no by-product streams other than processed wash water brine, which is treated appropriately in APEX's own waste water treatment plant, and then discharged to the publicly owned treatment works ("POTW") per the existing industrial pretreatment discharge permit with the City of Joliet.

As noted above, the only by-product generated from the APEX process is a wash water brine. The water brine contains salt (18% NaCl), the sodium component of which is derived from the sodium hydroxide (NaOH), which APEX adds during the process for pH control. The water brine will be managed on-site under APEX's existing industrial pretreatment permit (Permit No. J1610) and discharged to the local POTW (City of Joliet). In fact, APEX's current permit allows discharges from the "manufacture of ammonia-based etchants" and "boiling spent ammonia copper etchant with sodium hydroxide to produce copper oxide." Accordingly, the APEX facility is already specifically authorized to discharge the water brine that will be generated from its process. A true and correct copy of APEX's Permit No. J1610 is attached as Exhibit D.

d. Infrastructure

The APEX production facility at 10 Industry Avenue, Joliet, Will County, Illinois, was initially built by CP Inorganics, Inc. in 1972 ("CP"). CP operated the facility from its inception in 1972 until it was acquired by Phibro-Tech, Inc. in 1994. APEX acquired the facility on March 1, 2011.

When APEX purchased the facility, it employed a total of 12 people – 10 hourly and 2 salaried employees. Currently, APEX employs a total of 27 people – 17 hourly, 5 salaried, 2 interns, and 3 contract temporary employees. Once APEX begins to process CAC, it anticipates that it will be able to employ an additional 5 people, for a total of 32 employees – 24 hourly, 5 salaried, and 3 interns.

APEX plans to spend upwards of $1 million or more on upgrading its existing infrastructure to properly process the CAC material and generate useful products that will be sold

back into the stream of commerce. Attached as Exhibit E is a complete inventory listing of all proposed equipment and other infrastructure improvements associated with this program.

APEX currently utilizes a variety of pollution control equipment. Its ammonia detection equipment includes an ambient ammonia monitor. The monitor detects ammonia levels at four stations throughout the property and will alert at levels of 10 ppm ammonia and above. APEX also utilizes an HPG dust collector. The dust collector uses high temperature, pleated cartridge filters to capture HPG fines generated from an HPG dryer. Further pollution control equipment includes two single-stage wet caustic scrubbers. The scrubbers capture acid mist and particles from copper and nickel batch operations.

As stated above, APEX takes several steps to monitor and treat its discharge water. For example, ammonia is removed in primary and secondary ammonia scrubbing systems, and dissolved metals are precipitated with sodium sulfide. The water treatment equipment also utilizes pH controls and a two-stage filtration system. Finally, water samples are submitted to APEX's laboratory for a full analysis on a daily basis.

e. Benefits

APEX believes that its proposed program has many benefits including:

1. The "used etchant solution," once processed, is sold directly back to the original Customers for use in the same process that originally produced the CAC. The program essentially creates a "closed loop" for this material, and decreases costs and the use of prime resources (anhydrous ammonium, hydrochloric acid, and copper) that would otherwise be required for the production of "fresh etchant solution."

2. The process minimizes the use of reagents and heat associated with making copper oxide from copper metal and the associated reagents, which will reduce the "carbon footprint" for the entire process from beginning to end.

3. Returning used etchants to the economic mainstream is a goal of USEPA's Design for the Environment program. *See* U.S. EPA Case Study at http://www.epa.gov/opptintr/dfe/pubs/pwb/case_stu/case2/index.html.

4. The APEX program will provide many Illinois companies with an alternative market for the processing of the CAC material, and inject a level of competition into the marketplace where none currently exists.

f. Quality Assurance / Quality Control

APEX prides itself on its Quality Assurance / Quality Control ("QA/QC") procedures in all its processes. APEX has specific QA/QC protocols that will be followed to ensure the CAC material is properly handled and stored at its facility. A detailed copy of the QA/QC protocols is attached as Exhibit F.

In addition to its own internal QA/QC protocols, APEX will purchase the CAC from various circuit board manufacturers and will require each Customer to sample, profile, and certify that the material APEX is purchasing meets its specifications, and is free from hazardous waste or hazardous materials. In addition to the Customer certifications, APEX will maintain a Profile Sheet that sets forth certain specifications for the CAC. APEX's contracts with the Customers will allow APEX to return any material that does not meet its stated specifications. Additionally, APEX will require each customer to semi-annually re-certify its adherence to the Profile Sheet. Attached as Exhibit G is a Profile Sheet and certification executed by a proposed Customer, Galaxy Circuits, Inc. from Carol Stream, Illinois. APEX also anticipates having a

minimum of six more Customers committed to the proposed program at the outset. APEX also anticipates having a number of transporters committed to this program, each of which would also be required to provide a certification similar to the one contained in the Customer Profile Sheet.

As an additional quality control measure, APEX will also sample the incoming materials to verify that the CAC matches the Material Safety Data Sheets ("MSDS") provided by each Customer. The MSDS provided to APEX by the Customers demonstrate that the CAC is a non-corrosive, non-hazardous material. Attached as Exhibit H is a sample MSDS. CAC is not classified as a solid waste or a hazardous waste for regulatory purposes. CAC has a pH of 8 to 9 and never exhibits characteristics of corrosivity or toxicity. To confirm this fact, APEX recently performed analytical tests, including TCLP and pH, on a representative sample of CAC. The test results demonstrate CAC's non-corrosive and non-hazardous properties. Attached as Exhibit I are the test results.

Each Customer has evaluated, tested, and properly classified the used etchant solution as a commercial product that is currently being sold and shipped by the Customers throughout the Midwest to Micronutrients in Indiana via a standard "bill of lading" and without a waste manifest. Attached as Exhibit J are the Bills of Lading / Shipping Manifests currently used by the Customers to transport the CAC material. APEX plans to track and control the movement of the used etchant solution with the Customers via bills of lading and manifests, and to create a "closed loop" system of collection of the used etchant solution and sale of the fresh etchant solution back to the original Customers. This "closed loop" system will ensure that all Customer inventory is controlled and accounted for during the entire process from pick up and transportation, to processing at the APEX facility, to sale and transportation back to the original Customer.

g. Procedural History

Over the last ten months, APEX has had extensive discussions with the Illinois Environmental Protection Agency ("IEPA" or the "Agency") about its intended use and processing of the CAC material. APEX initially sought a Beneficial Use Determination ("BUD") from the Agency out of an overabundance of caution, so that it could purchase and use the CAC as a non-waste product with the Agency's approval. However, after extensive communications, the Agency indicated to APEX that the CAC would not be eligible for a BUD, and APEX subsequently withdrew its BUD application on February 7, 2014.

APEX then sent a letter to the Agency dated May 9, 2014 ("APEX Letter") in which it memorialized and explained APEX's intended use of the CAC and sought the Agency's concurrence that its use would not be subject to Illinois' solid waste disposal regulations. A true and correct copy of the APEX Letter is attached hereto as Exhibit K.

In a letter dated June 9, 2014, the Agency responded to the APEX Letter and indicated that APEX's use of the CAC is beyond the authority for a BUD ("Agency Letter"). Further, the Agency Letter stated that the reclamation of spent CAC is a regulated waste treatment activity, and an operating permit issued under 35 Ill. Adm. Code 807 is required for such activity.

However, the Agency Letter also provided an alternative to obtaining an operating permit. "The activity must be conducted at a facility which has obtained the applicable solid waste permits unless a determination is obtained from the Illinois Pollution Control Board that the material is not a waste." A true and correct copy of the Agency Letter is attached as Exhibit L.

As such, APEX has filed the instant Petition seeking a determination that the CAC is not a "waste" or, in the event the Board determines the CAC is a "waste," requesting an adjusted standard.

II. ARGUMENT

The used etchant solution that APEX wants to use in its process is not a "waste" and, therefore, the APEX facility is not a "pollution control facility" requiring a permit to process the CAC material. Accordingly, APEX seeks the Board's determination that the requirements of 35 Ill. Adm. Code Parts 807 and 810 are inapplicable.[1] As set forth below, such a determination is supported by Illinois law, prior decisions of the Board, and the facts of this case. Accordingly, the Board should grant APEX's petition and allow it to process the CAC according to its business plan.

a. The CAC is Not a "Waste"

The threshold issue before the Board is whether the used etchant solution that APEX wants to purchase from the Customers is a "waste" pursuant to the Illinois Administrative Code. Both Section 3.535 of the Act and Section 807.104 of the Board's solid waste regulations define "waste" as:

> any garbage, sludge from a waste treatment plant, water supply treatment plant, or air pollution control facility or other discarded material, including solid, liquid, semi-solid, or contained gaseous material resulting from industrial, commercial, mining and agricultural operations, or from community activities . . .

415 ILCS 5/3.535; 35 Ill. Adm. Code 807.104 (emphasis added).

[1] The Board has previously recognized that an adjusted standard petition can, in the alternative, seek a finding of inapplicability. See *Petition of Illinois Wood Energy Partners, L.P. for an Adjusted Standard from 35 Ill. Adm. Code Part 807 or, in the Alternative, a Finding of Inapplicability*, AS 94-1, slip op. at 2 (Oct. 6, 1994) ("*Illinois Wood Energy*"); see also *Petition of Jo'Lyn Corporation and Falcon Waste and Recycling for an Adjusted Standard from 35 Ill. Adm. Code Part 807 or, in the Alternative, a Finding of Inapplicability*, AS 04-2, slip op. at 13-14 (Apr. 7, 2005) ("*Jo'Lyn*").

Since at least 1980, this Board and the Illinois courts have provided very clear guidance on this threshold issue from which to decide the case at hand.

b. Safety-Kleen, Southern California Chemical, and R.R. Donnelley

In two decisions that are nearly directly on point with the case at hand, this Board has articulated the standard for determining whether a certain material is a "waste" for purposes of environmental regulation.

In *Safety-Kleen Corp. v. Environmental Protection Agency,* PCB 80-12, order at 2 (Feb. 7, 1980), affirmed by *Environmental Protection Agency v. Pollution Control Board*, 427 N.E.2d 1053 (Ill. App. Ct. 1981) (no opinion) ("*Safety-Kleen*"), this Board determined that solvent handled by Safety-Kleen was not a "waste." The Board noted that if the solvent was a waste it was a "special waste." *Id*. at 2. The Board found, however, that it was necessary to first determine whether the solvent was a "waste," as it cannot be a "special waste" if it is not a "waste." *Id*. at 2. The Board decided that since the spent solvent did not fit into any of the enumerated categories within the definition of "waste" (as set forth above), the question was whether it is "other discarded material." Ultimately, under the facts presented, this Board determined that the spent solvent was not a waste because it was "destined to be reused, rather than discarded." *Id.*

Four years after its decision in *Safety-Kleen,* this Board considered a case nearly factually identical to the instant petition. In *Southern California Chemical Co., Inc. v. Illinois Environmental Protection Agency*, PCB 84-51, slip op. at 2 (Sept. 20, 1984) ("*SCC*"), the Board approvingly cited *Safety-Kleen,* and held that SCC's spent etching solutions were not subject to the special waste regulations.

SCC was a manufacturer of etching solutions that were used to remove copper from printed circuit boards. *Id.* at 1. SCC would routinely ship fresh etchant to its customers and, at the same time, pickup spent etchant. *Id.* The spent etchant was returned to SCC, where it was processed into copper sulfate and fresh etchant. *Id.* at 2. SCC contended that the spent etchant was not a waste, and therefore, it was not subject to the special waste regulations. *Id.*

The Board noted that the case was controlled by its *Safety-Kleen* decision. "[O]ne doesn't get to the question of whether there is either a 'special' or a 'hazardous' waste until it is determined that a 'waste' is involved in the first place." *Id.* at 2-3. Again, the Board concluded that the spent etchant was not a waste, and as a result it was not subject to the special waste requirements. *Id.* at 4.

In our case, similar to *Safety-Kleen* and *SCC*, the used etchant solution that APEX plans to purchase from the Customers does not fit within the definition of a "waste" because it is "destined to be reused" and therefore cannot be considered "other discarded material." Further, just like in *SCC*, the "value of the spent etchant exceeds the value of the fresh etchant" due to the value of the copper that APEX will separate from the used etchant solution. *Id.* at 2.

As further support that the CAC material should not be classified as a "waste," APEX notes that the generators of the CAC, the Customers, do not classify the used etchant solution as a waste, and do not handle, store, transport, or discard it as a waste of any kind. See, *supra* I. Facts, f. Quality Assurance / Quality Control, at page 6.

The Board's decisions in both *Safety-Kleen* and *SCC* also turned on the fact that both petitioners maintained control over the spent solvent and spent etchant, respectively. In a subsequent decision, the Board relied upon *Safety-Kleen* and *SCC* in finding used printing oil (known as "MMT oil") was not a "discarded material." *R.R. Donnelley & Sons Co. v. Illinois*

Environmental Protection Agency, PCB 88-79, slip op. (Feb. 23, 1989) ("*R.R. Donnelley*"). In *R.R. Donnelley*, the Board merely acknowledged the ownership and control issue in a footnote, noting that R.R. Donnelly had "at least partial control" over the oil due to the fact that it "knows exactly to whom it is selling the oil." *Id*. at 4, fn. 1. Ownership and control was not a determinative factor in the Board's finding that the MMT oil was not "discarded material."

While it is not a determinative factor, in our case, APEX will also maintain at least partial control over the used etchant at all stages, and along with the Customers, APEX will maintain responsibility for the etchant during the entire "closed loop" system described above. Throughout all the stages of its life-cycle, the etchant solution will be tracked via APEX's QA/QC system, as well as manifested with licensed transporters to ensure that the material is properly handled, transported, stored, and processed. See, *supra* I. Facts, f. Quality Assurance / Quality Control, at page 6.

In conclusion, the *Safety-Kleen, SCC, and R.R. Donnelley* opinions, coupled with the nearly identical facts and circumstances of this case, provides the Board with sufficient validation to rule that the used etchant solution that APEX plans to process is not a "waste" for regulatory purposes. Nevertheless, should the Board need additional justification, several more recent Board opinions, as well as the Illinois Supreme Court case of *Alternate Fuels, Inc. v. Director of the Illinois Environmental Protection Agency*, 830 N.E.2d 444, 455-56 (2004) provide ample reasoning to rule in APEX's favor.

c. AFI

In *Alternate Fuels, Inc. v. Director of the Illinois Environmental Protection Agency*, 830 N.E.2d 444, 455-56 (2004) ("*AFI*"), the Illinois Supreme Court addressed the meaning of "discarded material" in the same definition of "waste" from which APEX currently seeks a

finding of inapplicability. The Court concluded that materials which are returned to the economic mainstream are not "discarded materials," and thus cannot be considered "waste." *AFI*, 830 N.E.2d at 456. The Court's analysis in *AFI* is applicable to the instant matter.

In *AFI*, the petitioner received empty agricultural chemical containers that it shredded into one inch chips. *Id.* at 446. Prior to receiving the material, the containers were "triple rinsed" in order to remove residual agricultural chemicals. *Id.* AFI then transported the chips to a local power plant for use as fuel. *Id.* The Agency took the position that the chips were a "waste," and that AFI needed a waste permit in order to store and process the containers at its facility. *Id.* at 449.

AFI filed an action against the Agency for a declaratory judgment that the chips were not a "waste" within the meaning of the Act. *Id.* at 449. The trial court granted summary judgment in favor of AFI. *Id.* at 449-50. The appellate court then affirmed the trial court's decision. *Id.* at 450. The Supreme Court also affirmed the decision of the appellate court and established the following test for determining whether an item falls within the definition of "waste" in the Act. *Id.* at 446.

The Court established a "two categories test" for determining whether certain items are discarded. *Id.* at 455. "[T]he legislature has categorized items that may be recycled, reclaimed, or reused into two main categories: (1) 'waste' from which contaminants may be removed and (2) 'materials.'" *Id*. at 455-56. The Court then proceeded to subdivide "materials" into two groups: "those that are 'discarded'" and those "materials that would otherwise be disposed of or discarded [which] are collected, separated or processed and returned to the economic mainstream in the form of raw materials or products." *Id*. at 456. The Court noted that while "discarded

materials" is not defined, the legislation does explain what it is not: material this is processed and returned to the economic mainstream is not "discarded material," and thus not "waste." *Id.*

The relevant facts of the present case are nearly identical to *AFI*. In this case, like AFI, APEX will purchase a non-hazardous material that it will recycle, reclaim, or reuse and return to the economic mainstream. The *AFI* "two categories test" demonstrates that the CAC is not a waste. Under the AFI test, an item that may be recycled, reclaimed, or reused is either "waste" or a "material." *Id*. at 455-56. Waste is an item from which contaminants may be removed, while all other items are materials. *Id.* The APEX process does not remove any contaminants from the used etchant solution. Rather, the APEX process simply separates the ammonia-based etchant from the residual copper. Further, the TCLP analysis performed by APEX indicates that the CAC does not contain any other contaminants. Thus, CAC is not a solution from which contaminants are removed. Therefore, the CAC is a "material."

The second part of the test calls for a determination of whether the material was "discarded" or "collected, separated or processed and returned to the economic mainstream in the form of raw materials or products." *Id*. at 456. APEX will not discard the material. Rather, like AFI, APEX will process the material to produce two products, copper oxide and ammonium chloride, which will be returned to the economic mainstream. As noted above, APEX will sell the copper oxide as a product into the pigment, frit, and/or micronutrient industries. APEX will sell the ammonium chloride as fresh etchant back to the original Customers for use in the same process that originally produced the CAC. Thus, under the *AFI* test, the CAC will not be discarded, but rather "collected, separated or processed and returned to the economic mainstream in the form of raw materials or products." Accordingly, based on the Illinois Supreme Court's

decision in *AFI*, the CAC is clearly not a "discarded material," and thus not a "waste" as defined under 415 ILCS 5/3.535 and 35 Ill. Adm. Code 807.104.

d. Westwood Lands and Jo'Lyn

On at least two occasions, this Board has applied the *AFI* decision to find that a material that might otherwise be discarded is not a "waste" when the material is returned to the economic mainstream.

In *Westwood Lands*, the Board considered a petition that is factually analogous to the instant matter. *Petition of Westwood Lands, Inc. for an Adjusted Standard from Portions of 35 Ill. Adm. Code 807.104 and 35 Ill. Adm. Code 810.103 or, in the Alternative, a Finding of Inapplicability*, AS 09-3 ("*Westwood Lands*"). Westwood Lands owns a facility that sought to process slag fines from steelmaking into two usable products. *Westwood Lands*, slip op. at 2 (Jan 7, 2010). Specifically, Westwood sought to extract metallic content in the form of metallic iron and iron oxides from the fines. *Id.* Westwood would then sell both of its products, a course metallic fraction and a fine fraction, to steel manufacturers for use in the making of steel. *Westwood Lands*, slip op. at 2-3 (Jan 7, 2010).

Westwood Lands further explained that its production process would result in a non-metallic waste fraction of calcium magnesium silicate that must be transported off-site for disposal. *Westwood Lands*, slip op. at 12 (Oct. 10, 2010). In fact, approximately one-third (by weight) of the slag fines would become product, while the remaining two-thirds would be the non-metallic waste fraction. *Id.*

Based on the fact that two-thirds of the slag fines would be eventually discarded, the IEPA argued that under the "two categories test" established in *AFI*, the slag fines are a "waste from which contaminants may be removed." *Id.* Westwood Lands responded that producing a

waste from a material does not make the material itself a "waste." The Board agreed with Westwood Lands and stated:

> The Board finds that calcium magnesium silicate is part of the chemical composition of the slag fines and is not a "contaminant." Therefore, the calcium magnesium silicate resulting from Westwood's process does not constitute removal of a contaminant.

Id. The Board went on to conclude that the steelmaking slag fines are "materials" that are "collected, separated or processed and returned to the economic mainstream in the form of raw materials or products." *Id.* at 13. Thus, under *AFI's* "two categories test," the slag fines used by Westwood Lands are not a "waste." *Id.* at 16.

Unlike in *Westwood Lands*, after its processing, APEX will return the vast majority of material processed back to the economic mainstream so there can be no argument that the CAC is a waste from which contaminants may be removed. Further, as noted herein, the only by-product APEX will generate is processed wash water brine. See Exhibit A. Similar to *Westwood Lands*, the chemical composition of the wash water brine is "an intrinsic part" of the CAC, and thus cannot be considered a contaminant. Any excess chloride and water generated during the process are constituents of the original solution purchased from the Customers. As such, the wash water brine resulting from APEX's process does not constitute removal of a contaminant. Accordingly, the CAC must be considered a "material" under the *AFI* "two categories test."

Further, as stated above, APEX will not discard the material. Rather, APEX will process the material to produce copper oxide and ammonium chloride. Both products will then be returned to the economic mainstream. Thus, the CAC is not a "discarded material" under the definition of "waste."

In *Jo'Lyn*, the petitioners used the "punch-outs" from the production of roofing shingles, known as granulated bituminous shingle material ("GBSM"), to create a paving product named

Eclipse Dust Control ("EDC"). *Jo'Lyn*, slip op. at 2-3. The GBSM was shredded, then applied to parking lots, driveways, and other similar paving applications. *Id.* Although the IEPA took the position that the GBSM was a waste, the Board disagreed. *Jo'Lyn*, slip op. at 5, 14. The Board again applied the Supreme Court's decision in *AFI* and found that the GBSM used by Jo'Lyn was not discarded because Jo'Lyn processed the GBSM and returned it to the economic mainstream. *Jo'Lyn*, slip op. at 14.

The facts of our case fall squarely within the decisions issued in *AFI*, *Westwood Lands*, and *Jo'Lyn*, as well as *Safety-Kleen, SCC, R.R. Donnelley*, and, as such, require the same finding from the Board that the material in question, CAC, is not a "discarded material," and thus not a "waste" as defined under 415 ILCS 5/3.535 and 35 Ill. Adm. Code 807.104. Based upon this clear precedent, APEX respectfully requests that the Board grant its petition for inapplicability.

e. Other Considerations

While APEX firmly believes that the forgoing precedent is more than sufficient justification for a finding of inapplicability, APEX also notes for the record that at least one other company in the Midwest, Heritage Environmental Services, Inc. a/k/a Micronutrients ("HES") from Indiana, is conducting substantially similar operations to those proposed by APEX. Several state agencies and the United States Environmental Protection Agency, Region 5 ("EPA") have acknowledged that HES is not subject to regulations governing solid waste. While these decisions are not binding on the Board, they may nonetheless be instructive.

The Indiana Department of Environmental Management ("IDEM") approved a solid waste exemption for HES, finding the spent etchants from manufactures of printed wire boards used to produce an animal micronutrient are not solid waste. April 14, 1994 Letter from IDEM to HES, Exhibit M. Recognizing the state's authority to make a final decision, EPA reviewed

HES's process and found IDEM's determination was not inconsistent with the environmental regulations. August 3, 1995 and September 7, 1995 Letters from USEPA to IDEM, Exhibit N and Exhibit O, respectively. Similarly, the Department of Environmental Quality for the Commonwealth of Virginia and the Colorado Department of Public Health and Environment both found that the spent copper etchant used by HES is not a solid waste. March 28, 1996 Letter from Commonwealth of Virginia to HES, Exhibit P; December 3, 2001 Letter from Colorado Department of Public Health and Environment to Micronutrients, a Division of Heritage Technologies, Exhibit Q.

In the HES matter, several agencies determined that the acid etchant solution is not a solid waste and that the use of the etchant as feedstock in the manufacture of copper salts to be used as an animal feed additive is consistent with the RCRA use/reuse exclusion. HES's process is substantially similar to the process proposed by APEX.

For all of the forgoing reasons, this Board should grant APEX's petition for inapplicability.

III. Petition for an Adjusted Standard

If the Board determines that the used etchant solution is a "waste," then APEX seeks an adjusted standard from specific provisions of 35 Ill. Adm. Code Parts 807 and 810.

a. Standard from which relief is sought (Section 104.406(a))

APEX believes that the used etchant solution does not fall within the definition of a "waste." Nevertheless, for purposes of requesting an adjusted standard, APEX identifies the definitions of "facility," "solid waste," "solid waste management," "unit," and "waste" contained in 35 Ill. Adm. Code 807.104 as the specific section from which an adjusted standard is sought. The CAC should not be treated as a waste, and thus the APEX facility is not a solid waste

management site. If the Board grants an adjusted standard from the enumerated definitions of Section 807.104, the remaining provisions of 35 Ill. Adm. Code Part 807 ("Part 807") will not be applicable to APEX's facility because it would not be handling "waste," and thus would not be a waste management site.

Part 807 was originally promulgated through emergency rulemaking in 1973. Section 807.104 became effective on July 27, 1973. The most recent amendment to Section 807.104 took effect on November 25, 1985. *See* 9 Ill. Reg. 18942.

APEX also seeks an adjusted standard from the definitions of "facility," "landfill," and "solid waste" contained in 35 Ill. Adm. Code 810.103. The CAC should not be treated as "solid waste," and thus APEX's facility is not a landfill. If the Board grants an adjusted standard from the enumerated definitions of 35 Ill. Adm. Code 810.103, the provisions of 35 Ill. Adm. Code Parts 811 through 817 would not be applicable to APEX's facility.

35 Ill. Adm. Code Part 810 ("Part 810") became effective on September 18, 1990. *See* 14 Ill. Reg. 15838. The most recent amendment to Part 810 took effect on March 22, 2005. *See* 29 Ill. Reg. 5028.

b. Promulgation of the regulation of general applicability (Section 104.406(b))

Part 807 was promulgated to implement Sections 5, 21.1, and 22 of the Act. *See* 415 ILCS 5/5, 21.1, and 22.

Part 810 was promulgated to implement Sections 7.2, 21, 21.1, 22, 22.17, and 22.40 of the Act. *See* 415 ILCS 5/7.2, 21, 21.1, 22, 22.17, and 22.40.

c. Level of justification (Section 104.406(c))

The regulations of general applicability (Parts 807 and 810) do not specify a level of justification or other requirements for an adjusted standard.

d. Description of petitioner's activity (Section 104.406(d))

APEX is a manufacturer of high-quality copper, cobalt, and nickel chemicals for the semiconductor, printed circuit board, catalyst, petrochemical, and battery industries. APEX operates a production facility at 10 Industry Avenue, Joliet, Will County, Illinois. As part of its plans to better serve its current customers, and to expand its product offerings to new customers, APEX wants to begin a new service that will process copper-rich CAC into two useful products, which will then be sold back into the economic mainstream.

APEX plans to purchase from printed circuit board manufacturers (the "Customers") CAC or "used etchant solution," which is an ammonia-based fluid that is used to strip away excess copper from printed circuit boards. APEX will then process the used etchant solution, and separate the dissolved copper from the ammonia solution to make two useful products. APEX has the experience and existing machinery that is capable of easily separating the CAC within the used etchant solution. The business objective is to use CAC as a raw material feed to produce two products, copper oxide and ammonium chloride. APEX will then sell the copper oxide as a product into the pigment, frit and/or micronutrient industries. APEX will also sell the ammonium chloride as "fresh etchant solution" back to the original Customers, to use in the same process that originally produced the "used etchant solution." APEX plans to sign long term contracts to purchase the copper-rich CAC from Customers at a unit price based on its copper content.

The production facility at 10 Industry Avenue, Joliet, Will County, Illinois, was initially built by CP Inorganics, Inc. in 1972 ("CP"). CP operated the facility from its inception in 1972 until it was acquired by Phibro-Tech, Inc. in 1994. APEX acquired the facility on March 1, 2011.

When APEX purchased the facility, it employed a total of 12 people – 10 hourly and 2 salaried employees. Currently, APEX employs a total of 27 people – 17 hourly, 5 salaried, 2 interns, and 3 contract temporary employees. Once APEX begins to process CAC, it anticipates that it will be able to employ an additional 5 people, for a total of 32 employees – 24 hourly, 2 salaried, and 2 interns.

APEX plans to spend upwards of $1 million or more on the upgrading of its existing infrastructure to properly process the CAC material and generate useful products that will be sold back into the stream of commerce. Attached as Exhibit E is a complete inventory listing of all proposed equipment and other infrastructure improvements associated with this program.

APEX currently utilizes a variety of pollution control equipment. Its ammonia detection equipment includes an ambient ammonia monitor. The monitor detects ammonia levels at four stations throughout the property and will alert at levels of 10 ppm ammonia and above. APEX also utilizes an HPG dust collector. The dust collector uses high temperature, pleated cartridge filters to capture HPG fines generated from an HPG dryer. Further pollution control equipment includes two single-stage wet caustic scrubbers. The scrubbers capture acid mist and particles from copper and nickel batch operations.

As stated above, APEX takes several steps to monitor and treat its discharge water. For example, ammonia is removed in primary and secondary ammonia scrubbing systems, and dissolved metals are precipitated with sodium sulfide. The water treatment equipment also utilizes pH controls and a two-stage filtration system. Finally, water samples are submitted to APEX's laboratory for a full analysis on a daily basis.

e. Compliance alternatives (Section 104.406(e))

APEX believes that the CAC used in its process is not a "waste." If the Board finds that the material is a "waste," then the only alternative would be to fully comply with the panoply of regulatory requirements imposed by the Act and by Parts 807 and 810. For example, prior to applying for a permit under either Part of the Board's regulations, APEX would be required to obtain local siting approval pursuant to Section 39.2 of the Act. 415 ILCS 5/39.2.

Previous petitions have detailed the time-consuming, expensive, and lengthy process of obtaining local siting approval. For example, both the *Westwood Lands* and *Jo'Lyn* petitions stated that the cost to obtain such approval is "hundreds of thousands of dollars, including local filing fees." *Westwood Lands*, pet. at 9 (Mar. 31, 2009); *Jo'Lyn*, pet. at 9 (Apr. 21, 2004). Further, these costs are in addition to the costs of complying with the requirements of Parts 807 and 810.

The costs faced by APEX would be substantially similar to those faced by both *Westwood Lands* and *Jo'Lyn*. As such, full compliance with the waste regulatory requirements of the Act and Parts 807 and 810, would most likely be cost-prohibitive. These requirements should not be imposed upon APEX because its processing of material into end-products is not the type of operation contemplated by the Board in promulgating Parts 807 and 810.

f. Description of the adjusted standard (Section 104.406(f))

APEX proposes the following adjusted standard language:

> APEX Material Technologies, LLC ("APEX") is hereby granted an adjusted standard from the following definitions of 35 Ill. Adm. Code 807.104: "facility," "solid waste," "solid waste management," "unit," and "waste." APEX is further granted an adjusted standard from the following definitions of 35 Ill. Adm. Code 810.103: "facility," "landfill," and "solid waste." These enumerated definitions do not apply to operations conducted by APEX at its facility located in Will County, Illinois, so long as:

1. APEX uses only copper-rich, copper ammonium chloride etchant ("CAC").

2. For purposes of this adjusted standard, "CAC" is defined as "copper rich, copper ammonium chloride etchant used to strip away excess copper from printed circuit boards."

3. APEX must maintain a quality control program that includes:

    a. The right to reject any CAC that does not comply with APEX's Profile Sheet;
    b. Weekly testing of a representative shipment for its copper content;
    c. Visual inspection of each shipment to ensure that no visual contaminants are present in that shipment;
    d. Before receiving any CAC from a new supplier, performing TCLP tests of a representative sample of the CAC from that new supplier; and
    e. Interim testing of a representative sample of each source of CAC, pursuant to an appropriate method, from each existing supplier. Such interim testing will be performed at least every six months, or upon significant changes in operating conditions.

4. APEX operates the facility in compliance with other provisions of the Environmental Protection Act.

g. Quantitative and qualitative impact of petitioner's activity (Section 104.406(g))

If APEX were granted an adjusted standard, then it would be able to process the CAC into ammonium chloride and copper oxide. The ammonium chloride would be sold as fresh etchant back to the original Customers for use in the same process that originally produced the CAC. The process essentially creates a "closed loop" for this solution and decreases the use of prime resources (anhydrous ammonium, hydrochloric acid, and copper) that would otherwise be required for the production of fresh etchant. Further, since APEX will also be processing the CAC into copper oxide, the process minimizes the use of reagents and heat associated with making copper oxide, which will reduce the carbon "footprint" for the entire process.

APEX will use 100% of the incoming product and will only generate wash water brine as a by-product. The excess chloride and water are constituents of the original solution purchased from the Customers. The water brine will be managed on-site under APEX's existing industrial pretreatment permit (Permit No. J1610) and discharged to the local POTW (City of Joliet). In fact, APEX's current permit allows discharges from the "manufacture of ammonia-based etchants" and "boiling spent ammonia copper etchant with sodium hydroxide to produce copper oxide." Accordingly, the facility is already specifically authorized to discharge the water brine that will be generated from its process.

As discussed above, it would be cost prohibitive for APEX to comply with the regulation of general applicability. Therefore, without an adjusted standard, APEX will not be able to process the CAC into useful end-products. As a result, the Customers will use more prime resources (anhydrous ammonium, hydrochloric acid, and copper) than would otherwise be required for the production of fresh etchant. Additionally, the use of reagents and heat needed to make copper oxide will increase.

Further, in the event the Board does not grant an adjusted standard, Customers in Illinois and elsewhere will be deprived of an alternative market to send their used etchant solution and receive fresh etchant solution in return. The market will be better served with allowing APEX to get into an underserved market and to inject a level of competition into this market where none currently exists.

h. Justification (Section 104.406(h))

As stated above, Parts 807 and 810 of the Board's regulations do not specify a level of justification for an adjusted standard. Therefore, the appropriate level of justification is governed by Section 28.1(c) of the Act, which states as follows:

> If a regulation of general applicability does not specify a level of justification required of a petitioner to qualify for an adjusted standard, the Board may grant individual adjusted standards whenever the Board determines, upon adequate proof by petitioner, that:
>
> (1) factors relating to that petitioner are substantially and significantly different from the factors relied upon by the Board in adopting the general regulation applicable to that petitioner;
>
> (2) the existence of those factors justifies an adjusted standard;
>
> (3) the requested standard will not result in environmental or health effects substantially and significantly more adverse than the effects considered by the Board in adopting the rule of general applicability; and
>
> (4) the adjusted standard is consistent with any applicable federal law.

415 ILCS 5/28.1(c).

1. The factors relating to APEX are substantially and significantly different

In adopting Part 807, the Board replaced and superseded the "Rules and Regulations for Refuse Disposal Sites and Facilities," adopted by the Illinois Department of Public Health in 1966. 35 Ill. Adm. Code 807.102. Also, the Board acted to implement Section 22 of the Act, which gives the Board authority to regulate, *inter alia*, waste disposal, storage, treatment, and disposal sites. 415 ILCS 5/22.

The process that APEX would like to perform at its facility is not refuse or waste disposal, and APEX's facility is not a landfill or transfer station. Rather, the process contemplated by APEX will actually reduce waste and positively impact the environment.

For example, the ammonium chloride would be sold as fresh etchant back to the original Customers for use in the same process that originally produced the CAC. The process essentially creates a "closed loop" for this solution and decreases the use of prime resources (anhydrous

ammonium, hydrochloric acid, and copper) that would otherwise be required for the production of fresh etchant. Further, since APEX will also be processing the CAC into copper oxide, the process minimizes the use of reagents and heat associated with making copper oxide, which will reduce the carbon "footprint" for the entire process.

Thus, the factors relating to APEX are substantially and significantly different than those pertaining to activities regulated under Parts 807 and 810.

2. The existence of those factors justifies an adjusted standard

The above factors, as well as those cited throughout the petition, justify an adjusted standard from Parts 807 and 810 of the Boards regulations. Part 807 regulates solid waste management sites, while Part 810 regulates solid waste disposal facilities. Neither Part 807 nor 810 is applicable to the process contemplated by APEX.

Further, compliance with the extensive waste requirements is economically unreasonable for APEX. As such, APEX will only be able to benefit the environment with its process if it is granted an adjusted standard.

3. The adjusted standard will not result in adverse environmental or health effects

The adjusted standard will not result in adverse environmental or health effects substantially and significantly more adverse than the effects considered by the Board in adopting Parts 807 and 810. In fact, the adjusted standard will not result in any adverse environmental or health effects at all. Instead, it will benefit the environment by reducing the amount of prime resources used by the Customers and decreasing the amount of heat and reagents used to produce copper oxide.

4. The adjusted standard is consistent with federal law

The Board may grant the proposed standard consistent with federal law.

i. Consistency with federal law (Section 104.406(i))

The Board may grant the proposed standard consistent with federal law.

j. Hearing (Section 104.406(j))

APEX requests a hearing on this petition.

k. Supporting documents (Section 104.406(k))

Documents supporting this petition are attached as Exhibits A through P.

IV. Conclusion

APEX has demonstrated that the definition of "waste" does not apply to CAC, since the CAC is not a "discarded material." Thus, the Board's solid waste regulations should not apply to APEX's intended use of CAC. However, in the alternative, if the Board finds that the CAC is a waste and subject to the Board's regulations, then APEX seeks an adjusted standard from those regulations as the factors relating to APEX are substantially and significantly different from the factors relied upon by the Board in adopting the general regulations.

WHEREFORE, Petitioner APEX Material Technologies, LLC hereby requests that the Board find that 35 Ill. Adm. Code Parts 807 and 810 are inapplicable to petitioner's Will County processing facility. In the alternative, Petitioner asks that the Board grant the proposed adjusted standard from portions of Parts 807 and 810 or for other relief as deemed appropriate by the Board.

Respectfully submitted,

APEX MATERIAL TECHNOLOGIES, LLC

Dated: August 8, 2014

By: /s/ Joseph L. Pellis II

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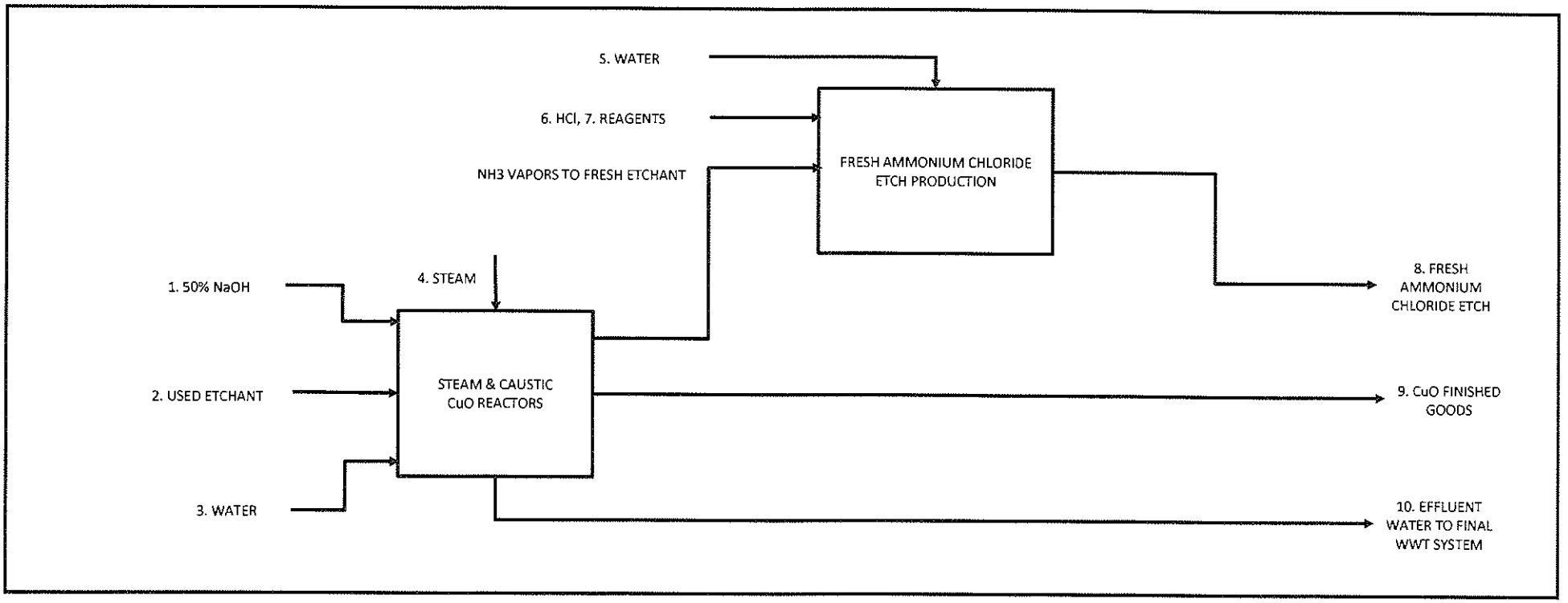
Attorney for the Petitioner

EXHIBIT A

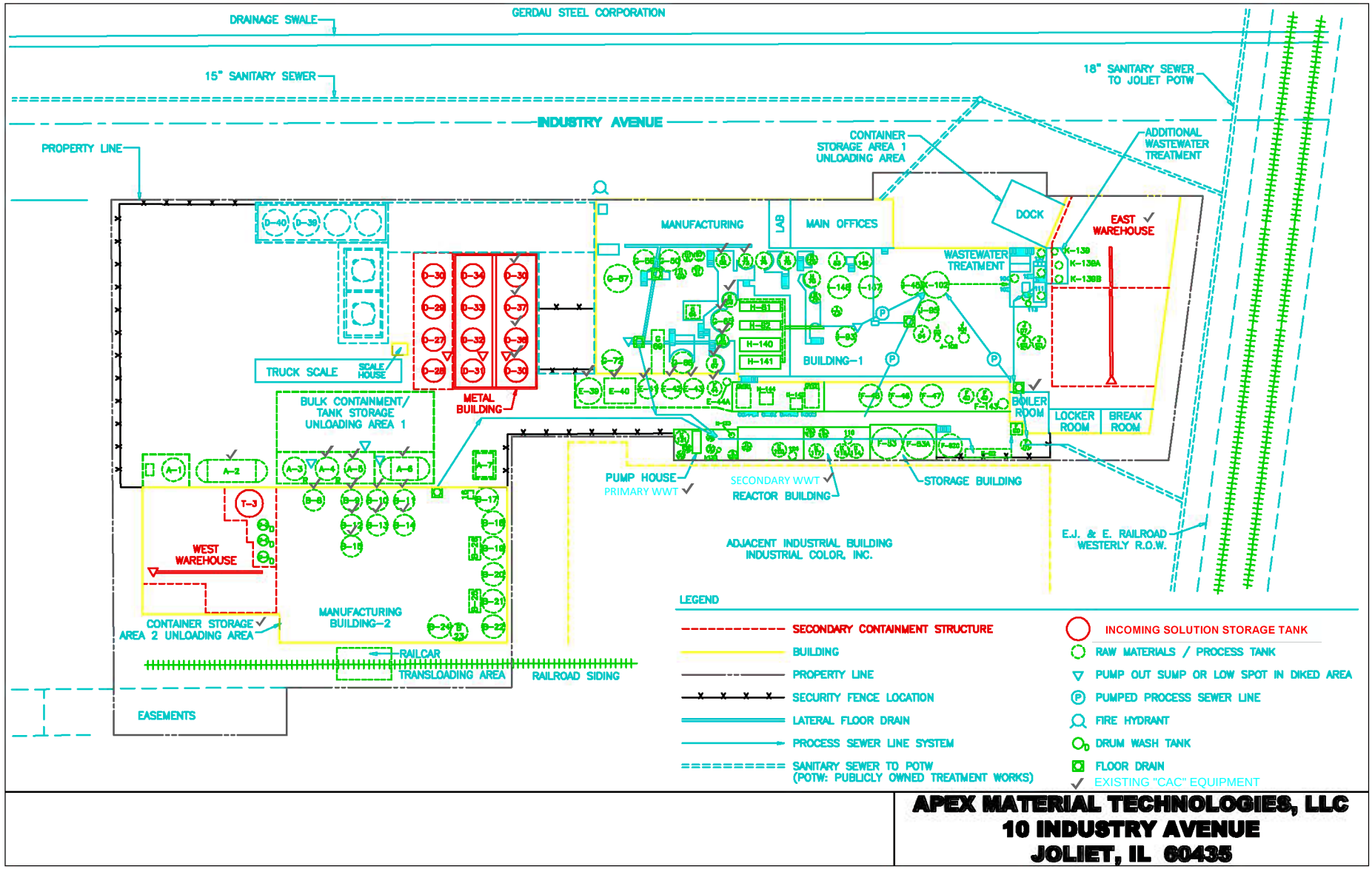


BASIS: 4,000 GALLONS SPENT ETCHANT INPUT

		QTY	UOM	LB
1	CAUSTIC SODA	949	GALLONS	12,090
2	FEED USED ETCHANT TO PROCESS	4,000	GALLONS	39,984
3	WATER FOR FILTER WASH	2,500	GALLONS	20,825
4	STEAM	3,000	LBS	3,000
5	WATER TO AMMONIA RECOVERY	1,000	LBS	8,330
6	HCL TO FRESH ETCHANT PRODUCTION	3,168	GALLONS	30,403
7	REAGENTS TO FRESH ETCHANT	AS NEEDED	AS NEEDED	AS NEEDED
8	FRESH ETCHANT AMMONIUM CHLORIDE TO MARKET	3,989	GALLONS	43,197
9	TECHNICAL GRADE CuO TO MARKET 50% MOISTURE	12,014	LBS	12,014
10	TREATED WATER DISCHARGE TO JOLIET POTW TECH CuO/ETCH ONLY	7,133	GALLONS	59,421

Input	114,632
Output	114,632
Difference	-
Difference %	0.00%

EXHIBIT B



APEX MATERIAL TECHNOLOGIES, LLC
10 INDUSTRY AVENUE
JOLIET, IL 60435

EXHIBIT C

Filed separately as a trade secret, pursuant to 35 Ill. Adm. Code Part 130

EXHIBIT D

PUBLIC UTILITIES
Plant Operations
1021 McKinley Avenue
Joliet, IL 60436
OFFICE: 815/724-3675
FAX: 815/724-3620
E-MAIL: ngornick@jolietcity.org

CITY OF JOLIET

150 WEST JEFFERSON STREET
JOLIET, ILLINOIS 60432-4158

Industry Name:	APEX MATERIAL TECHNOLOGIES, LLC
Address:	10 INDUSTRY AVENUE JOLIET, IL 60435
Phone:	1.815.727.3010 FAX: 1.815.727.0701
Permit No.:	**J1610**

In accordance with the terms and conditions of the City of Joliet Ordinance No. 16684 and applicable rules and regulations of the Illinois Environmental Protection Agency and the U.S. Environmental Protection Agency the above Industry is authorized to discharge industrial wastewater into the City of Joliet's sanitary sewer system from the facility located at the above address.

The Industrial Wastewater Discharge Permit is granted in accordance with the application on file and in conformance with plans, specifications and other data submitted to the City in support of the discharge application. The wastewater discharger is required to meet discharge limitations, monitoring requirements, reporting requirements, and any other conditions set forth in this Permit.

This Permit and the authorization to discharge shall expire at midnight March 31, 2015. In order to receive authorization to discharge beyond the date of expiration, the Permittee shall submit an Industrial Wastewater Discharge Permit Application in accordance with Ordinance No. 16684 and any amendments no later than 90 days prior to the date of Permit expiration.

This Permit shall be effective on April 1, 2012. This Permit shall not be assigned, transferred or sold to a new owner, new user, different premises, or a new or changed operation.

Nicholas C. Gornick
Plant Operations Superintendent

APEX MATERIAL TECHNOLOGIES, INC
J1610

A. DESCRIPTION OF DISCHARGE

1. Facility Description: BOIL SPENT, AMMONIA COPPER ETCHANT WITH SODIUM HYDROXIDE TO PRODUCE COPPER OXIDE. RE-PROCESS COPPER SULFATE, PRECIPITATE METAL FROM NICKEL PLATING SOLUTIONS. MANUFACTURE AMMONIA BASED ETCHANTS. PRODUCE HIGH PURITY GRADE COPPER OXIDE FROM COPPER METAL. MANUFACTURE FERRIC CHLORIDE ETCHANTS.

   Standard Industrial Classification Code (SIC) 2819
   Categorical Number – 40.415
   Description - INORGANIC CHEMICAL MANUFACTURING POINT SOURCE CATEGORY SUB-PART AJ AND AU.

2. Source of Wastewater: HPG COPPER OXIDE PRODUCTION, INORGANIC CHEMICAL PRODUCTION STORM WATER, BOILER, CWT APPLICATIONS.

3. Description of Treatment Facilities: EFFLUENT/WASTEWATER IS COMPOSITED IN A 15,000-GALLON STORAGE TANK. FROM THIS TANK, MATERIAL IS TRANSFERRED/CASCADED TO A SERIES OF SMALL AGITATED TANKS WHERE PH IS ADJUSTED INTO SPECIFICATION USING SULFURIC ACID. NEXT SULFIDE IS ADDED TO PRECIPITATE METALS, POLYMER IS ADDED TO COAGULATE PRECIPITATED METALS AND FINALLY, FERRIC CHLORIDE IS ADDED TO PRECIPITATE ARSENIC. THIS PROCESSED EFFLUENT IS NOW READY TO BE SENT THRU THE LARGE FILTER PRESS TO REMOVE PRECIPITATES. THE RESULTANT DISCHARGED CLEAR LIQUID IS AGAIN TREATED WITH FERRIC CHLORIDE TO FURTHER REMOVE ARSENIC FOLLOWED BY THE ADDITION OF FILTER AID.

   THIS EFFLUENT MIXTURE IS NOW PUMPED THRU A POLISHING FILTER. NEXT, THE PH IS RE- ADJUSTED IF REQUIRED WITH RESULTANT IN SPECIFICATION PRETREATED EFFLUENT BEING DISCHARED TO THE POTW.

4. Additional Treatment Requirements: N/A

5. Compliance Schedule: N/A

APEX MATERIAL TECHNOLOGIES, INC
J1610

B. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

Table No. 1

	Parameter	Conc. Limits MG/L	Type of Collection	Sampling Frequency
1.	FLOW	------	MEASURED/ESTIMATE	*SEE BELOW
2.	PH	6.0-10.0	GRAB	WEEKLY
3.	BOD	-----	COMPOSITE	WEEKLY
4.	SUSPENDED SOLIDS		COMPOSITE	WEEKLY
5.	AMMONIA AS N	100.0	COMPOSITE	WEEKLY
6.	ARSENIC	0.8	COMPOSITE	WEEKLY
7.	COPPER	1.0	COMPOSITE	WEEKLY
8.	NICKEL	1.5	COMPOSITE	WEEKLY
9.	SELENIUM	1.0	COMPOSITE	WEEKLY
10.	SELENIUM	0.53	COMPOSITE	MONTHLY AVG.
11.	ZINC	0.9	COMPOSITE	WEEKLY

***MGD for the day sample is pulled and average MGD for each month.**

2. The Permittee shall monitor its effluent concentrations of the following parameters and B. 1, on monitoring report forms provided by the City. **The Semi-Annual and Categorical effluent samples shall be taken twice a year, January and July** and consist of a composite discharge at the Industry's regular sampling point. **This report shall be submitted along with Self Monitoring Report Forms on the 20th of April and October of each year.**

APEX MATERIAL TECHNOLOGIES, INC
J1610

Table No. 2

Semi-Annual Report Parameters			
Parameter		Parameter	
1.	pH	13.	Lead, total
2.	BOD	14.	Manganese, total
3.	Suspended Solids	15.	Mercury
4.	Ammonia as N	16.	Naphthalene, grab
5.	Arsenic, total	17.	Nickel, total
6.	Barium, total	18.	Oil/Grease, grab
7.	Cadmium, total	19.	Phenols, grab
8.	Chromium, total	20.	Phosphorus, total
9.	Copper, total	21.	Selenium, total
10.	Cyanide, total, grab	22.	Silver,
11.	Fluoride, total	23.	Zinc, total
12.	Iron, total		

Table No. 3

Categorical Limits

	Pollutant	1-Day Max.		Max. Month Avg.	
		Conc.	Lbs./day	Conc.	Lbs.day
1	Benzene	102	0.15	43	0.06
2	Carbon Tetrachloride	289	0.41	108	0.15
3	Chlorobenzene	289	0.41	108	0.15
4	1, 2, 4, Trichlorobenzene	603	0.87	149	0.21
5	Hexachlorobenzene	603	0.87	149	0.21
6	1, 2, Dichloroethane	436	0.63	137	0.20
7	1, 1, 1, Trichloroethane	45	0.06	17	0.02
8	Hexachloroethane	603	0.87	149	0.21
9	1, 1, Dichloroethane	45	0.06	17	0.02
10	1, 1, 2, Trichloroethane	97	0.14	24	0.03
11	Chloroethane	224	0.32	84	0.12
12	Chloroform	247	0.35	84	0.12
13	1,2, Dichlorobenzene	603	0.87	149	0.21
14	1, 3 Dichlorobenzene	289	0.41	108	0.15
15	1, 4 Dichlorobenzene	289	0.41	108	0.15
16	1, 1 Dichloroethylene	46	0.07	17	0.02
17	1, 2 trans-dichloroethylene	50	0.07	19	0.03
18	1, 2 Dichloropropane	603	0.87	149	0.21
19	1, 3 Dichloropropylene	603	0.87	149	0.21

	Pollutant	1-Day Max.		Max. Month Avg.	
		Conc.	Lbs./day	Conc.	Lbs./day
20	Ethylbenzene	289	0.41	108	0.15
21	Methylene Chloride	129	0.19	27	0.04
22	Methyl Chloride	224	0.32	84	0.12
23	Hexachlorobutadiene	289	0.41	108	0.15
24	Nitrobenzene	4866	6.98	1,700	2.44
25	2, Nitrophenol	176	0.25	49	0.07
26	4, Nitrophenol	438	0.63	123	0.18
27	4, 6, dinitro-o-cresol	211	0.30	59	0.09
28	Tetrachloroethylene	125	0.18	40	0.06
29	Toluene	56	0.08	21	0.03
30	Trichloroethylene	52	0.08	20	0.03
31	Vinyl Chloride	131	0.19	74	0.11
32	Cyanide. Total	912	1.31	319	0.46
33	Lead, Total	524	0.75	243	0.35
35	Zinc, Total	1,984	2.85	798	1.15

C. MONITORING AND REPORTING

1. Representative Sampling: Samples and measurements taken as required herein shall be representative of the volume and nature of the monitored discharge. The industrial discharger shall be required to submit the following with the monitoring reports: sample time, sample location, flow rates during the sampling period, and laboratory methods.

   The sampling location shall be: AUTOMATIC SAMPLER IS LOCATED ALONG THE OUTSIDE OF THE SOUTH WALL OF EAST WAREHOUSE.

2. Reporting Monitoring Requirements: The Industry shall immediately notify the City of Joliet at (815) 724-3675 or (815) 724-3676, within 24 hours of any non-compliance with any categorical standard or local limit. The Industry shall resample and submit a resampling report to the City of Joliet within 30 days of any non-compliance with categorical standards and requirements listed under Section B. 2. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS, if applicable. A letter explaining the excursion and how the problem will be eliminated shall be mailed within five days to the address below.

   The Permittee shall submit the proper monitoring report forms, with **signatures** to the City of Joliet, containing results obtained during the previous three months and shall postmarked no later than the **20th day of January, April, July and October of each year.**

APEX MATERIAL TECHNOLOGIES, INC
J1610

Submit the above to the following address:

City of Joliet
Eastside Treatment Plant,
Nicholas C. Gornick
Plant Operations Superintendent
1021 McKinley Avenue
Joliet, IL 60436

3. Test Procedures: The analytical and sampling methods used shall conform to 40 CFR 136 as amended. Approved methods are detailed in the following sources.

(1) Standard Methods for the Examination of Water and Wastewater 15th Edition, 1981, American Public Health Association, New York, NY 10019.

(2) A.S.T.M. Standards, Part 31, Water American Society for Testing and Materials, Philadelphia, PA 19103.

(3) Methods for Chemical Analysis of Water and Wastes, March 1983, Environmental Protection Agency, Water Quality Office, Analytical Quality Control Laboratory, 1014 Broadway, Cincinnati, OH 45202.

4. Recording of Results on Monitoring Report Forms: For each measurement or sample taken pursuant to the requirements of this Permit, the Permittee shall record the following information:

a. The exact sampling location, date, time and daily flow of at time when the sample is pulled;
b. The dates the analyses were performed;
c. The person(s) who performed the analysis;
d. The analytical techniques and methods used; and
e. The results of all required analyses.

5. Records Retention: All records and information resulting from the monitoring activities required by this Permit, including all records of analyses performed, calibration and maintenance of instrumentation and recording from continuous monitoring instrumentation, shall be retained for a minimum of three (3) years. The City of Joliet may request that the records be retained for a longer period if enforcement action is pending against the discharger.

D. REQUIREMENTS

1. The discharger shall provide and maintain monitoring facilities to allow inspection, sampling and flow measurement of the building sewer or internal drainage systems. As required by the City, such monitoring facilities shall be provided at the end of a process wherein incompatible pollutants are used, produced, or treated.

2. The City may inspect the facilities of the discharger to ascertain whether the purpose and all requirements of the Permit are being met. City representatives shall have ready access upon presentation of credentials at reasonable times to the facility for the purposes of inspection, sampling, examination of records required to be kept by Ordinance No. 16684 and in the performance of any of their duties. The City shall have the right to set up on the dischargers property such devices as are necessary to conduct sampling, monitoring and metering operations.

3. Within 90 days after the effective date of a National Categorical Pretreatment Standard, or 90 days after a final administrative decision has been made upon categorical determination submission in accordance with Section 403.6 (a)(4) of the Industrial Pretreatment Regulations, whichever is later, a discharger subject to such National Categorical Pretreatment Standards shall apply for an Industrial Wastewater Discharge Permit modification.

4. The discharger shall report any material and substantial changes in the type, quality or volume of wastewater discharged to the City of Joliet's sanitary sewer system within 30 days of such change.

5. The Permittee shall not increase the use of process water or, in any way, attempt to dilute a discharge to achieve compliance with the Permit limitations. A discharger having the ability to cause interference with the wastewater treatment plant or to violate the regulatory provisions of Ordinance No. 16684 shall provide protection from accidental discharge to the sanitary sewer of prohibited materials or other substances regulated by the Ordinance.

6. Dischargers whose wastewater includes or could include compatible or incompatible pollutants in amounts great enough to cause interference with the treatment plant must have detailed plans on file at the City showing facilities and operating procedures to provide this protection. Plans shall be approved by the City before construction of the facility.

7. **In the case of an accidental or deliberate discharge of compatible or incompatible pollutants which may cause interference at the wastewater treatment plant or violate regulatory requirements of the Ordinance No. 16684, it shall be the responsibility of the discharger to immediately telephone the City of Joliet Eastside Plant 815/724-3675 or Westside Plant 815/724-3680 and notify the City of the incident. The notification shall include name of caller, location and time of discharge, type of wastewater, concentration and volume.**

Within fifteen (15) days following such an accidental or deliberate discharge the discharger shall submit to the Director a detailed written report describing the cause of the discharge and the measures to be taken by the User to prevent similar future occurrences.

Such report, or reports, shall not relieve the discharger of any expense, loss, damage or other liability which may be incurred as a result of damage to the City's wastewater collection and treatment system, fish kills, or any other damage to person or property; nor shall such report relieve the discharger of any fines, civil penalties, or other liability which may be imposed by the City. Failure to report accidental or deliberate dischargers may, in addition to any other remedies available to City, result in the revocation of the discharger's Industrial Wastewater Discharge Permit.

The City retains authority to take legal action against any Industrial User for any just cause or failure to meet an applicable pretreatment standard by the deadline date regardless of whether or not such failure has resulted in a Permit violation in accordance with Ordinance No. 16684

8. Notice shall be permanently posted on the discharger's bulletin board or other prominent place advising employees whom to call in the event of a discharge of a prohibitive material. Employers shall ensure that all employees who are in a position to cause, discover, or observe such an accidental discharge are advised of the emergency notification procedures.

EXHIBIT E

Filed separately as a trade secret, pursuant to 35 Ill. Adm. Code Part 130

EXHIBIT F

Filed separately as a trade secret, pursuant to 35 Ill. Adm. Code Part 130

EXHIBIT G

APEX
MATERIAL TECHNOLOGIES, LLC
10 Industry Avenue • Joliet, IL 60435 • Phone: 815.727.3010 • Fax: 815.727.7545

RAW MATERIAL PROFILE FORM

Ship to: Apex Material Technologies
10 Industry Avenue
Joliet, Illinois 60435

Date: 7/30/2014

Apex Contact: Lee Welgs
lwelgs@apexmattech.com
Cell #: 330-571-2182

Company Name: GALAXY CIRCUITS INC

Street Address: 383 RANDY ROAD

City: CARO STREAM **State:** IL. **Zip:** 60188 **Fax:** 630-462-1815

Contact Name: KANTI PATEL **Emergency Phone #:** 630-462-1010

E-Mail: KANTI@GALAXYCIRCUITS.COM

Date of Sample: 7/30/2014

Time of Sample: 3:00 PM

Name of Individual: KANTI PATEL

Signature: K Patel

Title: V.P.

Company: Galaxy Circuits Inc.

Material Name: Copper Ammonium Chloride

Physical State: Liquid **Wt% of Water:** 55-79%

Wt% of Free Acid: No free acid **pH:** 7.8-9.2 **Specific Gravity:** 1.17

Does this material contain any of the following?: Halogenated organics, (PCB), Dioxin, Medical Waste, Shock Sensitive Materials, Biohazards, Furans, Asbestos, Radioactive Wastes, Solvents, Phenolics, Explosives
Yes: _____ **No:** XXX

Any other hazardous constituents (Toxics, Metals, etc) Yes: _____ **No:** XXX

Describe Process Generating the Material (attach block flow diagram) See Attachment A

Attach MSDS: Yes: XXX **No:** _____ **If no, when will it be forwarded:** See Attachment B

Attach Assay: Yes: XXX **No:** _____ **If no, when will it be forwarded:** See Attachment C

Expected Packaging: 55 Gallon drums, 330 Gallon totes, tanker wagons

Volume Generated Per Annum: 20,000 Gallons

Regulatory Classification: UN 3226

DOT Shipping Name: Corrosive Liquid, Basic, Inorganic, NOSS **Class:** 8 **UN/NA #:** 3266

APEX
MATERIAL TECHNOLOGIES LLC 16 Industry Avenue • Joliet IL 60435 • Phone 815-727-3010 • Fax 815-727-7545

Handling Instructions: Wash thoroughly after handling. Insure adequate ventilation. Avoid breathing (dust, vapor, mist, gas). Avoid contact with eyes, skin and clothing.

Other Special Instructions: Store in original packaging in a cool place. Avoid direct sunlight. Store away from heat. Store away from incompatible materials. Keep from freezing. Keep container closed when not in use. Keep away from food and drinking water.

Profile and Sample Certification:

"As the seller of the Material described herein, I hereby certify and warrant based on a reasonable investigation: (1) that all information submitted on this profile is complete and accurate; (2) that all known or suspected hazards are disclosed; (3) that the sample submitted with this document was collected using the appropriate sampling technique and is representative of the actual stream; (4) that the sample is properly classified, packaged, marked, and labeled; and (5) that the package is in proper condition for transporting according to DOT regulations.

I, further certify and warrant that the Material sold to APEX under the terms and conditions of this Agreement qualifies for use as a commercial product/raw material, and is excluded from being a solid waste, hazardous waste, special waste, or other discarded material under all applicable local, state, and federal laws, rules, and regulations including but not limited to 40 CFR 261 *et seq.*, and 35 IAC 721 *et seq.*"

Signature: Kamlesh Patel V.P. Date: 7/30/2014

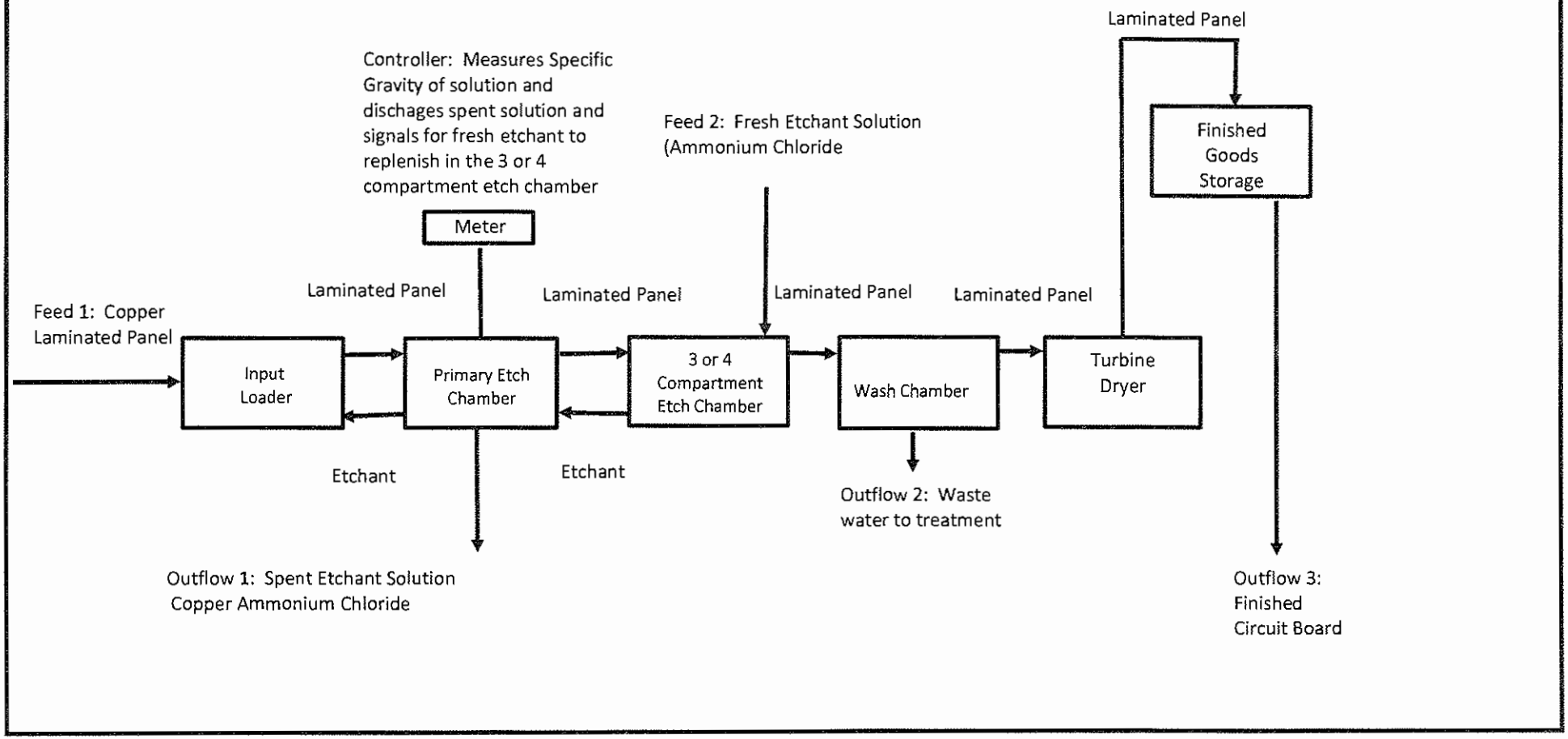
Name and Title:

Galaxy
CIRCUITS, INC.
MANUFACTURERS OF PRINTED CIRCUIT BOARDS

Appendix A

383 Randy Road
Carol Stream, IL 60188
(630)462-1010
Fax (630)462-1815 • *Modem* (630)462-8515

FIGURE 2
AMMONIACAL ETCHING PROCESS



Galaxy CIRCUITS, INC.
MANUFACTURERS OF PRINTED CIRCUIT BOARDS

Appendix B

383 Randy Road
Carol Stream, IL 60188
(630)462-1010
Fax (630)462-1815 • *Modem* (630)462-8515

MATERIAL SAFETY DATA SHEET

Date Issued: 11-14-2007
Product Name: Copper Ammonium Chloride

1. PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME: Copper Ammonium Chloride

GENERAL USE: Alkaline Copper Etchant for Printed Circuit Boards

PRODUCT DESCRIPTION: Alkaline Copper Etchant for Printed Circuit Boards

MANUFACTURER
Galaxy Circuits, Inc.
383 Randy Rd.
Carol Stream, IL 60188

24 HR. EMERGENCY TELEPHONE NUMBERS
CHEMTREC: (800) 424-9300
CHEMTREC International (703) 527-3887

2. COMPOSITION / INFORMATION ON INGREDIENTS

The specific identities of one or more components of this product are withheld as a trade secret.

Chemical Name	Wt.%	CAS#
COPPER (II) CHLORIDE	10 - 20	7447-39-4
AMMONIUM CHORIDE	10 - 20	12125-02-9
AMMONIUM HYDROXIDE	1 - 5	1336-21-6
WATER	55 - 79	7732-18-5

3. HAZARDS IDENTIFICATION

EYES: Corrosive to the eyes and may cause severe damage including blindness,

SKIN: Extremely irritating to the skin. Frequent or prolonged contact may irritate the skin and cause a rash (dermatitis).

INGESTION: Toxic and may be fatal ; may produce kidney and liver damage. Can burn mouth, throat and stomach. May cause vomiting. If vomiting does not occur immediately systemic copper poisoning may occur. Symptons may include capillary damage, headache, cold sweat, weak pulse, kidney and liver damage, central nervous excitation followed by depression, jaundice, convulsions, paralysis, and coma. Death may occur from shock or renal failure

INHALATION: Prolonged or repeated exposure to dusts of copper salts may cause discoloration of the skin or hair, ulceration and perforation of the nasal septum, runny nose, metallic taste, atrophic changes, and irritation of the mucous membranes.

Exposure may aggravate other pre-existing diseases, including diseases of the eyes, skin, and lungs.

4. FIRST AID MEASURES

EYES: Immediately flush with plenty of water. After initial flushing, remove any contact lenses and continue flushing for at least 15 minutes. Have eyes examined and tested by medical personnel.

SKIN: In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Get medical attention immediately. Thoroughly wash (or discard) clothing and shoes before reuse.

INGESTION: If swallowed, do NOT induce vomiting. Give victim a glass of water or milk. Call a physician or poison control center immediately. Never give anything by mouth to an unconscious person.

INHALATION: Rescuers should put on appropriate protective gear. Remove from area of exposure. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Keep victim warm. Get immediate medical attention.

---

5. FIRE FIGHTING MEASURES

FLASHPOINT AND METHOD: None

FLAMMABLE LIMITS: LEL = 15.75; UEL = 26 (Limits are for NH3)

AUTOIGNITION TEMPERATURE: None

FLAMMABLE CLASS: IV

EXTINGUISHING MEDIA: Use alcohol foam, carbon dioxide, or water spray when fighting fires involving this material. Cool fire exposed container with water. Exposure to extreme heat may cause containers to burst.

OTHER CONSIDERATIONS: Water runoff can cause environmental damage. Dike and collect water used to fight fire.

FIRE FIGHTING EQUIPMENT: As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear.

---

6. ACCIDENTAL RELEASE MEASURES

SMALL SPILL: Ventilate area of leak or spill. Vacuum or sweep up material and place in disposal container. Absorb spill with inert material (e.g. dry sand or earth).

LARGE SPILL: Large spills may be neutralized with dilute alkaline solutions of soda ash, or lime. Do not flush to sewer.

---

7. HANDLING AND STORAGE

GENERAL PROCEDURES:

HANDLING: Wash hands thoroughly after handling. Use with adequate ventilation. Avoid breathing (dust, vapor, mist, gas). Avoid contact with eyes, skin, and clothing.

STORAGE: Store in a cool place in original container and protect from sunlight. Store away from heat. Store away from incompatible materials. Keep from freezing. Keep container closed when not in use. Keep away from food and drinking water.

ELECTROSTATIC ACCUMULATION HAZARD: No.

---

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

EXPOSURE GUIDELINES:

OSHA HAZARDOUS COMPONENTS (29 CFR 1910.1200)

		EXPOSURE LIMITS					
		OSHA PEL		ACGIH TLV		Supplier OEL	
		ppm	mg/m^3	ppm	mg/m^3	ppm	mg/m^3
Copper (II) Chloride	TWA		1*		1*		
	STEL						
Ammonium Chloride	TWA				10**		
	STEL						
Ammonium Hydroxide	TWA			25***		50***	
	STEL						

TABLE FOOTNOTES:

*Cu

**Fume

***NH_3

ENGINEERING CONTROLS: Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower. Local exhaust ventilation may be necessary to control any air contaminants to within their TLV's during the use of this product.

PERSONAL PROTECTIVE EQUIPMENT

EYES AND FACE: Wear safety glasses with side shields (or goggles) and a face shield.

SKIN: Use gloves, recommended for this material by manufacturers or suppliers based on test data showing adequate permeation and penetration resistance.

RESPIRATORY: A NIOSH-approved air purifying respirator with the appropriate cartridge or canister for the hazards may be permissible under certain circumstances where airborne concentrations are expected to exceed exposure limits. Protection provided by air purifying respirators is limited, Use appositive-pressure air-supplied respirator if there is any potential for an uncontrolled release, exposure levels are not known, or any other circumstances where air-purifying respirators may not provide adequate protection.

PROTECTIVE CLOTHING: Use appropriate body coverings recommended for this material by manufacturers or suppliers based on test data showing adequate permeation and penetration resistance.

9. PHYSICAL AND CHEMICAL PROPERTIES

PHYSICAL STATE: Liquid

ODOR: Strong ammonia. DO NOT SMELL.

APPEARANCE: Clear

COLOR: Deep blue

pH: 7.8 – 9.2

PERCENT VOLATILE: 60% - 80%

VAPOR PRESSURE: mm Hg at 20°C Approximately 20

VAPOR DENSITY: (air=1) 0.6

BOILING POINT: °C (°F) 100 (212)

SOLUBILITY IN WATER: Miscible

EVAPORATION RATE (butyl acetate=1)**:** 0.1

SPECIFIC GRAVITY: 1.17

---

10. STABILITY AND REACTIVITY

STABLE: Stable under normal conditions of use and storage.

HAZARDOUS POLYMERIZATION: Will not occur.

CONDITIONS TO AVOID: Incompatibles. Direct sunlight. Exposure to heat. Protect from freezing.

HAZARDOUS DECOMPOSITION PRODUCTS: thermal decomposition may produce fumes of copper. Thermal decomposition may produce hydrogen chloride or chlorine compounds. Thermal decomposition may release toxic ammonia fumes. Thermal decomposition releases oxides of nitrogen.

INCOMPATIBLE MATERIALS: Alkalies. Potassium, sodium, hydrazine, nitromethane, aluminum, strong oxidizers, acetylene, sodium hypobromite, sulfides, sulfites, and formaldehyde. Corrosive to metals; reacts exothermally with strong bases and oxidizers.

---

11. TOXICOLOGICAL INFORMATION

CARCINOGENICITY

IARC: No

NTP: No

OSHA: No

There is no experimental toxicity data for this product. Refer to the data listed below for relative toxicity assessment.

100% CUPRIC CHLORIDE

INTRAPERITONEAL LD_{50} : mg/kg (species) 14,700 µg/Kg (Rat); 4,700 µg/Kg (Mouse) LDLo: 35mg/Kg (Mouse) Reproductive Effects

INTRAVENOUS LD_{50}: 17,500 µg/Kg (Mouse); 5mg/Kg (Rat)

ORAL LD_{50}: mg/kg (species) 584 (Rat); 233 (Mouse)

INHALATION TCLo (species): 20µg/M3/26W (Rat)

OTHER: NIOSH immediately dangerous to health and life (IDHL) 100 mg/m3 in air as Cu.

GENERAL COMMENTS: Refer to Section 3 for additional information on potential health effects.

100% AMMONIUM CHLORIDE

INTRAMUSCULAR TOXICITY: LD_{50}: 30 mg/Kg (Rat)

INTRAPERITONEAL TOXICITY: LD_{50} : 1439 mg/kg (Mouse)

SUBCUTANEOUS TOXICTY: LDLo: 500 mg/Kg (Rat)

ORAL TOXICTY LD_{50}: 1,650 mg/kg (Mouse); 1,300 mg/Kg (Mouse)

EYE TOXICITY: Sev 500 mg/24H (Rabbit)

OTHER: NIOSH immediately dangerous to health and life (IDHL) 100 mg/m3 in air as Cu.

GENERAL COMMENTS: Refer to Section 3 for additional information on potential health effects.

100% AMMONIUM HYDROXIDE

ORAL TOXICITY: LDLo: 43 mg/kg (Human)

ORAL TOXICITY: LD_{50}: 350 mg/kg (Rat)

ORAL TOXICITY: LDlo: 750 mg/Kg (Cat)

EYE TOXICITY: SEV 1mg/30s Rns (Rabbit)

INHALATION TOXICITY: LDLo: 5000 ppm (Human)

INHALATION TOXICITY: TCLo: 700 PPM: Eye (Human)

INHALATION TOXICITY: TCLo: 408 ppm: lrr (Human)

GENERAL COMMENTS: Refer to Section 3 for additional information on potential health effects.

12. ECOLOGICAL INFORMATION

ENVIRONMENTAL DATA: Harmful to fish and other water organisms. Keep out of waterways.

13. DISPOSAL CONSIDERATIONS

DISPOSAL METHOD: Dispose in accordance with federal state, local environmental regulatory requirements.

14. TRANSPORT INFORMATION

DOT (DEPARTMENT OF TRANSPORTATION)

PROPER SHIPPING NAME: Corrosive Liquid, Basic, Inorganic, N.O.S. (Copper(II) chloride, Ammonium chloride)

TECHNICAL NAME: Copper(II) Chloride, Ammonium Chloride

PRIMARY HAZARD CLASS/DIVISION: 8

UN/NA NUMBER: UN 3266

PACKING GROUP: II

LABEL: Corrosive

OTHER SHIPPING INFORMATION: RQ is applicable when shipping 10# or more copper chloride, 1000# or more ammonium chloride or 5000# or more of ammonium chloride in one package.

Additional Marking: "Marine Pollutant" required for bulk shipment.

The words "Marine Pollutant" must be entered on the Shipping Paper in association with the basic DOT description for bulk shipments and containers must be marked as a "Marine Pollutant". In addition, any quantity shipped by vessel must be identified and marked as a "Marine Pollutant".

---

15. REGULATORY INFORMATION

TOXIC SUBSTANCES CONTROL ACT (TSCA): Chemical ingredients are on the TSCA inventory.

SUPERFUND REPORTABLE QUANTITIY RQ): 10#/4.54 Kg ($CuCl_2$), 5000# - Ammonium chloride, 1000# - Ammonium Hydroxide

SARA TITLE III (SECTION 313): This product contains a copper compound which is subject to reporting. This product contains ammonia and subject to reporting as ammonia and ammonium ion on an ammonia basis = 1.6 lb/gal.

CALIFORNIA PROPOSITION 65 WARNING: This product may contain chemicals known to the state of California to cause cancer, or birth defects or other reproductive harm.

CANADIAN LISTS

DSL/NDSL: Found on the domestic substances list.

WHMIS: Copper (II) Chloride it item number 430 from the ingredient disclosure list and is subject to reporting at 1% threshold; Ammonium Hydroxide: Item number 96, reporting at 1% threshold; Ammonium Chloride: Item number 88, reporting at 1% threshold.

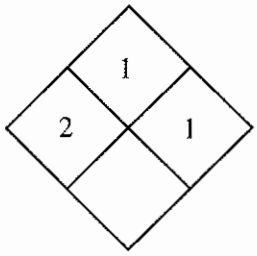
STATE LISTS: This product contains ingredients that are listed for disclosure or reporting in the states of California, Connecticut, Illinois, Louisiana, Massachusetts, Michigan, Minnesota, North Carolina, New Jersey, New York, Oregon, Pennsylvania, Rhode Island, and Texas. Please check with appropriate agencies.

16. OTHER INFORMATION

It is reasonable to assume that ammonia etchant compounds contain arsenic, cadmium, chromium, and lead in concentrations ranging from a few parts per billion to several parts per million. It is reasonable to assume that copper compounds contain arsenic, cadmium, chromium, and lead in concentrations ranging from a few parts per billion to several parts per million.

All information presented herein is given in good faith and is based on sources and tests considered to be reliable, but cannot be guaranteed. It is the user's full responsibility to accept risk for safety, toxicity, handling, storage, and use of the product, as well as to determine the suitability of the product for a specific purpose. We make no warranty as to the results to be obtained in suing the product; therefore all risks must be assumed by the user.

NFPA RATINGS



Galaxy CIRCUITS, INC.
MANUFACTURERS OF PRINTED CIRCUIT BOARDS

Appendix C

383 Randy Road
Carol Stream, IL 60188
(630)462-1010
Fax (630)462-1815 • *Modem* (630)462-8515

EXHIBIT C
Analytical Test Results

Sample:	Copper Ammonium Chloride	Sample:	Copper Ammonium Chloride	Sample:	Copper Ammonium Chloride
Source:	ITO Industries	Source:	Midwest Printed Circuits	Source:	Galaxy Circuits
Via:	ITO Industries	Via:	Martin Lieberman	Via:	Martin Lieberman
Date Received:	14-Mar-14	Date Received:	7-Apr-14	Date Received:	14-Apr-14
Lab ID:	B14083-02O	Lab ID:	B14097-02O	Lab ID:	B14104-01O

Analysis		
Ca	< 1	ppm
Cd	< 1	ppm
Co	274	ppm
Cr (total)	< 1	ppm
Cr(VI)*	< 2.5	ppm
Cu	12.59	wt%
Fe	2	ppm
Mg	6	ppm
Mn	3	ppm
Na	2.98	wt %
Ni	8	ppm
Pb*	2.5	ppm
Zn	119	ppm

Specific Gravity	1.239
pH	8.297

Analysis		
Ca	44	ppm
Cd	< 1	ppm
Co	< 1	ppm
Cr (total)	29	ppm
Cr(VI)*	< 2.5	ppm
Cu	12.41	wt%
Fe	8	ppm
Mg	5	ppm
Mn	< 1	ppm
Na	7749	ppm
Ni	6	ppm
Pb*	2.5	ppm
Zn	164	ppm

Specific Gravity	1.211
pH	8.615

Analysis		
Ca	33	ppm
Cd	< 1	ppm
Co	< 1	ppm
Cr (total)	41	ppm
Cr(VI)*	< 2.5	ppm
Cu	11.47	wt%
Fe	3	ppm
Mg	9	ppm
Mn	< 1	ppm
Na	7531	ppm
Ni	9	ppm
Pb*	2.1	ppm
Zn	49	ppm

Specific Gravity	1.215
pH	9.201

Above are the results of the analysis of three representative samples of Copper Ammonia Chloride obtained from three different printed circuit board manufacturers. Except where indicated, all analyses were performed by Apex Material Technologies' internal lab.

*Lead and hexavalent chrome, Cr(VI), assays were performed by an independent IL EPA Certified testing lab. See attachment. The hexavalent chrome assays were below the 2.5 ppm routine reportable limit.

No other TCLP metals were analyzed as they are not used nor present at the processing facilities. All inbound Spent Etchant will be analyzed regularly and routinely by Apex Material Technologies' internal lab prior to processing. Apex will also use this independent IL EPA certified lab to analyze inbound Spent Etchant materialsfor TCLP metals prior to processing. Apex Material Technologies will use this IL EPA Certified lab to qualify samples of spent etchant from all

First Environmental Laboratories, Inc.
IL ELAP / NELAC Accreditation # 100292
1600 Shore Road • Naperville, Illinois 60563 • Phone (630) 778-1200 • Fax (630) 778-1233

May 02, 2014

Mr. Timothy Racette
Apex Material Technologies, LLC
10 Industry Ave
Joliet, IL 60435

Project ID: Blackbeard
First Environmental File ID: 14-2198
Date Received: April 25, 2014

Dear Mr. Timothy Racette:

The above referenced project was analyzed as directed on the enclosed chain of custody record.

All Quality Control criteria as outlined in the methods and current IL ELAP/NELAP have been met unless otherwise noted. QA/QC documentation and raw data will remain on file for future reference. Our accreditation number is 100292 and our current certificate is number 003363: effective 02/18/2014 through 02/28/2015.

I thank you for the opportunity to be of service to you and look forward to working with you again in the future. Should you have any questions regarding any of the enclosed analytical data or need additional information, please contact me at (630) 778-1200.

Sincerely,

Stan Zawerski
Project Manager

First Environmental Laboratories, Inc.
IL ELAP / NELAC Accreditation # 100292
1600 Shore Road • Naperville, Illinois 60563 • Phone (630) 778-1200 • Fax (630) 778-1233

Case Narrative

Apex Material Technologies, LLC

Lab File ID: **14-2198**

Project ID: **Blackbeard**

Date Received: **April 25, 2014**

All quality control criteria, as outlined in the methods, have been met except as noted below or on the following analytical report.

The results in this report apply to the samples in the following table:

Laboratory Sample ID	Client Sample Identifier	Date/Time Collected
14-2198-001	B14083-02O	03/14/14
14-2198-002	B14097-02O	04/07/14
14-2198-003	B14104-01O	04/14/14

Sample Batch Comments:

Time of sample collection was not provided.

The following is a definition of flags that may be used in this report:

Flag	Description	Flag	Description
<	Analyte not detected at or above the reporting limit.	L	LCS recovery outside control limits.
C	Sample received in an improper container for this test.	M	MS recovery outside control limits; LCS acceptable.
D	Surrogates diluted out; recovery not available.	N	Analyte is not part of our NELAC accreditation.
E	Estimated result; concentration exceeds calib range.	P	Chemical preservation pH adjusted in lab.
G	Surrogate recovery outside control limits.	Q	Result was determined by a GC/MS database search.
H	Analysis or extraction holding time exceeded.	S	Analysis was subcontracted to another laboratory.
J	Estimated result; concentration is less than routine RL but greater than MDL.	W	Reporting limit elevated due to sample matrix.
RL	Routine Reporting Limit (Lowest amount that can be detected when routine weights/volumes are used without dilution.)	ND	Analyte was not detected using a library search routine; No calibration standard was analyzed.

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IL ELAP / NELAC Accreditation # 100292
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Analytical Report

Client: Apex Material Technologies, LLC
Project ID: Blackbeard
Date Received: 04/25/14
Date Reported: 05/02/14

Results are reported on an "as received" basis.

Lab No:	Sample ID:	Analyte	Result	R.L.	Units	Flags
Chromium, Hexavalent		**Method: 3060A/7196A**				
14-2198-001	B14083-02O	Date Collected: 03/14/14	Time Collected:			
Analysis Date:	05/02/14					
		Chromium, Hexavalent	**<2.5**	2.5	**mg/kg**	
14-2198-002	B14097-02O	Date Collected: 04/07/14	Time Collected:			
Analysis Date:	05/02/14					
		Chromium, Hexavalent	**<2.5**	2.5	**mg/kg**	
14-2198-003	B14104-01O	Date Collected: 04/14/14	Time Collected:			
Analysis Date:	05/02/14					
		Chromium, Hexavalent	**<2.5**	2.5	**mg/kg**	
Total Metals		**Method: 6010C**	**Preparation Method 3050B**			
14-2198-001	B14083-02O	Date Collected: 03/14/14	Time Collected:			
Analysis Date:	04/29/14		Preparation Date: 04/29/14			
		Lead	**2.5**	0.5	**mg/kg**	
14-2198-002	B14097-02O	Date Collected: 04/07/14	Time Collected:			
Analysis Date:	04/29/14		Preparation Date: 04/29/14			
		Lead	**2.5**	0.5	**mg/kg**	
14-2198-003	B14104-01O	Date Collected: 04/14/14	Time Collected:			
Analysis Date:	04/29/14		Preparation Date: 04/29/14			
		Lead	**2.1**	0.5	**mg/kg**	

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CHAIN OF CUSTODY RECORD

First Environmental Laboratories, Inc.

1600 Shore Road, Suite D
Naperville, IL 60563
Phone: (630)778-1200 * Fax (630)778-1233
E-Mail: info@firstenv.com
IEPA Accreditation #100292

Company Name: Apex Material Technologies LLC			
Street Address: 10 Industry Ave.			
City: Joliet		State: IL	Zip: 60435
Phone: 630 746-7050	Fax: 815 727-7545	e-Mail:	
Send Report To: Timothy Racette		Via Fax: ☐	Via e-Mail: ☒
Sampled By: M Lieberman			

Project I.D.: BLACKBEARD

P.O. #: Cash

Enter analyses required on the lines to the left. Place an "X" in the box below to indicate which samples require what analysis.

Date/Time Taken	Sample Description	Matrix	Cr (VI) Assay	Pb Assay (ICP)						Comments	Lab I.D.
March 14, 2014	Copper Ammonium Chloride	Other	✓	✓						B14083-02O 14-2198-001	
April 7, 2014	Copper Ammonium Chloride	Other	✓	✓						B14097-02O 002	
April 14, 2014	Copper Ammonium Chloride	Other	✓	✓						B14104-01O 003	

FOR LAB USE ONLY: Cooler Temperature:0.1-6°C Yes___ No___ N/A °C
Received within 6 hrs of collection:_____
Ice Present: Yes____ No____

Sample Refrigerated: Yes___ No___
Refrigerator Temperature:_____°C

Containers Received Preserved: Yes___ No___
5035 Vials Frozen: Yes___ No___
Freezer Temperature:_____°C

Notes and Special Instructions:

Relinquished By:	Date/Time: 4/25/14 1545	Received By:	Date/Time: 4/25/14 1545
Relinquished By:	Date/Time:	Received By:	Date/Time:

Rev 1/07

EXHIBIT H

MATERIAL SAFETY DATA SHEET

Date Issued: 11-14-2007
Product Name: Copper Ammonium Chloride

1. PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME: Copper Ammonium Chloride

GENERAL USE: Alkaline Copper Etchant for Printed Circuit Boards

PRODUCT DESCRIPTION: Alkaline Copper Etchant for Printed Circuit Boards

MANUFACTURER
Delta Precision Circuits
1370 Lively Blvd.
Elk Grove, IL 60007

24 HR. EMERGENCY TELEPHONE NUMBERS
CHEMTREC: (800) 424-9300
CHEMTREC International (703) 527-3887

2. COMPOSITION / INFORMATION ON INGREDIENTS

Chemical Name	Wt.%	CAS#
COPPER (II) CHLORIDE	10 - 20	7447-39-4
AMMONIUM CHORIDE	10 - 20	12125-02-9
AMMONIUM HYDROXIDE	1 - 5	1336-21-6
WATER	55 - 79	7732-18-5
	- -	

3. HAZARDS IDENTIFICATION

EYES: Corrosive to the eyes and may cause severe damage including blindness,

SKIN: Extremely irritating to the skin. Frequent or prolonged contact may irritate the skin and cause a rash (dermatitis).

INGESTION: Toxic and may be fatal ; may produce kidney and liver damage. Can burn mouth, throat and stomach. May cause vomiting. If vomiting does not occur immediately systemic copper poisoning may occur. Symptons may include capillary damage, headache, cold sweat, weak pulse, kidney and liver damage, central nervous excitation followed by depression, jaundice, convulsions, paralysis, and coma. Death may occur from shock or renal failure

INHALATION: Prolonged or repeated exposure to dusts of copper salts may cause discoloration of the skin or hair, ulceration and perforation of the nasal septum, runny nose, metallic taste, atrophic changes, and irritation of the mucous membranes.

Exposure may aggravate other pre-existing diseases, including diseases of the eyes, skin, and lungs.

4. FIRST AID MEASURES

EYES: Immediately flush with plenty of water. After initial flushing, remove any contact lenses and continue flushing for at least 15 minutes. Have eyes examined and tested by medical personnel.

SKIN: In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Get medical attention immediately. Thoroughly wash (or discard) clothing and shoes before reuse.

INGESTION: If swallowed, do NOT induce vomiting. Give victim a glass of water or milk. Call a physician or poison control center immediately. Never give anything by mouth to an unconscious person.

INHALATION: Rescuers should put on appropriate protective gear. Remove from area of exposure. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Keep victim warm. Get immediate medical attention.

---

5. FIRE FIGHTING MEASURES

FLASHPOINT AND METHOD: None

FLAMMABLE LIMITS: LEL = 15.75; UEL = 26 (Limits are for NH3)

AUTOIGNITION TEMPERATURE: None

FLAMMABLE CLASS: IV

EXTINGUISHING MEDIA: Use alcohol foam, carbon dioxide, or water spray when fighting fires involving this material. Cool fire exposed container with water. Exposure to extreme heat may cause containers to burst.

OTHER CONSIDERATIONS: Water runoff can cause environmental damage. Dike and collect water used to fight fire.

FIRE FIGHTING EQUIPMENT: As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear.

---

6. ACCIDENTAL RELEASE MEASURES

SMALL SPILL: Ventilate area of leak or spill. Vacuum or sweep up material and place in disposal container. Absorb spill with inert material (e.g. dry sand or earth).

LARGE SPILL: Large spills may be neutralized with dilute alkaline solutions of soda ash, or lime. Do not flush to sewer.

---

7. HANDLING AND STORAGE

GENERAL PROCEDURES:

HANDLING: Wash hands thoroughly after handling. Use with adequate ventilation. Avoid breathing (dust, vapor, mist, gas). Avoid contact with eyes, skin, and clothing.

STORAGE: Store in a cool place in original container and protect from sunlight. Store away from heat. Store away from incompatible materials. Keep from freezing. Keep container closed when not in use. Keep away from food and drinking water.

ELECTROSTATIC ACCUMULATION HAZARD: No.

---

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

EXPOSURE GUIDELINES:

OSHA HAZARDOUS COMPONENTS (29 CFR 1910.1200)

		EXPOSURE LIMITS					
		OSHA PEL		ACGIH TLV		Supplier OEL	
		ppm	mg/m^3	ppm	mg/m^3	ppm	mg/m^3
Copper (II) Chloride	**TWA**		1*		1*		
	STEL						
Ammonium Chloride	**TWA**				10**		
	STEL						
Ammonium Hydroxide	**TWA**			25***		50***	
	STEL						

TABLE FOOTNOTES:

***Cu**

****Fume**

*****NH_3

ENGINEERING CONTROLS: Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower. Local exhaust ventilation may be necessary to control any air contaminants to within their TLV's during the use of this product.

PERSONAL PROTECTIVE EQUIPMENT

EYES AND FACE: Wear safety glasses with side shields (or goggles) and a face shield.

SKIN: Use gloves, recommended for this material by manufacturers or suppliers based on test data showing adequate permeation and penetration resistance.

RESPIRATORY: A NIOSH-approved air purifying respirator with the appropriate cartridge or canister for the hazards may be permissible under certain circumstances where airborne concentrations are expected to exceed exposure limits. Protection provided by air purifying respirators is limited, Use appositive-pressure air-supplied respirator if there is any potential for an uncontrolled release, exposure levels are not known, or any other circumstances where air-purifying respirators may not provide adequate protection.

PROTECTIVE CLOTHING: Use appropriate body coverings recommended for this material by manufacturers or suppliers based on test data showing adequate permeation and penetration resistance.

9. PHYSICAL AND CHEMICAL PROPERTIES

PHYSICAL STATE: Liquid

ODOR: Strong ammonia. DO NOT SMELL.

APPEARANCE: Clear

COLOR: Deep blue

pH: 7.8 – 9.2

PERCENT VOLATILE: 60% - 80%

VAPOR PRESSURE: mm Hg at 20°C Approximately 20

VAPOR DENSITY: (air=1) 0.6

BOILING POINT: °C (°F) 100 (212)

SOLUBILITY IN WATER: Miscible

EVAPORATION RATE (butyl acetate=1)**:** 0.1

SPECIFIC GRAVITY: 1.17

---

10. STABILITY AND REACTIVITY

STABLE: Stable under normal conditions of use and storage.

HAZARDOUS POLYMERIZATION: Will not occur.

CONDITIONS TO AVOID: Incompatibles. Direct sunlight. Exposure to heat. Protect from freezing.

HAZARDOUS DECOMPOSITION PRODUCTS: Thermal decomposition may produce fumes of copper. Thermal decomposition may produce hydrogen chloride or chlorine compounds. Thermal decomposition may release toxic ammonia fumes. Thermal decomposition releases oxides of nitrogen.

INCOMPATIBLE MATERIALS: Alkalies. Potassium, sodium, hydrazine, nitromethane, aluminum, strong oxidizers, acetylene, sodium hypobromite, sulfides, sulfites, and formaldehyde. Corrosive to metals; reacts exothermally with strong bases and oxidizers.

---

11. TOXICOLOGICAL INFORMATION

CARCINOGENICITY

IARC: No

NTP: No

OSHA: No

There is no experimental toxicity data for this product. Refer to the data listed below for relative toxicity assessment.

100% CUPRIC CHLORIDE

INTRAPERITONEAL LD_{50} : mg/kg (species) 14,700 µg/Kg (Rat); 4,700 µg/Kg (Mouse) LDLo: 35mg/Kg (Mouse) Reproductive Effects

INTRAVENOUS LD_{50}: 17,500 µg/Kg (Mouse); 5mg/Kg (Rat)

ORAL LD_{50}: mg/kg (species) 584 (Rat); 233 (Mouse)

INHALATION TCLo (species): 20µg/M3/26W (Rat)

OTHER: NIOSH immediately dangerous to health and life (IDHL) 100 mg/m3 in air as Cu.

GENERAL COMMENTS: Refer to Section 3 for additional information on potential health effects.

100% AMMONIUM CHLORIDE

INTRAMUSCULAR TOXICITY: LD_{50}: 30 mg/Kg (Rat)

INTRAPERITONEAL TOXICITY: LD_{50} : 1439 mg/kg (Mouse)

SUBCUTANEOUS TOXICTY: LDLo: 500 mg/Kg (Rat)

ORAL TOXICTY LD_{50}: 1,650 mg/kg (Mouse); 1,300 mg/Kg (Mouse)

EYE TOXICITY: Sev 500 mg/24H (Rabbit)

OTHER: NIOSH immediately dangerous to health and life (IDHL) 100 mg/m3 in air as Cu.

GENERAL COMMENTS: Refer to Section 3 for additional information on potential health effects.

100% AMMONIUM HYDROXIDE

ORAL TOXICITY: LDLo: 43 mg/kg (Human)

ORAL TOXICITY: **LD_{50}:** 350 mg/kg (Rat)

ORAL TOXICITY: LDlo: 750 mg/Kg (Cat)

EYE TOXICITY: SEV 1mg/30s Rns (Rabbit)

INHALATION TOXICITY: LDLo: 5000 ppm (Human)

INHALATION TOXICITY: TCLo: 700 PPM: Eye (Human)

INHALATION TOXICITY: TCLo: 408 ppm: lrr (Human)

GENERAL COMMENTS: Refer to Section 3 for additional information on potential health effects.

12. ECOLOGICAL INFORMATION

ENVIRONMENTAL DATA: Harmful to fish and other water organisms. Keep out of waterways.

13. DISPOSAL CONSIDERATIONS

DISPOSAL METHOD: Dispose in accordance with federal state, local environmental regulatory requirements.

14. TRANSPORT INFORMATION

DOT (DEPARTMENT OF TRANSPORTATION)

PROPER SHIPPING NAME: Corrosive Liquid, Basic, Inorganic, N.O.S. (Copper(II) chloride, Ammonium chloride)

TECHNICAL NAME: Copper(II) Chloride, Ammonium Chloride

PRIMARY HAZARD CLASS/DIVISION: 8

UN/NA NUMBER: UN 3266

PACKING GROUP: II

LABEL: Corrosive

OTHER SHIPPING INFORMATION: RQ is applicable when shipping 10# or more copper chloride, 1000# or more ammonium chloride or 5000# or more of ammonium chloride in one package.

Additional Marking: "Marine Pollutant" required for bulk shipment.

The words "Marine Pollutant" must be entered on the Shipping Paper in association with the basic DOT description for bulk shipments and containers must be marked as a "Marine Pollutant". In addition, any quantity shipped by vessel must be identified and marked as a "Marine Pollutant".

15. REGULATORY INFORMATION

TOXIC SUBSTANCES CONTROL ACT (TSCA): Chemical ingredients are on the TSCA inventory.

SUPERFUND REPORTABLE QUANTITIY RQ): 10#/4.54 Kg ($CuCl_2$), 5000# - Ammonium chloride, 1000# - Ammonium Hydroxide

SARA TITLE III (SECTION 313): This product contains a copper compound which is subject to reporting. This product contains ammonia and subject to reporting as ammonia and ammonium ion on an ammonia basis = 1.6 lb/gal.

CALIFORNIA PROPOSITION 65 WARNING: This product may contain chemicals known to the state of California to cause cancer, or birth defects or other reproductive harm.

CANADIAN LISTS

DSL/NDSL: Found on the domestic substances list.

WHMIS: Copper (II) Chloride it item number 430 from the ingredient disclosure list and is subject to reporting at 1% threshold; Ammonium Hydroxide: Item number 96, reporting at 1% threshold; Ammonium Chloride: Item number 88, reporting at 1% threshold.

STATE LISTS: This product contains ingredients that are listed for disclosure or reporting in the states of California, Connecticut, Illinois, Louisiana, Massachusetts, Michigan, Minnesota, North Carolina, New Jersey, New York, Oregon, Pennsylvania, Rhode Island, and Texas. Please check with appropriate agencies.

16. OTHER INFORMATION

It is reasonable to assume that ammonia etchant compounds contain arsenic, cadmium, chromium, and lead in concentrations ranging from a few parts per billion to several parts per million. It is reasonable to assume that copper compounds contain arsenic, cadmium, chromium, and lead in concentrations ranging from a few parts per billion to several parts per million**.**

All information presented herein is given in good faith and is based on sources and tests considered to be reliable, but cannot be guaranteed. It is the user's full responsibility to accept risk for safety, toxicity, handling, storage, and use of the product, as well as to determine the suitability of the product for a specific purpose. We make no warranty as to the results to be obtained in suing the product; therefore all risks must be assumed by the user.

NFPA RATINGS

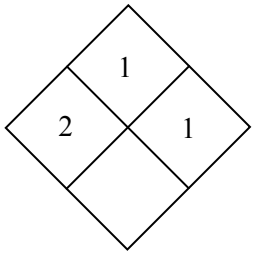

EXHIBIT I

Analytical Test Results

Sample:	Copper Ammonium Chloride	Sample:	Copper Ammonium Chloride	Sample:	Copper Ammonium Chloride
Source:	ITO Industries	Source:	Midwest Printed Circuits	Source:	Galaxy Circuits
Via:	ITO Industries	Via:	Martin Lieberman	Via:	Martin Lieberman
Date Received:	14-Mar-14	Date Received:	7-Apr-14	Date Received:	14-Apr-14
Lab ID:	B14083-02O	Lab ID:	B14097-02O	Lab ID:	B14104-01O

Analysis		
Ca	< 1	ppm
Cd	< 1	ppm
Co	274	ppm
Cr (total)	< 1	ppm
Cr(VI)*	< 2.5	ppm
Cu	12.59	wt%
Fe	2	ppm
Mg	6	ppm
Mn	3	ppm
Na	2.98	wt %
Ni	8	ppm
Pb*	2.5	ppm
Zn	119	ppm

Analysis		
Ca	44	ppm
Cd	< 1	ppm
Co	< 1	ppm
Cr (total)	29	ppm
Cr(VI)*	< 2.5	ppm
Cu	12.41	wt%
Fe	8	ppm
Mg	5	ppm
Mn	< 1	ppm
Na	7749	ppm
Ni	6	ppm
Pb*	2.5	ppm
Zn	164	ppm

Analysis		
Ca	33	ppm
Cd	< 1	ppm
Co	< 1	ppm
Cr (total)	41	ppm
Cr(VI)*	< 2.S	ppm
Cu	11.47	wt%
Fe	3	ppm
Mg	9	ppm
Mn	< 1	ppm
Na	7531	ppm
Ni	9	ppm
Pb*	2.1	ppm
Zn	49	ppm

Specific Gravity	1.239	**Specific Gravity**	1.211	**Specific Gravity**	1.215
pH	8.297	**pH**	8.615	**pH**	9.201

Above are the results of the analysis of three representative samples of Copper Ammonia Chloride obtained from three different printed circuit board manufacturers. Except where indicated, all analyses were performed by Apex Material Technologies' internal lab.

*Lead and hexavalent chrome, **Cr**(VI), assays were performed by an independent IL EPA Certified testing lab. See attachment. The hexavalent chrome assays were below the 2.5 ppm routine reportable limit.

No other TCLP metals were analyzed as they are not used nor present at the processing facilities. All inbound Spent Etchant will be analyzed regularly and routinely by Apex Material Technologies' internal lab prior to processing. Apex will also use this independent IL EPA certified lab to analyze inbound Spent Etchant materialsfor TCLP metals prior to processing. Apex Material Technologies will use this IL EPA Certified lab to qualify samples of spent etchant from all

First Environmental Laboratories, Inc.
IL ELAP / NELAC Accreditation # 100292
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May 02, 2014

Mr. Timothy Racette
Apex Material Technologies, LLC
10 Industry Ave
Joliet, IL 60435

Project ID: Blackbeard
First Environmental File ID: 14-2198
Date Received: April 25, 2014

Dear Mr. Timothy Racette:

The above referenced project was analyzed as directed on the enclosed chain of custody record.

All Quality Control criteria as outlined in the methods and current IL ELAP/NELAP have been met unless otherwise noted. QA/QC documentation and raw data will remain on file for future reference. Our accreditation number is 100292 and our current certificate is number 003363: effective 02/18/2014 through 02/28/2015.

I thank you for the opportunity to be of service to you and look forward to working with you again in the future. Should you have any questions regarding any of the enclosed analytical data or need additional information, please contact me at (630) 778-1200.

Sincerely,

Stan Zawerski
Project Manager

First Environmental Laboratories, Inc.
IL ELAP / NELAC Accreditation # 100292
1600 Shore Road • Naperville, Illinois 60563 • Phone (630) 778-1200 • Fax (630) 778-1233

Case Narrative

Apex Material Technologies, LLC

Lab File ID: **14-2198**

Project ID: **Blackbeard**

Date Received: **April 25, 2014**

All quality control criteria, as outlined in the methods, have been met except as noted below or on the following analytical report.

The results in this report apply to the samples in the following table:

Laboratory Sample ID	Client Sample Identifier	Date/Time Collected
14-2198-001	B14083-02O	03/14/14
14-2198-002	B14097-02O	04/07/14
14-2198-003	B14104-01O	04/14/14

Sample Batch Comments:

Time of sample collection was not provided.

The following is a definition of flags that may be used in this report:

Flag	Description	Flag	Description
<	Analyte not detected at or above the reporting limit.	L	LCS recovery outside control limits.
C	Sample received in an improper container for this test.	M	MS recovery outside control limits; LCS acceptable.
D	Surrogates diluted out; recovery not available.	N	Analyte is not part of our NELAC accreditation.
E	Estimated result; concentration exceeds calib range.	P	Chemical preservation pH adjusted in lab.
G	Surrogate recovery outside control limits.	Q	Result was determined by a GC/MS database search.
H	Analysis or extraction holding time exceeded.	S	Analysis was subcontracted to another laboratory.
J	Estimated result; concentration is less than routine RL but greater than MDL.	W	Reporting limit elevated due to sample matrix.
RL	Routine Reporting Limit (Lowest amount that can be detected when routine weights/volumes are used without dilution.)	ND	Analyte was not detected using a library search routine; No calibration standard was analyzed.

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Analytical Report

Client: Apex Material Technologies, LLC
Project ID: Blackbeard
Date Received: 04/25/14
Date Reported: 05/02/14

Results are reported on an "as received" basis.

Lab No:	Sample ID:	Analyte	Result	R.L.	Units	Flags
Chromium, Hexavalent		**Method: 3060A/7196A**				
14-2198-001	B14083-02O	Date Collected: 03/14/14	Time Collected:			
Analysis Date:	05/02/14					
		Chromium, Hexavalent	**<2.5**	2.5	**mg/kg**	
14-2198-002	B14097-02O	Date Collected: 04/07/14	Time Collected:			
Analysis Date:	05/02/14					
		Chromium, Hexavalent	**<2.5**	2.5	**mg/kg**	
14-2198-003	B14104-01O	Date Collected: 04/14/14	Time Collected:			
Analysis Date:	05/02/14					
		Chromium, Hexavalent	**<2.5**	2.5	**mg/kg**	
Total Metals		**Method: 6010C**	**Preparation Method 3050B**			
14-2198-001	B14083-02O	Date Collected: 03/14/14	Time Collected:			
Analysis Date:	04/29/14		Preparation Date: 04/29/14			
		Lead	**2.5**	0.5	**mg/kg**	
14-2198-002	B14097-02O	Date Collected: 04/07/14	Time Collected:			
Analysis Date:	04/29/14		Preparation Date: 04/29/14			
		Lead	**2.5**	0.5	**mg/kg**	
14-2198-003	B14104-01O	Date Collected: 04/14/14	Time Collected:			
Analysis Date:	04/29/14		Preparation Date: 04/29/14			
		Lead	**2.1**	0.5	**mg/kg**	

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CHAIN OF CUSTODY RECORD

First Environmental Laboratories, Inc.

1600 Shore Road, Suite D
Naperville, IL 60563
Phone: (630)778-1200 * Fax (630)778-1233
E-Mail: info@firstenv.com
IEPA Accreditation #100292

Company Name: Apex Material Technologies LLC			
Street Address: 10 Industry Ave.			
City: Joliet		State: IL	Zip: 60435
Phone: 630 746-7050	Fax: 815 727-7545	e-Mail:	
Send Report To: Timothy Racette		Via Fax: ☐	Via e-Mail: ☒
Sampled By: M Lieberman			

Project I.D.: BLACKBEARD

P.O. #: Cash

Enter analyses required on the lines to the left. Place an "X" in the box below to indicate which samples require what analysis.

Date/Time Taken	Sample Description	Matrix	Cr (VI) Assay	Pb Assay (ICP)							Comments	Lab I.D.
March 14, 2014	Copper Ammonium Chloride	Other	✓	✓							B14083-02O 14-2198-001	
April 7, 2014	Copper Ammonium Chloride	Other	✓	✓							B14097-02O 002	
April 14, 2014	Copper Ammonium Chloride	Other	✓	✓							B14104-01O 003	

FOR LAB USE ONLY: Cooler Temperature:0.1-6°C Yes___ No___ N/A °C
Received within 6 hrs of collection:_____
Ice Present: Yes____ No_____

Sample Refrigerated: Yes___ No___
Refrigerator Temperature:_____°C

Containers Received Preserved: Yes___ No___
5035 Vials Frozen: Yes___ No___
Freezer Temperature:_____°C

Notes and Special Instructions:

Relinquished By:	Date/Time: 4/25/14 1545	Received By:	Date/Time: 4/25/14 1545
Relinquished By:	Date/Time:	Received By:	Date/Time:

Rev 1/07

EXHIBIT J

1835681-15388

HAZMAT BILL OF LADING/MANIFEST

1. Offeror's ID Number	2. Page 1 of	3. Emergency Response Phone	4. Tracking Number
INR000000463	1	(800)424-9300	1835681-15388

5. Offeror's Name and Mailing Address
MICRONUTRIENTS / STEPHEN LUCAS
1550 RESEARCH WAY
INDIANAPOLIS, IN 46231-3350
Offeror's Phone: (317)486-5880

Offeror's Site Address (if different than mailing address)
MICRONUTRIENTS / STEPHEN LUCAS
1550 RESEARCH WAY
INDIANAPOLIS, IN 46231-3350
GEN: 31990

6. Transporter 1 Company Name: PLAINFIELD MOTOR SERVICE — U.S. EPA ID Number: ILR000037309

7. Transporter 2 Company Name: — U.S. EPA ID Number:

8. Designated Facility Name and Site Address
AMPEL
925 ESTES AVENUE
ELK GROVE, IL 60007
Facility's Phone: (847)952-1900
U.S. EPA ID Number:
193973

9a. HM	9b. U.S. DOT Description (including Proper Shipping Name, Hazard Class, ID Number, and Packing Group (if any))	10. Containers No.	10. Containers Type	11. Total Quantity	12. Unit Wt./Vol.
X	1. RQ, UN3266, CORROSIVE LIQUID, BASIC, INORGANIC, N.O.S., 8, PGII, (AMMONIUM HYDROXIDE, AMMONIUM CHLORIDE), ERG#154	2	TP	6640	lbs
	2. 5974				
	3.				
	4.				
	5.				
	6.				
	7.				

13. Special Handling Instructions and Additional Information
CHEMTREC ACCOUNT NUMBER: 10435
1.T#7161025
ADU 400
DELIVERY 7/2/14
PO# 50294
N.L.130R
[4498661]

14. OFFEROR'S CERTIFICATION: I hereby declare that the contents of this consignment are fully and accurately described above by the proper shipping name, and are classified, packaged, marked and labeled/placarded, and are in all respects in proper condition for transport according to applicable international and national governmental regulations.

Offeror's Printed/Typed Name	Signature	Month	Day	Year
Davie Atterberry	Davie Atterberry	07	02	14

15. Transporter Acknowledgment of Receipt of Materials

	Printed/Typed Name	Signature	Month	Day	Year
Transporter 1	Dennis Gates	[signature]	07	02	14
Transporter 2					

16. Discrepancy

17. Designated Facility Owner or Operator: Certification of receipt of hazardous Bill of Lading/Manifest covered by the manifest except as noted in item 16

Printed/Typed Name	Signature	Month	Day	Year
Dhon [illegible]	[signature]	07	02	14

DESIGNATED FACILITY TO OFFEROR

1835683-15306

HAZMAT BILL OF LADING/MANIFEST	1. Offeror's ID Number	2. Page 1 of	3. Emergency Response Phone	4. Tracking Number
	ILD102182714	1	(800)424-8300	1835683-15306

5. Offeror's Name and Mailing Address
AMPEL, INC. / ROY ENGLISH
925 ESTES AVE
ELK GROVE VILLAGE, IL 60007-4905
Offeror's Phone: (847)952-1900

Offeror's Site Address (if different than mailing address)
AMPEL, INC. / ROY ENGLISH
925 ESTES AVE
ELK GROVE VILLAGE, IL 60007-4905
GEN: 36134

6. Transporter 1 Company Name
PLAINFIELD MOTOR SERVICE
U.S. EPA ID Number: ILR000037309

7. Transporter 2 Company Name
U.S. EPA ID Number:

8. Designated Facility Name and Site Address
MICRONUTRIENTS
1550 RESEARCH WAY
INDIANAPOLIS, IN 46231-3350
Facility's Phone: (317)486-5880
193974
U.S. EPA ID Number: INR000000463

9a. HM	9b. U.S. DOT Description (Including Proper Shipping Name, Hazard Class, ID Number, and Packing Group (if any))	10. Containers No.	10. Containers Type	11. Total Quantity	12. Unit Wt./Vol.
X	1. RQ, UN3266, CORROSIVE LIQUID, BASIC, INORGANIC, N.O.S., 8, PGII, (AMMONIUM HYDROXIDE, AMMONIUM CHLORIDE), ERG#154	2	TP	726	1/16
	2.				
	3.				
	4.				
	5.				
	6.				
	7.				

13. Special Handling Instructions and Additional Information
1. T#7161028

PU 7/2/14
TR 13012

[4498662]

14. OFFEROR'S CERTIFICATION: I hereby declare that the contents of this consignment are fully and accurately described above by the proper shipping name, and are classified, packaged, marked and labeled/placarded, and are in all respects in proper condition for transport according to applicable international and national governmental regulations.

OFFEROR

Offeror's Printed/Typed Name	Signature	Month	Day	Year
X	X	07	02	14

15. Transporter Acknowledgment of Receipt of Materials

TRANSPORTER

Transporter 1 Printed/Typed Name	Signature	Month	Day	Year
VANNESS GATES		07	02	14
Transporter 2 Printed/Typed Name	Signature	Month	Day	Year

16. Discrepancy

17. Designated Facility Owner or Operator Certification of receipt of hazardous Bill of Lading/Manifest covered by the manifest except as noted in item 16

DESIGNATED FACILITY

Printed/Typed Name	Signature	Month	Day	Year

DESIGNATED FACILITY TO OFFEROR

1803772-15306

HAZMAT BILL OF LADING/MANIFEST	1. Offeror's ID Number	2. Page 1 of 1	3. Emergency Response Phone (800)424-8300	4. Tracking Number 1803772-15306

5. Offeror's Name and Mailing Address
GENERAL CIRCUITS
1370 LIVELY BLVD
ELK GROVE VILLAGE, IL 60007
Offeror's Phone: (847)758-8000

Offeror's Site Address (if different than mailing address)
GENERAL CIRCUITS
1370 LIVELY BLVD
ELK GROVE VILLAGE, IL 60007
GEN: 98327

6. Transporter 1 Company Name: PLAINFIELD MOTOR SERVICE — U.S. EPA ID Number: ILR000037309

7. Transporter 2 Company Name — U.S. EPA ID Number

8. Designated Facility Name and Site Address
MICRONUTRIENTS
1550 RESEARCH WAY
INDIANAPOLIS, IN 46231-3350
Facility's Phone: (317)486-5880
190357
U.S. EPA ID Number: INR000000463

9a. HM	9b. U.S. DOT Description (Including Proper Shipping Name, Hazard Class, ID Number, and Packing Group (if any))	10. Containers No.	10. Containers Type	11. Total Quantity	12. Unit Wt./Vol.
X	1. RQ, UN3266, CORROSIVE LIQUID, BASIC, INORGANIC, N.O.S., 8, PGII, (AMMONIUM HYDROXIDE, AMMONIUM CHLORIDE), ERG#154	15	DF	8550	LB
	2.				
	3.				
	4.				
	5.				
	6.				
	7.				

13. Special Handling Instructions and Additional Information
1. T#6883284

PU 4/2/14
RC IRS

[42870222]

14. OFFEROR'S CERTIFICATION: I hereby declare that the contents of this consignment are fully and accurately described above by the proper shipping name, and are classified, packaged, marked and labeled/placarded, and are in all respects in proper condition for transport according to applicable international and national governmental regulations.

Offeror's Printed/Typed Name: X — Signature: X — Month 04 Day 02 Year 14

15. Transporter Acknowledgment of Receipt of Materials

Transporter 1 Printed/Typed Name: [illegible] — Signature: [signature] — Month 04 Day 02 Year 14

Transporter 2 Printed/Typed Name — Signature — Month Day Year

16. Discrepancy

17 Designated Facility Owner or Operator: Certification of receipt of hazardous Bill of Lading/Manifest covered by the manifest except as noted in item 16

Printed/Typed Name — Signature — Month Day Year

OFFEROR

TRANSPORTER

DESIGNATED FACILITY TO OFFEROR

1709498-15818

HAZMAT BILL OF LADING/MANIFEST	1. Offeror's ID Number	2. Page 1 of	3. Emergency Response Phone	4. Tracking Number
	INR000000463	1	(800)424-9300	1709498-15818

5. Offeror's Name and Mailing Address
MICRONUTRIENTS / BRIAN WILSON
1550 RESEARCH WAY
INDIANAPOLIS, IN 46231-3350
Offeror's Phone: (317)486-5880

Offeror's Site Address (if different than mailing address)
MICRONUTRIENTS / BRIAN WILSON
1550 RESEARCH WAY
INDIANAPOLIS, IN 46231-3350
GEN: 31990

6. Transporter 1 Company Name: PLAINFIELD MOTOR SERVICE 180257 — U.S. EPA ID Number: ILR000037309

7. Transporter 2 Company Name — U.S. EPA ID Number

8. Designated Facility Name and Site Address
STAR AQUISITIONS
825 PRATT BLVD
ELK GROVE VILLAGE, IL 60007
Facility's Phone: — U.S. EPA ID Number: ILD984779587

Sa. HM	9b. U.S. DOT Description (Including Proper Shipping Name, Hazard Class, ID Number, and Packing Group (if any))	10. Containers No.	10. Containers Type	11. Total Quantity	12. Unit Wt./Vol.
X	1. RQ, UN3266, CORROSIVE LIQUID, BASIC, INORGANIC, N.O.S., 8, PGII, (AMMONIUM HYDROXIDE, AMMONIUM CHLORIDE), ERG#154	2	TP	6640	LB
	2. LOT 5714				
	3.				
	4.				
	5.				
	6.				
	7.				

13. Special Handling Instructions and Additional Information
CHEMTREC ACCOUNT NUMBER: 10435
1. T#6027344
ADW400
Delivery 6/26/13
PO# VIN10D618
[3623145]

14 OFFEROR'S CERTIFICATION: I hereby declare that the contents of this consignment are fully and accurately described above by the proper shipping name, and are classified packaged, marked and labeled/placarded, and are in all respects in proper condition for transport according to applicable international and national governmental regulations.

Offeror's Printed/Typed Name	Signature	Month	Day	Year
Becky Taylor (2)	Becky Taylor			

15. Transporter Acknowledgment of Receipt of Materials

Transporter 1 Printed/Typed Name	Signature	Month	Day	Year

Transporter 2 Printed/Typed Name	Signature	Month	Day	Year

16 Discrepancy

17. Designated Facility Owner or Operator: Certification of receipt of hazardous Bill of Lading/Manifest covered by the manifest except as noted in Item 16

Printed/Typed Name	Signature	Month	Day	Year
JITENDRA				

OFFEROR

TRANSPORTER

DESIGNATED FACILITY TO OFFEROR

EXHIBIT K

APEX
MATERIAL TECHNOLOGIES, LLC
Lee Welgs • 1-330-571-2182 • lwelgs@apexmattech.com
10 Industry Avenue • Joliet, IL 60435 • Phone: 815-727-3010 • Fax: 815-727-7645

Friday, May 09, 2014

Steve Nightingale, P.E.
Manager, Bureau of Land Permit Section
1021 N. Grand Avenue, East
P.O. Box 19276
Springfield, IL 62794-9276

RE: Apex Material Technologies, LLC
Processing of Copper Ammonium Chloride Etchant

Dear Sir:

This letter will follow up on my letter to you dated February 7, 2014 in which Apex Material Technologies, LLC's ("APEX") requested to withdraw our Beneficial Use Determination ("BUD") applications. The purpose of this follow up letter is to provide the Illinois EPA with our thought process and analysis regarding our proposed processing of copper-rich, copper ammonium chloride etchant. ("CAC").

Based on discussions with IEPA, we initially sought a Beneficial Use Determination (BUD) so the CAC could be purchased and used by APEX as a non-waste product with approval of IEPA. As you may be aware, over the course of the last several months, Bill Graham from Civil & Environmental Consultants, Inc., APEX's outside consultant, has had extensive communications with Ted Dragovich, Mary Riegle and Michael Dura of IEPA. During the course of these exchanges, IEPA clarified its position that the material was being purchased and reclaimed and would not be eligible for a BUD. We withdrew the BUD applications accordingly. Nevertheless, APEX wants to set forth its position that the purchase and use of this CAC as a feedstock would not be subject to Illinois' solid waste disposal regulations as set forth in more detail below.

Overview

APEX plans to purchase from printed circuit board manufacturers (the "Customers") CAC which is a fluid used to strip away excess copper from printed circuit boards. The Customers classify the material as a product on their shipping manifests, and according to them, have determined it is neither a solid waste nor a hazardous waste. CAC is liquid with a pH of 8 to 9 and never exhibits the waste characteristic for corrosivity or toxicity, and is routinely shipped conforming to DOT requirements with shipping papers and without a waste manifest.

APEX will process the CAC, and separate the dissolved copper to make several useful products, which will then be sold back into the economic main stream.

APEX
MATERIAL TECHNOLOGIES, LLC
Lee Welgs • 1-330-571-2182 • lwelgs@apexmattech.com
10 Industry Avenue • Joliet, IL 60435 • Phone: 815-727-3010 • Fax: 815-727-7545

Our objective is to use CAC as a raw material feed to produce two products, copper oxide and ammonium chloride. APEX has the experience and existing machinery that is capable to easily separate the CAC into two usable end-products (copper oxide and ammonium chloride.) A Process Flow Diagram and Material Balance are attached for your reference as Exhibit A. APEX will then sell the copper oxide as a product into the pigment, frit and/or micronutrient industries. APEX will also sell the ammonium chloride as Fresh Etchant back to the original Customers to use in the same process that originally produced the CAC.

APEX believes that our proposed program has many beneficial uses including:

1. CAC once processed, is sold directly back to the original Customer to be used for exactly the same purpose. Our program essentially creates a "closed loop" for this solution, and decreases cost and the use of prime resources (anhydrous ammonium, hydrochloric acid, and copper) that would otherwise be required for the production of "fresh etchant."

2. Our process minimizes the use of reagents and heat associated with making copper oxide from copper metal and the associated reagents, which will reduce the "carbon foot print" for the entire process from beginning to end.

3. Returning used etchants to the economic mainstream is a goal of USEPA's Design for the Environment program.http://www.epa.gov/opptintr/dfe/pubs/pwb/case_stu/case2/index.html.

4. In our process, APEX uses 100% of the incoming product and generates no other by-product streams other than processed wash water brine (described in more detail below), which is treated appropriately in our own waste water treatment plant, and then discharged to the POTW per our existing industrial pretreatment discharge permit with the City of Joliet.

Analysis

While our original inquiry with IEPA regarding the BUD was done out of an overabundance of caution, and our desire to comply with applicable rules and regulations as a good corporate citizen, APEX is proceeding on the basis that under its own analysis and the Customer's own determination that the CAC is neither a "hazardous waste" nor a "solid waste" per Illinois regulations. This assumption is based upon the fact that the CAC has been evaluated, tested, and properly classified by each Customer as a commercial product, and is not classified as hazardous waste or a solid waste for regulatory purposes. This CAC product is currently being sold and shipped by the Customers via a standard "bill of lading" and not handled or discarded as a "waste" of any kind. As such, the purchase and processing of CAC is not subject to regulation or permitting under either the Illinois Environmental Protection Act (the "Act") (415 ILCS 5/1 *et seq.* (West 2002)) or the Illinois Solid Waste Management Act (415 ILCS 20/1 *et seq.* (West 2002)).

APEX
MATERIAL TECHNOLOGIES, LLC
Lee Welgs • 1-330-571-2182 • lwelgs@apexmattech.com
10 Industry Avenue • Joliet, IL 60435 • Phone: 815-727-3010 • Fax: 815-727-7545

APEX is also taking further direction from the Illinois Supreme Court in the case of *Alternative Fuels, Inc. v. Director of IEPA, et al.*, 830 N.E.2d 444 (2005), *In the Matter of: Petition of Jo'Lyn Corporation and Falcon Waste and Recycling Inc.*, Illinois Pollution Control Board, AS 04-2, (April 7, 2005), and *In the Matter of: Petition of Westwood Lands, Inc.*, Illinois Pollution Control Board, AS 09-3, (October 7, 2010). In those cases, the facts and circumstances are similar to our situation in that the petitioners accepted material for processing that was not considered "waste" for regulatory purposes, and generating a waste by-product from this processing does not make the original material a "waste." Similar to those cases, APEX is purchasing from Customers a useful product, and is not accepting a "discarded material" as a "waste." In addition, the brine generated as a result of our process does not involve "removing a contaminant" since the copper removed from the used etchant is part of the chemical composition of the original material, and thus does not make the original material a "waste." Accordingly, based upon existing legal precedent, APEX believes the used etchant solution it purchases from the Customers is not a "waste" or a "material that would otherwise be disposed of or discarded," and therefore is not subject to regulation.

Nor does the material meet the Act's definition of an industrial process waste (Sec 3.235) because it is not a waste per the Act and the Court (ARI, 2004). It is not a waste because it is not hazardous, is not discarded, nor are contaminants removed, and it is returned to the economic mainstream.

In fact, APEX plans to sign long term contracts to purchase the copper-rich CAC at a unit price based on its copper content; pricing will be based on a percentage of the COMEX price for copper. Further, APEX will purchase the CAC from various circuit board manufacturers and will require each Customer to sample, profile, and certify that the material APEX is purchasing meets our specifications. In addition to the Customer certifications, APEX will also sample the incoming material to verify that the solution matches our specifications and the Material Safety Data Sheets ("MSDS") provided by each Customer. The MSDSs provided to APEX by the Customers for CAC demonstrate that the liquid is a non-corrosive, non-hazardous material. A sample MSDS is attached for your reference as Exhibit B. Also attached for your reference as Exhibit C are analytical test results (pH, TCLP) that APEX recently performed on a representative sample of CAC, which demonstrates its non-corrosive and non-hazardous properties.

Our contracts with the Customers will also allow APEX to return any material that does not meet the Profile Sheet we require and our own specifications for purity. A sample copy of our Profile Sheet is attached hereto for your reference as Exhibit D. APEX will require each Customer to annually re-certify its adherence to the Profile Sheet.

Regarding the wash water by-product generated as a result of our process, the materials not incorporated into the commercial products is a water brine, containing salt (18% NaCl). The

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sodium component of the salt derives from caustic (NaOH) added for pH control. The excess chloride and water were constituents of the original solution purchased from the Customers.

The water brine will be managed on-site under APEX's existing industrial pretreatment permit (Permit No. J1610) and discharged to the local POTW (City of Joliet). In fact, our current permit allows discharges from the *"manufacture of ammonia-based etchants"* and *"boiling spent ammonia copper etchant with sodium hydroxide to produce copper oxide."* Accordingly, our facility is already specifically authorized to discharge the water brine that will be generated from our process. A copy of Permit No. J1610 is attached for your reference as Exhibit E.

We seek IEPAs concurrence that our processing of this material is not regulated under solid waste regulations and the material is not discarded or a waste as defined in the Act. We further ask your acknowledgement that; based on our description of the proposed process, we may rely on the opinions of the IPCB cited above.

Should you have any questions, or wish to discuss this matter further, we would be please to speak, meet and/or provide additional information.

Thank you for your time and attention to this matter.

Very truly yours,

Apex Material Technology, LLC

Lee Welgs
Executive Vice President and General Manager

CC: Joseph L. Pellis, II, Esq.
William K. Graham, P.E.

APEX
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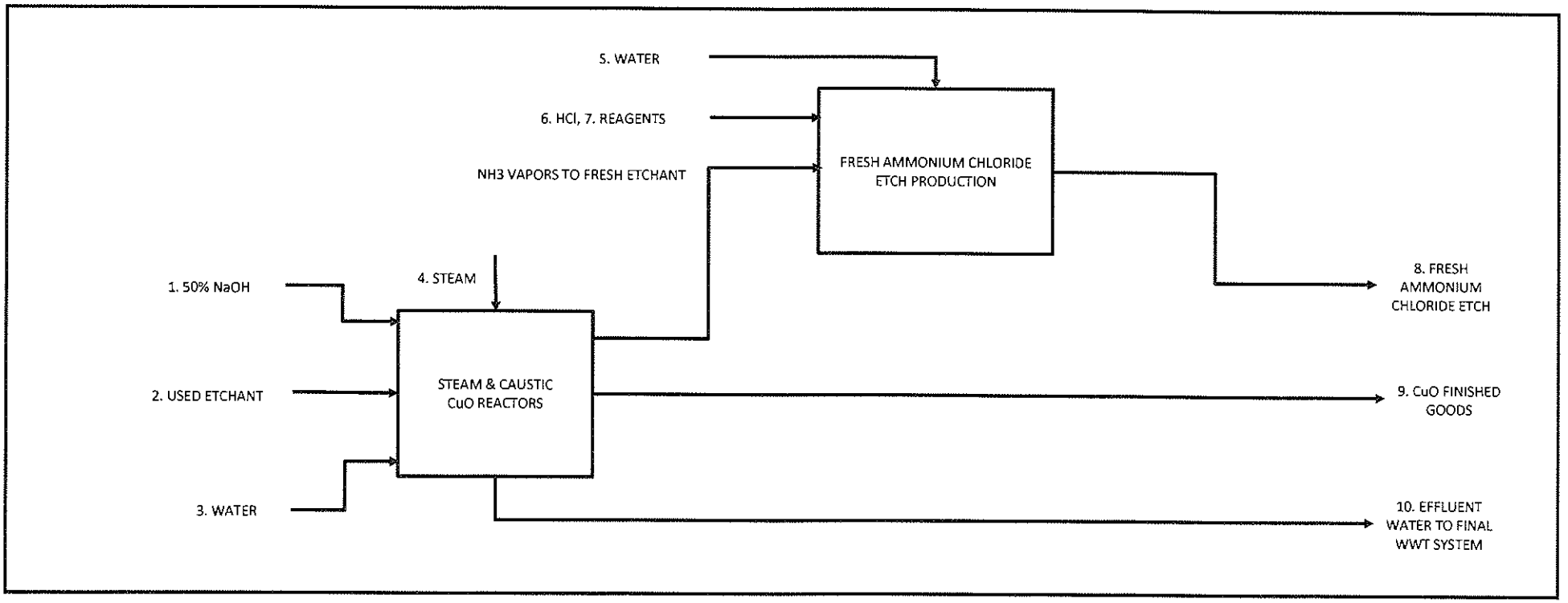
EXHIBIT A



BASIS: 4,000 GALLONS SPENT ETCHANT INPUT

		QTY	UOM	LB
1	CAUSTIC SODA	949	GALLONS	12,090
2	FEED USED ETCHANT TO PROCESS	4,000	GALLONS	39,984
3	WATER FOR FILTER WASH	2,500	GALLONS	20,825
4	STEAM	3,000	LBS	3,000
5	WATER TO AMMONIA RECOVERY	1,000	LBS	8,330
6	HCL TO FRESH ETCHANT PRODUCTION	3,168	GALLONS	30,403
7	REAGENTS TO FRESH ETCHANT	AS NEEDED	AS NEEDED	AS NEEDED
8	FRESH ETCHANT AMMONIUM CHLORIDE TO MARKET	3,989	GALLONS	43,197
9	TECHNICAL GRADE CuO TO MARKET 50% MOISTURE	12,014	LBS	12,014
10	TREATED WATER DISCHARGE TO JOLIET POTW TECH CuO/ETCH ONLY	7,133	GALLONS	59,421

Input	114,632
Output	114,632
Difference	-
Difference %	0.00%

APEX
MATERIAL TECHNOLOGIES, LLC
Lee Welgs • 1-330-571-2182 • lwelgs@apexmattech.com
10 Industry Avenue • Joliet, IL 60435 • Phone: 815-727-3010 • Fax: 815-727-7545

EXHIBIT B

MATERIAL SAFETY DATA SHEET

Date Issued: 11-14-2007
Product Name: Spent Etchant Copper Ammonium Chloride

1. PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME: Spent Etchant Copper Ammonium Chloride
GENERAL USE: Alkaline Copper Etchant for Printed Circuit Boards
PRODUCT DESCRIPTION: Alkaline Copper Etchant for Printed Circuit Boards

MANUFACTURER
Delta Precision Circuits
1370 Lively Blvd.
El Grove, IL 60007
Produet Iuformation:

24 HR. EMERGENCY TELEPHONE NUMBERS
CHEMTREC: (800) 424-9300
CHEMTREC International (703) 527-3887

2. COMPOSITION / INFORMATION ON INGREDIENTS

The specific identities of one or more components of this produet are withheld as a trade secret.

Chemical Name	Wt.%	CAS#
COPPER (II) CHLORIDE	10 - 20	7447-39-4
AMMONIUM CHORIDE	10 - 20	12125-02-9
AMMONIUM HYDROXIDE	1 - 5	1336-21-6
WATER	55 - 79	7732-18-5

3. HAZARDS IDENTIFICATION

EYES: Corrosive to the eyes and may cause severe damage including blindness,

SKIN: Extremely irritating to the skin. Frequent or prolonged contact may irritate the skin and cause a rash (dermatitis).

INGESTION: Toxic and may be fatal ; may produce kidney and liver damage. Can burn mouth, throat and stomach. May cause vomiting. If vomiting does not occur immediately systemic copper poisoning may occur. Symptons may include capillary damage, headache, cold sweat, weak pulse, kidney and liver damage, central nervous excitation followed by depression, jaundice, convulsions, paralysis, and coma. Death may occur from shock or renal failure

INHALATION: Prolonged or repeated exposure to dusts of copper salts may cause discoloration of the skin or hair, ulceration and perforation of the nasal septum, runny nose, metallic taste, atrophic changes, and irritation of the mucous membranes.

Exposure may aggravate other pre-existing diseases, including diseases of the eyes, skin, and lungs.

4. FIRST AID MEASURES

EYES: Immediately flush with plenty of water. After initial flushing, remove any contact lenses and continue flushing for at least 15 minutes. Have eyes examined and tested by medical personnel.

SKIN: In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Get medical attention immediately. Thoroughly wash (or discard) clothing and shoes before reuse.

INGESTION: If swallowed, do NOT induce vomiting. Give victim a glass of water or milk. Call a physician or poison control center immediately. Never give anything by mouth to an unconscious person.

INHALATION: Rescuers should put on appropriate protective gear. Remove from area of exposure. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Keep victim warm. Get immediate medical attention.

5. FIRE FIGHTING MEASURES

FLASHPOINT AND METHOD: None

FLAMMABLE LIMITS: LEL = 15.75; UEL = 26 (Limits are for NH3)

AUTOIGNITION TEMPERATURE: None

FLAMMABLE CLASS: IV

EXTINGUISHING MEDIA: Use alcohol foam, carbon dioxide, or water spray when fighting fires involving this material. Cool fire exposed container with water. Exposure to extreme heat may cause containers to burst.

OTHER CONSIDERATIONS: Water runoff can cause environmental damage. Dike and collect water used to fight fire.

FIRE FIGHTING EQUIPMENT: As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear.

6. ACCIDENTAL RELEASE MEASURES

SMALL SPILL: Ventilate area of leak or spill. Vacuum or sweep up material and place in disposal container. Absorb spill with inert material (e.g. dry sand or earth).

LARGE SPILL: Large spills may be neutralized with dilute alkaline solutions of soda ash, or lime. Do not flush to sewer.

7. HANDLING AND STORAGE

GENERAL PROCEDURES:

HANDLING: Wash hands thoroughly after handling. Use with adequate ventilation. Avoid breathing (dust, vapor, mist, gas). Avoid contact with eyes, skin, and clothing.

STORAGE: Store in a cool place in original container and protect from sunlight. Store away from heat. Store away from incompatible materials. Keep from freezing. Keep container closed when not in use. Keep away from food and drinking water.

ELECTROSTATIC ACCUMULATION HAZARD: No.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

EXPOSURE GUIDELINES:

OSHA HAZARDOUS COMPONENTS (29 CFR 1910.1200)

		EXPOSURE LIMITS					
		OSHA PEL		ACGIH TLV		Supplier OEL	
		ppm	mg/m^3	ppm	mg/m^3	ppm	mg/m^3
Copper (II) Chloride	TWA		1*		1*		
	STEL						
Ammonium Chloride	TWA				10**		
	STEL						
Ammonium Hydroxide	TWA			25***		50***	
	STEL						

TABLE FOOTNOTES:

*Cu

**Fume

***NH_3

ENGINEERING CONTROLS: Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower. Local exhaust ventilation may be necessary to control any air contaminants to within their TLV's during the use of this product.

PERSONAL PROTECTIVE EQUIPMENT

EYES AND FACE: Wear safety glasses with side shields (or goggles) and a face shield.

SKIN: Use gloves, recommended for this material by manufacturers or suppliers based on test data showing adequate permeation and penetration resistance.

RESPIRATORY: A NIOSH-approved air purifying respirator with the appropriate cartridge or canister for the hazards may be permissible under certain circumstances where airborne concentrations are expected to exceed exposure limits. Protection provided by air purifying respirators is limited, Use appositive-pressure air-supplied respirator if there is any potential for an uncontrolled release, exposure levels are not known, or any other circumstances where air-purifying respirators may not provide adequate protection.

PROTECTIVE CLOTHING: Use appropriate body coverings recommended for this material by manufacturers or suppliers based on test data showing adequate permeation and penetration resistance.

9. PHYSICAL AND CHEMICAL PROPERTIES

PHYSICAL STATE: Liquid

ODOR: Strong ammonia. DO NOT SMELL.

APPEARANCE: Clear

COLOR: Deep blue

pH: 7.8 – 9.2

PERCENT VOLATILE: 60% - 80%

VAPOR PRESSURE: mm Hg at 20°C Approximately 20

VAPOR DENSITY: (air=1) 0.6

BOILING POINT: °C (°F) 100 (212)

SOLUBILITY IN WATER: Miscible

EVAPORATION RATE (butyl acetate=1): 0.1

SPECIFIC GRAVITY: 1.17

10. STABILITY AND REACTIVITY

STABLE: Stable under normal conditions of use and storage.

HAZARDOUS POLYMERIZATION: Will not occur.

CONDITIONS TO AVOID: Incompatibles. Direct sunlight. Exposure to heat. Protect from freezing.

HAZARDOUS DECOMPOSITION PRODUCTS: thermal decomposition may produce fumes of copper. Thermal decomposition may produce hydrogen chloride or chlorine compounds. Thermal decomposition may release toxic ammonia fumes. Thermal decomposition releases oxides of nitrogen.

INCOMPATIBLE MATERIALS: Alkalies. Potassium, sodium, hydrazine, nitromethane, aluminum, strong oxidizers, acetylene, sodium hypobromite, sulfides, sulfites, and formaldehyde. Corrosive to metals; reacts exothermally with strong bases and oxidizers.

11. TOXICOLOGICAL INFORMATION

CARCINOGENICITY

IARC: No

NTP: No

OSHA: No

There is no experimental toxicity data for this product. Refer to the data listed below for relative toxicity assessment.

100% CUPRIC CHLORIDE

INTRAPERITONEAL LD_{50} : mg/kg (species) 14,700 µg/Kg (Rat); 4,700 µg/Kg (Mouse)

LDLo: 35mg/Kg (Mouse) Reproductive Effects

INTRAVENOUS LD_{50}: 17,500 µg/Kg (Mouse); 5mg/Kg (Rat)

ORAL LD_{50}: mg/kg (species) 584 (Rat); 233 (Mouse)

INHALATION TCLo (species): 20µg/M3/26W (Rat)

OTHER: NIOSH immediately dangerous to health and life (IDHL) 100 mg/m3 in air as Cu.

GENERAL COMMENTS: Refer to Section 3 for additional information on potential health effects.

100% AMMONIUM CHLORIDE

INTRAMUSCULAR TOXICITY: LD_{50}: 30 mg/Kg (Rat)

INTRAPERITONEAL TOXICITY: LD_{50} : 1439 mg/kg (Mouse)

SUBCUTANEOUS TOXICTY: LDLo: 500 mg/Kg (Rat)

ORAL TOXICTY LD_{50}: 1,650 mg/kg (Mouse); 1,300 mg/Kg (Mouse)

EYE TOXICITY: Sev 500 mg/24H (Rabbit)

OTHER: NIOSH immediately dangerous to health and life (IDHL) 100 mg/m3 in air as Cu.

GENERAL COMMENTS: Refer to Section 3 for additional information on potential health effects.

100% AMMONIUM HYDROXIDE

ORAL TOXICITY: LDLo: 43 mg/kg (Human)

ORAL TOXICITY: LD_{50}: 350 mg/kg (Rat)

ORAL TOXICITY: LDlo: 750 mg/Kg (Cat)

EYE TOXICITY: SEV 1mg/30s Rns (Rabbit)

INHALATION TOXICITY: LDLo: 5000 ppm (Human)

INHALATION TOXICITY: TCLo: 700 PPM: Eye (Human)

INHALATION TOXICITY: TCLo: 408 ppm: Irr (Human)

GENERAL COMMENTS: Refer to Section 3 for additional information on potential health effects.

12. ECOLOGICAL INFORMATION

ENVIRONMENTAL DATA: Harmful to fish and other water organisms. Keep out of waterways.

13. DISPOSAL CONSIDERATIONS

DISPOSAL METHOD: Dispose in accordance with federal state, local environmental regulatory requirements.

14. TRANSPORT INFORMATION

DOT (DEPARTMENT OF TRANSPORTATION)

PROPER SHIPPING NAME: Corrosive Liquid, Basic, Inorganic, N.O.S. (Copper(II) chloride, Ammonium chloride)

TECHNICAL NAME: Copper(II) Chloride, Ammonium Chloride

PRIMARY HAZARD CLASS/DIVISION: 8

UN/NA NUMBER: UN 3266

PACKING GROUP: II

LABEL: Corrosive

OTHER SHIPPING INFORMATION: RQ is applicable when shipping 10# or more copper chloride, 1000# or more ammonium chloride or 5000# or more of ammonium chloride in one package.

Additional Marking: "Marine Pollutant" required for bulk shipment.

The words "Marine Pollutant" must be entered on the Shipping Paper in association with the basic DOT description for bulk shipments and containers must be marked as a "Marine Pollutant". In addition, any quantity shipped by vessel must be identified and marked as a "Marine Pollutant".

---

15. REGULATORY INFORMATION

TOXIC SUBSTANCES CONTROL ACT (TSCA): Chemical ingredients are on the TSCA inventory.

SUPERFUND REPORTABLE QUANTITIY RQ): 10#/4.54 Kg ($CuCl_2$), 5000# - Ammonium chloride, 1000# - Ammonium Hydroxide

SARA TITLE III (SECTION 313): This product contains a copper compound which is subject to reporting. This product contains ammonia and subject to reporting as ammonia and ammonium ion on an ammonia basis = 1.6 lb/gal.

CALIFORNIA PROPOSITION 65 WARNING: This product may contain chemicals known to the state of California to cause cancer, or birth defects or other reproductive harm.

CANADIAN LISTS

DSL/NDSL: Found on the domestic substances list.

WHMIS: Copper (II) Chloride it item number 430 from the ingredient disclosure list and is subject to reporting at 1% threshold; Ammonium Hydroxide: Item number 96, reporting at 1% threshold; Ammonium Chloride: Item number 88, reporting at 1% threshold.

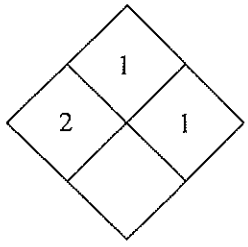
STATE LISTS: This product contains ingredients that are listed for disclosure or reporting in the states of California, Connecticut, Illinois, Louisiana, Massachusetts, Michigan, Minnesota, North Carolina, New Jersey, New York, Oregon, Pennsylvania, Rhode Island, and Texas. Please check with appropriate agencies.

16. OTHER INFORMATION

It is reasonable to assume that ammonia etchant compounds contain arsenic, cadmium, chromium, and lead in concentrations ranging from a few parts per billion to several parts per million. It is reasonable to assume that copper compounds contain arsenic, cadmium, chromium, and lead in concentrations ranging from a few parts per billion to several parts per million.

All information presented herein is given in good faith and is based on sources and tests considered to be reliable, but cannot be guaranteed. It is the user's full responsibility to accept risk for safety, toxicity, handling, storage, and use of the product, as well as to determine the suitability of the product for a specific purpose. We make no warranty as to the results to be obtained in suing the product; therefore all risks must be assumed by the user.

NFPA RATINGS



Lee Welgs • 1-330-571-2182 • lwelgs@apexmattech.com

MATERIAL TECHNOLOGIES, LLC 10 Industry Avenue • Joliet, IL 60435 • Phone: 815-727-3010 • Fax: 815-727-7545

EXHIBIT C

EXHIBIT C

Analytical Test Results

Sample:	Copper Ammonium Chloride	Sample:	Copper Ammonium Chloride	Sample:	Copper Ammonium Chloride
Source:	ITO Industries	Source:	Midwest Printed Circuits	Source:	Galaxy Circuits
Via:	ITO Industries	Via:	Martin Lieberman	Via:	Martin Lieberman
Date Received:	14-Mar-14	Date Received:	7-Apr-14	Date Received:	14-Apr-14
Lab ID:	B14083-02O	Lab ID:	B14097-02O	Lab ID:	B14104-01O

Analysis		
Ca	< 1	ppm
Cd	< 1	ppm
Co	274	ppm
Cr (total)	< 1	ppm
Cr(VI)*	< 2.5	ppm
Cu	12.59	wt%
Fe	2	ppm
Mg	6	ppm
Mn	3	ppm
Na	2.98	wt %
Ni	8	ppm
Pb*	2.5	ppm
Zn	119	ppm

Analysis		
Ca	44	ppm
Cd	< 1	ppm
Co	< 1	ppm
Cr (total)	29	ppm
Cr(VI)*	< 2.5	ppm
Cu	12.41	wt%
Fe	8	ppm
Mg	5	ppm
Mn	< 1	ppm
Na	7749	ppm
Ni	6	ppm
Pb*	2.5	ppm
Zn	164	ppm

Analysis		
Ca	33	ppm
Cd	< 1	ppm
Co	< 1	ppm
Cr (total)	41	ppm
Cr(VI)*	< 2.S	ppm
Cu	11.47	wt%
Fe	3	ppm
Mg	9	ppm
Mn	< 1	ppm
Na	7531	ppm
Ni	9	ppm
Pb*	2.1	ppm
Zn	49	ppm

Specific Gravity	1.239	**Specific Gravity**	1.211	**Specific Gravity**	1.215
pH	8.297	**pH**	8.615	**pH**	9.201

Above are the results of the analysis of three representative samples of Copper Ammonia Chloride obtained from three different printed circuit board manufacturers. Except where indicated, all analyses were performed by Apex Material Technologies' internal lab.

*Lead and hexavalent chrome, **Cr**(VI), assays were performed by an independent IL EPA Certified testing lab. See attachment. The hexavalent chrome assays were below the 2.5 ppm routine reportable limit.

No other TCLP metals were analyzed as they are not used nor present at the processing facilities. All inbound Spent Etchant will be analyzed regularly and routinely by Apex Material Technologies' internal lab prior to processing. Apex will also use this independent IL EPA certified lab to analyze inbound Spent Etchant materialsfor TCLP metals prior to processing. Apex Material Technologies will use this IL EPA Certified lab to qualify samples of spent etchant from all

First Environmental Laboratories, Inc.
IL ELAP / NELAC Accreditation # 100292
1600 Shore Road • Naperville, Illinois 60563 • Phone (630) 778-1200 • Fax (630) 778-1233

May 02, 2014

Mr. Timothy Racette
Apex Material Technologies, LLC
10 Industry Ave
Joliet, IL 60435

Project ID: Blackbeard
First Environmental File ID: 14-2198
Date Received: April 25, 2014

Dear Mr. Timothy Racette:

The above referenced project was analyzed as directed on the enclosed chain of custody record.

All Quality Control criteria as outlined in the methods and current IL ELAP/NELAP have been met unless otherwise noted. QA/QC documentation and raw data will remain on file for future reference. Our accreditation number is 100292 and our current certificate is number 003363: effective 02/18/2014 through 02/28/2015.

I thank you for the opportunity to be of service to you and look forward to working with you again in the future. Should you have any questions regarding any of the enclosed analytical data or need additional information, please contact me at (630) 778-1200.

Sincerely,

Stan Zawerski
Project Manager

First Environmental Laboratories, Inc.
IL ELAP / NELAC Accreditation # 100292
1600 Shore Road • Naperville, Illinois 60563 • Phone (630) 778-1200 • Fax (630) 778-1233

Case Narrative

Apex Material Technologies, LLC

Lab File ID: **14-2198**

Project ID: **Blackbeard**

Date Received: **April 25, 2014**

All quality control criteria, as outlined in the methods, have been met except as noted below or on the following analytical report.

The results in this report apply to the samples in the following table:

Laboratory Sample ID	Client Sample Identifier	Date/Time Collected
14-2198-001	B14083-02O	03/14/14
14-2198-002	B14097-02O	04/07/14
14-2198-003	B14104-01O	04/14/14

Sample Batch Comments:

Time of sample collection was not provided.

The following is a definition of flags that may be used in this report:

Flag	Description	Flag	Description
<	Analyte not detected at or above the reporting limit.	L	LCS recovery outside control limits.
C	Sample received in an improper container for this test.	M	MS recovery outside control limits; LCS acceptable.
D	Surrogates diluted out; recovery not available.	N	Analyte is not part of our NELAC accreditation.
E	Estimated result; concentration exceeds calib range.	P	Chemical preservation pH adjusted in lab.
G	Surrogate recovery outside control limits.	Q	Result was determined by a GC/MS database search.
H	Analysis or extraction holding time exceeded.	S	Analysis was subcontracted to another laboratory.
J	Estimated result; concentration is less than routine RL but greater than MDL.	W	Reporting limit elevated due to sample matrix.
RL	Routine Reporting Limit (Lowest amount that can be detected when routine weights/volumes are used without dilution.)	ND	Analyte was not detected using a library search routine; No calibration standard was analyzed.

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Analytical Report

Client: Apex Material Technologies, LLC
Project ID: Blackbeard
Date Received: 04/25/14
Date Reported: 05/02/14

Results are reported on an "as received" basis.

Lab No:	Sample ID:	Analyte	Result	R.L.	Units	Flags
Chromium, Hexavalent		**Method: 3060A/7196A**				
14-2198-001	B14083-02O	Date Collected: 03/14/14	Time Collected:			
Analysis Date:	05/02/14					
		Chromium, Hexavalent	**<2.5**	2.5	**mg/kg**	
14-2198-002	B14097-02O	Date Collected: 04/07/14	Time Collected:			
Analysis Date:	05/02/14					
		Chromium, Hexavalent	**<2.5**	2.5	**mg/kg**	
14-2198-003	B14104-01O	Date Collected: 04/14/14	Time Collected:			
Analysis Date:	05/02/14					
		Chromium, Hexavalent	**<2.5**	2.5	**mg/kg**	
Total Metals		**Method: 6010C**	**Preparation Method 3050B**			
14-2198-001	B14083-02O	Date Collected: 03/14/14	Time Collected:			
Analysis Date:	04/29/14		Preparation Date: 04/29/14			
		Lead	**2.5**	0.5	**mg/kg**	
14-2198-002	B14097-02O	Date Collected: 04/07/14	Time Collected:			
Analysis Date:	04/29/14		Preparation Date: 04/29/14			
		Lead	**2.5**	0.5	**mg/kg**	
14-2198-003	B14104-01O	Date Collected: 04/14/14	Time Collected:			
Analysis Date:	04/29/14		Preparation Date: 04/29/14			
		Lead	**2.1**	0.5	**mg/kg**	

Print Form

Page / of / Pgs

CHAIN OF CUSTODY RECORD

First Environmental Laboratories, Inc.

1600 Shore Road, Suite D
Naperville, IL 60563
Phone: (630)778-1200 * Fax (630)778-1233
E-Mail: info@firstenv.com
IEPA Accreditation #100292

Company Name: Apex Material Technologies LLC			
Street Address: 10 Industry Ave.			
City: Joliet		State: IL	Zip: 60435
Phone: 630 746-7050	Fax: 815 727-7545	e-Mail:	
Send Report To: Timothy Racette		Via Fax: ☐	Via e-Mail: ☒
Sampled By: M Lieberman			

Project I.D.: BLACKBEARD

P.O. #: Cash

Enter analyses required on the lines to the left. Place an "X" in the box below to indicate which samples require what analysis.

Date/Time Taken	Sample Description	Matrix	Cr (VI) Assay	Pb Assay (ICP)							Comments	Lab I.D.
March 14, 2014	Copper Ammonium Chloride	Other	✓	✓							B14083-02O 14-2198-001	
April 7, 2014	Copper Ammonium Chloride	Other	✓	✓							B14097-02O 002	
April 14, 2014	Copper Ammonium Chloride	Other	✓	✓							B14104-01O 003	

FOR LAB USE ONLY: Cooler Temperature:0.1-6°C Yes___ No___ N/A °C
Received within 6 hrs of collection:_____
Ice Present: Yes____ No_____

Sample Refrigerated: Yes___ No___
Refrigerator Temperature:_____°C

Containers Received Preserved: Yes___ No___
5035 Vials Frozen: Yes___ No___
Freezer Temperature:_____°C

Notes and Special Instructions:

Relinquished By:	Date/Time: 4/25/14 1545	Received By:	Date/Time: 4/25/14 1545
Relinquished By:	Date/Time:	Received By:	Date/Time:

Rev 1/07

Lee Welgs • 1-330-571-2182 • lwelgs@apexmattech.com

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EXHIBIT D

APEX
MATERIAL TECHNOLOGIES, LLC
10 Industry Avenue • Joliet, IL 60435 • Phone: 815-727-3010 • Fax: 815-727-7545

RAW MATERIAL PROFILE FORM

Ship to: Apex Material Technologies
10 Industry Avenue
Joliet, Illinois 60435

Date: 2/25/14 **(7)**

Apex Contact: Lee Welgs
lwelgs@apexmattech.com
Cell #: 330-571-2182

Company Name: Delta Precision Circuits **(8)**

Date of Sample: 2/25/14 **(1)**

Time of Sample: 3:00 PM EST **(2)**

Name of Individual: Joe Blow **(3)**

Signature: *Joe Blow* **(4)**

Title: Lab Rat **(5)**

Company: Delta Precision Circuits **(6)**

Street Address: Number One Easy Street **(9)** **Phone:** 123-456-7891 **(10)**

City: Fat **(11)** **State:** Insanity **(12)** **Zip:** 12345 **(13)** **Fax:** 123-456-7890 **(14)**

Contact Name: Rajesh Shah **(15)** **Emergency Phone #:** 123-456-XXXX **(16)**

E-Mail: RShah@deltacircuits.com **(17)**

Material Name: Copper Ammonium Chloride **(18)**

Physical State: Liquid **(19)** **Wt% of Water:** 55-79% **(20)**

Wt% of Free Acid: No free acid **(21)** **pH:** 7.8-9.2 **(22)** **Specific Gravity:** 1.17 **(23)**

Does this material contain any of the following?: Halogenated organics, (PCB), Dioxin, Medical Waste, Shock Sensitive Materials, Biohazards, Furans, Asbestos, Radioactive Wastes, Solvents, Phenolics, Explosives
Yes: _____ **No:** XXX **(24)**

Any other hazardous constituents (Toxics, Metals, etc) Yes: _____ **No:** XXX **(25)**

Describe Process Generating the Material (attach block flow diagram) See Attachment A **(26)**

Attach MSDS: Yes: XXX **No:** _____ **If no, when will it be forwarded:** See Attachment B **(27)**

Attach Assay: Yes: XXX **No:** _____ **If no, when will it be forwarded:** See Attachment C **(28)**

Expected Packaging: 55 Gallon drums, 330 Gallon totes, tanker wagons **(29)**

Volume Generated Per Annum: 20,000 Gallons **(30)**

Regulatory Classification: UN 3226 **(31)**

DOT Shipping Name: Corrosive Liquid, Basic, Inorganic, NOSS **(32)** **Class:** 8 **(33)** **UN/NA #:** 3266 **(34)**

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Handling Instructions: Wash thoroughly after handling. Insure adequate ventilation. Avoid breathing (dust, vapor, mist, gas). Avoid contact with eyes, skin and clothing. **(35)**

Other Special Instructions: Store in original packaging in a cool place. Avoid direct sunlight. Store away from heat. Store away from incompatible materials. Keep from freezing. Keep container closed when not in use. Keep away from food and drinking water. **(36)**

Profile and Sample Certification;

"As the seller of the Material described herein, I hereby certify and warrant based on a reasonable investigation: (1) that all information submitted on this profile is complete and accurate; (2) that all known or suspected hazards are disclosed; (3) that the sample submitted with this document was collected using the appropriate sampling technique and is representative of the actual stream; (4) that the sample is properly classified, packaged, marked, and labeled; and (5) that the package is in proper condition for transporting according to DOT regulations.

I, further certify and warrant that the Material sold to APEX under the terms and conditions of this Agreement qualifies for use as a commercial product/raw material, and is excluded from being a solid waste, hazardous waste, special waste, or other discarded material under all applicable local, state, and federal laws, rules, and regulations including but not limited to 40 CFR 261 *et seq.*, and 35 IAC 721 *et seq.*"

Signature: Rajesh Shah **(37)** Date: 2/25/14 **(38)**

Name and Title: Technical Manager **(39)**

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10 Industry Avenue • Joliet, IL 60435 • Phone: 815.727.3010 • Fax 815.727.7545

Mechanics for Raw Material Profile Form

(1) - Sample data, Date of Sample - Enter date sample taken

(2) - Sample data, Time of Sample - Enter time of day sample taken

(3) - Sample data, Name of Individual - Enter name of individual taking sample

(4) - Sample data, Signature - Enter signature of individual taking sample

(5) - Sample data, Title - Enter title of person taking sample

(6) - Sample data, Company Name - Enter name of company that the sample taker works for

(7) - Company Information, Date form Completed - Enter date that this form was completed

(8) - Company Information, Company Name - Enter the company name

(9) - Company Information, Street Address - Enter the company street address

(10)- Company Information, Phone Number - Enter the company phone number

(11) - Company Information, City - Enter company city

(12) - Company Information, State - Enter company state

(13) - Company Information, Zip Code - Enter company zip code

(14) - Company Information, Fax - Enter company fax number

(15) - Company Information, Contact Name - Enter company contact name

(16) - Company Information, Emergency Phone - Enter company emergency phone number

(17) - Company Information, E-Mail - Enter e-mail of the company contact

(18) - Material Information, Material Name - Enter the name of the material

(19) - Material Information, Physical State - Enter the physical state of the material (Solid, liquid, gas)

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(20) - Material Information, Weight of water - Enter the weight of water by percentage

(21) - Material Information, Weight of Free Acid - Enter the weight of free acid by percentage

(22) - Material Information, pH - Enter the pH of the solution

(23) - Material Information, Specific Gravity - Enter the specific gravity of the solution

(24) - Material Information, Biohazard Acknowledgement - Enter any known or potential bio-hazards.

(25) - Material Information, Toxic Acknowledgement - Enter any known/potential toxic risks

(26) - Material Information, Process Flow - Attach process flow

(27) - Material Information, MSDS - Attach MSDS

(28) - Material Information, Assay - Attach assay

(29) - Material Information, Packaging - Enter packaging information

(30) - Material Information, Volume - Enter volume generated per annum

(31) - Material Information, Regulatory Classification - Enter regulatory classification

(32) - Company Information, DOT Shipping Name - Enter DOT Shipping Name

(33) - Company Information, Class - Enter DOT shipping class

(34) - Company Information, UN/NA # - Enter UN number

(35) - Material Information, Handling Instructions - Enter proper handling instructions from MSDS

(36) - Material Information, Special Instructions - Enter any special instructions from MSDS

(37) - Liability Information, Signature - Enter signature of authorizing manager

(38) - Liability Information, Date - Enter Date signed

(39) - Liability Information, Name and Title - Enter name and title of authorizing manager

APEX
MATERIAL TECHNOLOGIES, LLC
Lee Welgs • 1-330-571-2182 • lwelgs@apexmattech.com
10 Industry Avenue • Joliet, IL 60435 • Phone: 815-727-3010 • Fax: 815-727-7545

EXHIBIT E

PUBLIC UTILITIES
Plant Operations
1021 McKinley Avenue
Joliet, IL 60436
OFFICE: 815/724-3675
FAX: 815/724-3620
E-MAIL: ngornick@jolietcity.org

CITY OF JOLIET

150 WEST JEFFERSON STREET
JOLIET, ILLINOIS 60432-4158

Industry Name:	APEX MATERIAL TECHNOLOGIES, LLC
Address:	10 INDUSTRY AVENUE JOLIET, IL 60435
Phone:	1.815.727.3010 FAX: 1.815.727.0701
Permit No.:	**J1610**

In accordance with the terms and conditions of the City of Joliet Ordinance No. 16684 and applicable rules and regulations of the Illinois Environmental Protection Agency and the U.S. Environmental Protection Agency the above Industry is authorized to discharge industrial wastewater into the City of Joliet's sanitary sewer system from the facility located at the above address.

The Industrial Wastewater Discharge Permit is granted in accordance with the application on file and in conformance with plans, specifications and other data submitted to the City in support of the discharge application. The wastewater discharger is required to meet discharge limitations, monitoring requirements, reporting requirements, and any other conditions set forth in this Permit.

This Permit and the authorization to discharge shall expire at midnight March 31, 2015. In order to receive authorization to discharge beyond the date of expiration, the Permittee shall submit an Industrial Wastewater Discharge Permit Application in accordance with Ordinance No. 16684 and any amendments no later than 90 days prior to the date of Permit expiration.

This Permit shall be effective on April 1, 2012. This Permit shall not be assigned, transferred or sold to a new owner, new user, different premises, or a new or changed operation.

Nicholas C. Gornick
Plant Operations Superintendent

APEX MATERIAL TECHNOLOGIES, INC
J1610

A. DESCRIPTION OF DISCHARGE

1. Facility Description: BOIL SPENT, AMMONIA COPPER ETCHANT WITH SODIUM HYDROXIDE TO PRODUCE COPPER OXIDE. RE-PROCESS COPPER SULFATE, PRECIPITATE METAL FROM NICKEL PLATING SOLUTIONS. MANUFACTURE AMMONIA BASED ETCHANTS. PRODUCE HIGH PURITY GRADE COPPER OXIDE FROM COPPER METAL. MANUFACTURE FERRIC CHLORIDE ETCHANTS.

   Standard Industrial Classification Code (SIC) 2819
   Categorical Number – 40.415
   Description - INORGANIC CHEMICAL MANUFACTURING POINT SOURCE CATEGORY SUB-PART AJ AND AU.

2. Source of Wastewater: HPG COPPER OXIDE PRODUCTION, INORGANIC CHEMICAL PRODUCTION STORM WATER, BOILER, CWT APPLICATIONS.

3. Description of Treatment Facilities: EFFLUENT/WASTEWATER IS COMPOSITED IN A 15,000-GALLON STORAGE TANK. FROM THIS TANK, MATERIAL IS TRANSFERRED/CASCADED TO A SERIES OF SMALL AGITATED TANKS WHERE PH IS ADJUSTED INTO SPECIFICATION USING SULFURIC ACID. NEXT SULFIDE IS ADDED TO PRECIPITATE METALS, POLYMER IS ADDED TO COAGULATE PRECIPITATED METALS AND FINALLY, FERRIC CHLORIDE IS ADDED TO PRECIPITATE ARSENIC. THIS PROCESSED EFFLUENT IS NOW READY TO BE SENT THRU THE LARGE FILTER PRESS TO REMOVE PRECIPITATES. THE RESULTANT DISCHARGED CLEAR LIQUID IS AGAIN TREATED WITH FERRIC CHLORIDE TO FURTHER REMOVE ARSENIC FOLLOWED BY THE ADDITION OF FILTER AID.

   THIS EFFLUENT MIXTURE IS NOW PUMPED THRU A POLISHING FILTER. NEXT, THE PH IS RE- ADJUSTED IF REQUIRED WITH RESULTANT IN SPECIFICATION PRETREATED EFFLUENT BEING DISCHARED TO THE POTW.

4. Additional Treatment Requirements: N/A

5. Compliance Schedule: N/A

APEX MATERIAL TECHNOLOGIES, INC
J1610

B. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

Table No. 1

	Parameter	Conc. Limits MG/L	Type of Collection	Sampling Frequency
1.	FLOW	------	MEASURED/ESTIMATE	*SEE BELOW
2.	PH	6.0-10.0	GRAB	WEEKLY
3.	BOD	-----	COMPOSITE	WEEKLY
4.	SUSPENDED SOLIDS		COMPOSITE	WEEKLY
5.	AMMONIA AS N	100.0	COMPOSITE	WEEKLY
6.	ARSENIC	0.8	COMPOSITE	WEEKLY
7.	COPPER	1.0	COMPOSITE	WEEKLY
8.	NICKEL	1.5	COMPOSITE	WEEKLY
9.	SELENIUM	1.0	COMPOSITE	WEEKLY
10.	SELENIUM	0.53	COMPOSITE	MONTHLY AVG.
11.	ZINC	0.9	COMPOSITE	WEEKLY

***MGD for the day sample is pulled and average MGD for each month.**

2. The Permittee shall monitor its effluent concentrations of the following parameters and B. 1, on monitoring report forms provided by the City. **The Semi-Annual and Categorical effluent samples shall be taken twice a year, January and July** and consist of a composite discharge at the Industry's regular sampling point. **This report shall be submitted along with Self Monitoring Report Forms on the 20th of April and October of each year.**

APEX MATERIAL TECHNOLOGIES, INC
J1610

Table No. 2

Semi-Annual Report Parameters			
Parameter		Parameter	
1.	pH	13.	Lead, total
2.	BOD	14.	Manganese, total
3.	Suspended Solids	15.	Mercury
4.	Ammonia as N	16.	Naphthalene, grab
5.	Arsenic, total	17.	Nickel, total
6.	Barium, total	18.	Oil/Grease, grab
7.	Cadmium, total	19.	Phenols, grab
8.	Chromium, total	20.	Phosphorus, total
9.	Copper, total	21.	Selenium, total
10.	Cyanide, total, grab	22.	Silver,
11.	Fluoride, total	23.	Zinc, total
12.	Iron, total		

Table No. 3

Categorical Limits

	Pollutant	1-Day Max.		Max. Month Avg.	
		Conc.	Lbs./day	Conc.	Lbs.day
1	Benzene	102	0.15	43	0.06
2	Carbon Tetrachloride	289	0.41	108	0.15
3	Chlorobenzene	289	0.41	108	0.15
4	1, 2, 4, Trichlorobenzene	603	0.87	149	0.21
5	Hexachlorobenzene	603	0.87	149	0.21
6	1, 2, Dichloroethane	436	0.63	137	0.20
7	1, 1, 1, Trichloroethane	45	0.06	17	0.02
8	Hexachloroethane	603	0.87	149	0.21
9	1, 1, Dichloroethane	45	0.06	17	0.02
10	1, 1, 2, Trichloroethane	97	0.14	24	0.03
11	Chloroethane	224	0.32	84	0.12
12	Chloroform	247	0.35	84	0.12
13	1,2, Dichlorobenzene	603	0.87	149	0.21
14	1, 3 Dichlorobenzene	289	0.41	108	0.15
15	1, 4 Dichlorobenzene	289	0.41	108	0.15
16	1, 1 Dichloroethylene	46	0.07	17	0.02
17	1, 2 trans-dichloroethylene	50	0.07	19	0.03
18	1, 2 Dichloropropane	603	0.87	149	0.21
19	1, 3 Dichloropropylene	603	0.87	149	0.21

	Pollutant	1-Day Max.		Max. Month Avg.	
		Conc.	Lbs./day	Conc.	Lbs./day
20	Ethylbenzene	289	0.41	108	0.15
21	Methylene Chloride	129	0.19	27	0.04
22	Methyl Chloride	224	0.32	84	0.12
23	Hexachlorobutadiene	289	0.41	108	0.15
24	Nitrobenzene	4866	6.98	1,700	2.44
25	2, Nitrophenol	176	0.25	49	0.07
26	4, Nitrophenol	438	0.63	123	0.18
27	4, 6, dinitro-o-cresol	211	0.30	59	0.09
28	Tetrachloroethylene	125	0.18	40	0.06
29	Toluene	56	0.08	21	0.03
30	Trichloroethylene	52	0.08	20	0.03
31	Vinyl Chloride	131	0.19	74	0.11
32	Cyanide. Total	912	1.31	319	0.46
33	Lead, Total	524	0.75	243	0.35
35	Zinc, Total	1,984	2.85	798	1.15

C. MONITORING AND REPORTING

1. Representative Sampling: Samples and measurements taken as required herein shall be representative of the volume and nature of the monitored discharge. The industrial discharger shall be required to submit the following with the monitoring reports: sample time, sample location, flow rates during the sampling period, and laboratory methods.

   The sampling location shall be: AUTOMATIC SAMPLER IS LOCATED ALONG THE OUTSIDE OF THE SOUTH WALL OF EAST WAREHOUSE.

2. Reporting Monitoring Requirements: The Industry shall immediately notify the City of Joliet at (815) 724-3675 or (815) 724-3676, within 24 hours of any non-compliance with any categorical standard or local limit. The Industry shall resample and submit a resampling report to the City of Joliet within 30 days of any non-compliance with categorical standards and requirements listed under Section B. 2. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS, if applicable. A letter explaining the excursion and how the problem will be eliminated shall be mailed within five days to the address below.

   The Permittee shall submit the proper monitoring report forms, with **signatures** to the City of Joliet, containing results obtained during the previous three months and shall postmarked no later than the **20th day of January, April, July and October of each year.**

APEX MATERIAL TECHNOLOGIES, INC
J1610

Submit the above to the following address:

City of Joliet
Eastside Treatment Plant,
Nicholas C. Gornick
Plant Operations Superintendent
1021 McKinley Avenue
Joliet, IL 60436

3. Test Procedures: The analytical and sampling methods used shall conform to 40 CFR 136 as amended. Approved methods are detailed in the following sources.

(1) Standard Methods for the Examination of Water and Wastewater 15th Edition, 1981, American Public Health Association, New York, NY 10019.

(2) A.S.T.M. Standards, Part 31, Water American Society for Testing and Materials, Philadelphia, PA 19103.

(3) Methods for Chemical Analysis of Water and Wastes, March 1983, Environmental Protection Agency, Water Quality Office, Analytical Quality Control Laboratory, 1014 Broadway, Cincinnati, OH 45202.

4. Recording of Results on Monitoring Report Forms: For each measurement or sample taken pursuant to the requirements of this Permit, the Permittee shall record the following information:

a. The exact sampling location, date, time and daily flow of at time when the sample is pulled;
b. The dates the analyses were performed;
c. The person(s) who performed the analysis;
d. The analytical techniques and methods used; and
e. The results of all required analyses.

5. Records Retention: All records and information resulting from the monitoring activities required by this Permit, including all records of analyses performed, calibration and maintenance of instrumentation and recording from continuous monitoring instrumentation, shall be retained for a minimum of three (3) years. The City of Joliet may request that the records be retained for a longer period if enforcement action is pending against the discharger.

D. REQUIREMENTS

1. The discharger shall provide and maintain monitoring facilities to allow inspection, sampling and flow measurement of the building sewer or internal drainage systems. As required by the City, such monitoring facilities shall be provided at the end of a process wherein incompatible pollutants are used, produced, or treated.

2. The City may inspect the facilities of the discharger to ascertain whether the purpose and all requirements of the Permit are being met. City representatives shall have ready access upon presentation of credentials at reasonable times to the facility for the purposes of inspection, sampling, examination of records required to be kept by Ordinance No. 16684 and in the performance of any of their duties. The City shall have the right to set up on the dischargers property such devices as are necessary to conduct sampling, monitoring and metering operations.

3. Within 90 days after the effective date of a National Categorical Pretreatment Standard, or 90 days after a final administrative decision has been made upon categorical determination submission in accordance with Section 403.6 (a)(4) of the Industrial Pretreatment Regulations, whichever is later, a discharger subject to such National Categorical Pretreatment Standards shall apply for an Industrial Wastewater Discharge Permit modification.

4. The discharger shall report any material and substantial changes in the type, quality or volume of wastewater discharged to the City of Joliet's sanitary sewer system within 30 days of such change.

5. The Permittee shall not increase the use of process water or, in any way, attempt to dilute a discharge to achieve compliance with the Permit limitations. A discharger having the ability to cause interference with the wastewater treatment plant or to violate the regulatory provisions of Ordinance No. 16684 shall provide protection from accidental discharge to the sanitary sewer of prohibited materials or other substances regulated by the Ordinance.

6. Dischargers whose wastewater includes or could include compatible or incompatible pollutants in amounts great enough to cause interference with the treatment plant must have detailed plans on file at the City showing facilities and operating procedures to provide this protection. Plans shall be approved by the City before construction of the facility.

7. **In the case of an accidental or deliberate discharge of compatible or incompatible pollutants which may cause interference at the wastewater treatment plant or violate regulatory requirements of the Ordinance No. 16684, it shall be the responsibility of the discharger to immediately telephone the City of Joliet Eastside Plant 815/724-3675 or Westside Plant 815/724-3680 and notify the City of the incident. The notification shall include name of caller, location and time of discharge, type of wastewater, concentration and volume.**

Within fifteen (15) days following such an accidental or deliberate discharge the discharger shall submit to the Director a detailed written report describing the cause of the discharge and the measures to be taken by the User to prevent similar future occurrences.

Such report, or reports, shall not relieve the discharger of any expense, loss, damage or other liability which may be incurred as a result of damage to the City's wastewater collection and treatment system, fish kills, or any other damage to person or property; nor shall such report relieve the discharger of any fines, civil penalties, or other liability which may be imposed by the City. Failure to report accidental or deliberate dischargers may, in addition to any other remedies available to City, result in the revocation of the discharger's Industrial Wastewater Discharge Permit.

The City retains authority to take legal action against any Industrial User for any just cause or failure to meet an applicable pretreatment standard by the deadline date regardless of whether or not such failure has resulted in a Permit violation in accordance with Ordinance No. 16684

8. Notice shall be permanently posted on the discharger's bulletin board or other prominent place advising employees whom to call in the event of a discharge of a prohibitive material. Employers shall ensure that all employees who are in a position to cause, discover, or observe such an accidental discharge are advised of the emergency notification procedures.

EXHIBIT L

ILLINOIS ENVIRONMENTAL PROTECTION AGENCY

1021 NORTH GRAND AVENUE EAST, P.O. BOX 19276, SPRINGFIELD, ILLINOIS 62794-9276 • (217) 782-2829
PAT QUINN, GOVERNOR LISA BONNETT, DIRECTOR

217/524-3300

June 9, 2014

Certified Mail
7012 0470 0001 2974 9346

APEX Material Technologies, LLC
10 Industry Avenue
Joliet, IL 60435

Re: 1970250002 -- Will County
APEX Material Technologies, LLC
PS14-061
Solid Waste Permits File

Dear Mr. Welgs,

This letter is in response to your letter dated May 9, 2014 regarding recycling spent copper ammonium chloride etchant. You explain in your letter that you previously submitted a Beneficial Use Determination (BUD) for this process and subsequently withdrew the request after it was determined that a BUD was not appropriate.

A review of the previously requested BUD identified in your letter, indicates that the activity being conducted is beyond the authority for Beneficial Use Determinations under Section 22.54 of the Illinois Environmental Protection Act (Act). An operating permit issued under 35 Ill. Adm. Code 807 is required for treatment of spent copper ammonium chloride etchant.
In accordance with Sec. 22.54 of the Act BUDs may be issued to determine that a material otherwise required to be managed as waste may be managed as non-waste if that material is used beneficially and in a manner that is protective of human health and the environment.
Specifically in Section 22.54(a)(B)(3) of The Illinois Environmental Protection Act (Act), the waste must be used as an effective substitute for a similar commercially available material. For the purposes of this paragraph (B) of item (3) of subsection (a) of this Section, a material is "used as an effective substitute for a commercially available material" if the applicant demonstrates one or more of the following:

(i) The material is used as a valuable raw material or ingredient to produce a legitimate end product.

(ii) The material is used directly as a legitimate end product in place of a similar commercially available product.

(iii) The material replaces a catalyst or carrier to produce a legitimate end product.

The reclamation of the spent copper ammonium chloride etchant prior to use as a raw material or product is a regulated waste treatment activity.

The activity must be conducted at a facility which has obtained the applicable solid waste permits unless a determination is obtained from the Illinois Pollution Control Board that the material is not a waste.

If you have any questions regarding this application, please contact Mary Riegle at 217/524-3329.

Sincerely,

Stephen F. Nightingale, P.E.
Manager, Permit Section
Bureau of Land

SFN:MER:1970250002-TRTSTR-PS14-061.doc

cc: Bureau File
Ted Dragovich
Mary Riegle
Paul Purseglove

EXHIBIT M

INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT

We make Indiana a cleaner, healthier place to live

Kevin Brinkman
Governor

Kathy Prosser
Commissioner

100 North Senate Avenue
P.O. Box 6015
Indianapolis, Indiana 46206-6015
Telephone 317-232-8603
Environmental Helpline 1-800-451-6027

April 14, 1994

Mr. Gary P. Lindgren, CHMM
Vice President
Environmental Compliance
Heritage Environmental Services
7901 West Morris Street
Indianapolis, Indiana 46231

Dear Mr. Lindgren:

Re: Reuse of Copper-Containing Secondary Materials

This is in response to your letter of February 22, 1994, requesting concurrence with your position that the reuse of copper containing secondary materials in the manner described in your letter is not subject to Indiana's hazardous waste regulations (329 IAC 3.1).

Based upon a review of the information submitted it is the opinion of this office that your recycling proposal would be exempt from regulation based upon the recycling exemption at 40 CFR 261.2 (e), which is incorporated by reference in 329 IAC 3.1. Please note that this office considers compliance with 40 CFR 261.2 (f), regarding documentation of recycling claims as a very important factor in this determination.

If you should have any questions regarding this matter, please contact Mr. Dave Kerrey of this office at 317/232-4417.

Sincerely,

Dave Werman

Dave Werman
Assistant Commissioner
Solid and Hazardous Waste Management

EXHIBIT N

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 5
77 WEST JACKSON BOULEVARD
CHICAGO, IL 60604-3590

AUG 0 3 1995

REPLY TO THE ATTENTION OF:
HRP-8J

Mr. Thomas Linson, Chief
Hazardous Waste Management Branch
Office of Solid and Hazardous Waste Management
IDEM
100 North Senate Avenue
Indianapolis, Indiana 46206-6015

RE: Spent Etchant Recycling
Heritage Environmental Services, Inc.
Indianapolis, Indiana

Dear Mr. Linson:

As a follow-up to our July 12, 1995, meeting, the United States Environmental Protection Agency (U.S. EPA) Region 5 has prepared a regulatory assessment of the copper salt production process proposed by Heritage Environmental Services, Inc. (Heritage) of Indianapolis, Indiana. The attached summary outlines three issues which we believe are pertinent to State of Indiana's April 14, 1995, recycling determination of the Heritage process. The U.S. EPA is requesting a review of our position by the IDEM to ensure that all relevant regulatory and technical factors were considered in the State's ruling.

In the IDEM's April 14, 1995, letter, the State concurred with Heritage's position that its process met the criteria for excluding spent etchants from RCRA regulation under the "use/reuse" provision at 329 Indiana Administrative Code 3.1. The State's regulations at this citation incorporate Federal regulations at 40 CFR 261.2(e) by reference.

In our meeting, the U.S. EPA Region 5 identified several regulatory considerations which may impact the exclusion for the incoming waste streams to the Heritage copper salt production process. Our opinion has been formulated from information contained in the Heritage position paper (February 22, 1994) about its process, and discussions with U.S. EPA headquarters and representatives from a RCRA-regulated etchant recycler. Additional information from Heritage may be necessary to reach a regulatory consensus about the spent etchants used in the Heritage process. ?

The Region recognizes the State's efforts to fully assess the RCRA recycling provisions as they apply to the Heritage process. We understand the basis for the State's interpretation, but believe that additional consideration may be necessary to ensure the consistent implementation of RCRA recycling regulation across the Region. Following your review of this letter, we would appreciate a written response which outlines the State's position on the issues raised in the attachment to this letter.

We thank you for your cooperation in further evaluating this important issue with us. If you wish to discuss this matter further before you respond, please contact me at (312) 886-0988.

Sincerely yours,

Hak K. Cho, Chief
Indiana Section
RCRA Permitting Branch

Attachment

cc: Gary Lindgren, Heritage Environmental Services, Inc.
Tom Moran, Phibro-Tech, Inc.
Paul Borst, U.S. EPA headquarters
Charlotte Mooney, U.S. EPA headquarters
Jack Shinderle, Michigan DNR
Ted Dragovich, Illinois EPA

Attachment
U.S. EPA Region 5 Regulatory Assessment

Heritage Environmental Services, Inc.
Copper Salt/Etchant Production Process

Based on the information available, the U.S. EPA Region 5 believes that the regulatory status of the incoming waste streams is dependent upon the following three issues:

1) What is the role of Feedstock A (see Exhibit 1) in the production of the copper salt? Does the addition of Feedstock A represent a reclamation step?

2) If the alkaline etchant co-product is sold as a product, does the "regeneration" of this stream constitute reclamation? If it does, does the incoming alkaline etchant continue to be excluded as a solid waste by the "use/reuse" provision?

3) Do the incoming waste streams carry other characteristic waste codes (i.e., toxicity) besides D002 (corrosivity characteristic)?

Issue 1

As the IDEM and the U.S. EPA established in our meeting, the exclusion under the "use/reuse" provision is not applicable to a solid waste if reclamation precedes its utilization as an ingredient or effective substitute in a production process. Consequently, we believe that Issue 1 highlights the importance of the determining the similarity of etchant feedstocks with raw materials in analogous copper salt production operations. It is our understanding that the addition of this Feedstock A represents a step not normally found in analogous productions using raw materials. If Feedstock A were necessary to chemically render or transform one or both of the waste feedstreams to a state necessary for Heritage to produce its copper salt, direct use/reuse may not be occurring in accordance with the criteria specified at 40 CFR 261.2(e)(1)(i). Specifically, the addition of Feedstock A would be considered a reclamation step prior to the actual use of the wastestreams as substitutes or ingredients in the production operation.

The intent of the reclamation restriction in the use/reuse provision is to provide regulatory relief to operations which directly incorporate RCRA wastes (in their entirety) into a product, and by doing so, add value to the product in a manner equivalent to the contribution of analogous raw materials. Reclamation before (or during) the production process is not consistent with the intent of "directly" using the wastes. We acknowledge that it is a difficult task to distinguish Feedstock A as an ingredient feedstock from a "reclamation" feedstock, but the issue is clearly important in light of other types of recycling operations which manage spent etchant solutions as RCRA hazardous wastes.

Issue 2

More importantly, Issue 2 highlights specific limitations on the scope of the use/reuse provision as described in the text of RCRA regulation. According to 40 CFR 261.1(c)(5), a material is used or reused if it is employed as an ingredient in a production process to make a product, provided that distinct components of the material are not recovered as separate end products. Applying this restriction to the use/reuse exclusion set forth at 40 CFR 261.2(e), the process as a whole must first be evaluated to determine whether or not any reclamation is occurring. 40 CFR 261.1(c)(4) states that a "material is 'reclaimed' if it is processed to recover a usable product or if it regenerated. Examples are recovery of lead values from spent batteries and regeneration of spent solvent." Table 1 of 40 CFR 261.2 further emphasizes the importance of first determining whether a process (in its entirety) contains or represents reclamation.

In our opinion, the collection and resale of the alkaline etchant co-product at the end of the copper salt production process represents regeneration (and thus reclamation) because the alkaline stream is a separate and distinct end component of an incoming waste stream. The exclusion provided by the copper salt production should not "shield" the incoming wastes from regulation invoked by the regeneration of the alkaline waste stream. In fact, the identification of the alkaline etchant as a co-product by Heritage clearly indicates that two products are being produced in the Heritage process, each of which should be fully evaluated as a potential reclamation product. Consequently, the regeneration of the alkaline waste stream should subject the incoming alkaline waste stream to RCRA regulation as a solid waste, regardless of whether copper salt production is also occurring.

The Agency clearly intended to distinguish between the production of "products" under a use/reuse scenario and under reclamation. The following two use/reuse examples are described in the preamble to the January 4, 1985, Definition of Solid Waste Rule (50 FR 637):

- use of hydrofluorosilicic acid (an air emission control dust) as a drinking water fluoridating agent; and

- use of spent pickle liquor as a wastewater conditioner.

In both of these examples, the spent material is used in its entirety, without generating waste or a co-product. The Agency further specified its concern about separating a waste stream into components in its description of the closed-loop recycling exclusion (50 FR 639):

> "the proposed approach [which allowed reclamation in closed-loop recycling] might also have excluded operations where the secondary material itself is substantially unrecoverable and contains comparatively small percentages of utilizable material. The proposal thus might have invited abuse, as companies might seek to avoid regulation by reclaiming some small increment, and returning that increment to the original production process."

Although this citation pertains to another RCRA recycling exclusion, it clearly presents the Agency's intentions for evaluating recycling processes in their entirety to identify all "products" from incoming waste streams. Without this distinction, the use/reuse exclusion could allow companies to evade regulation by using/reusing a waste stream for a product in a manner that doesn't truly utilize the waste (and all that's in it) simply to reclaim the larger (and perhaps more valuable when reclaimed) component of the original waste stream.

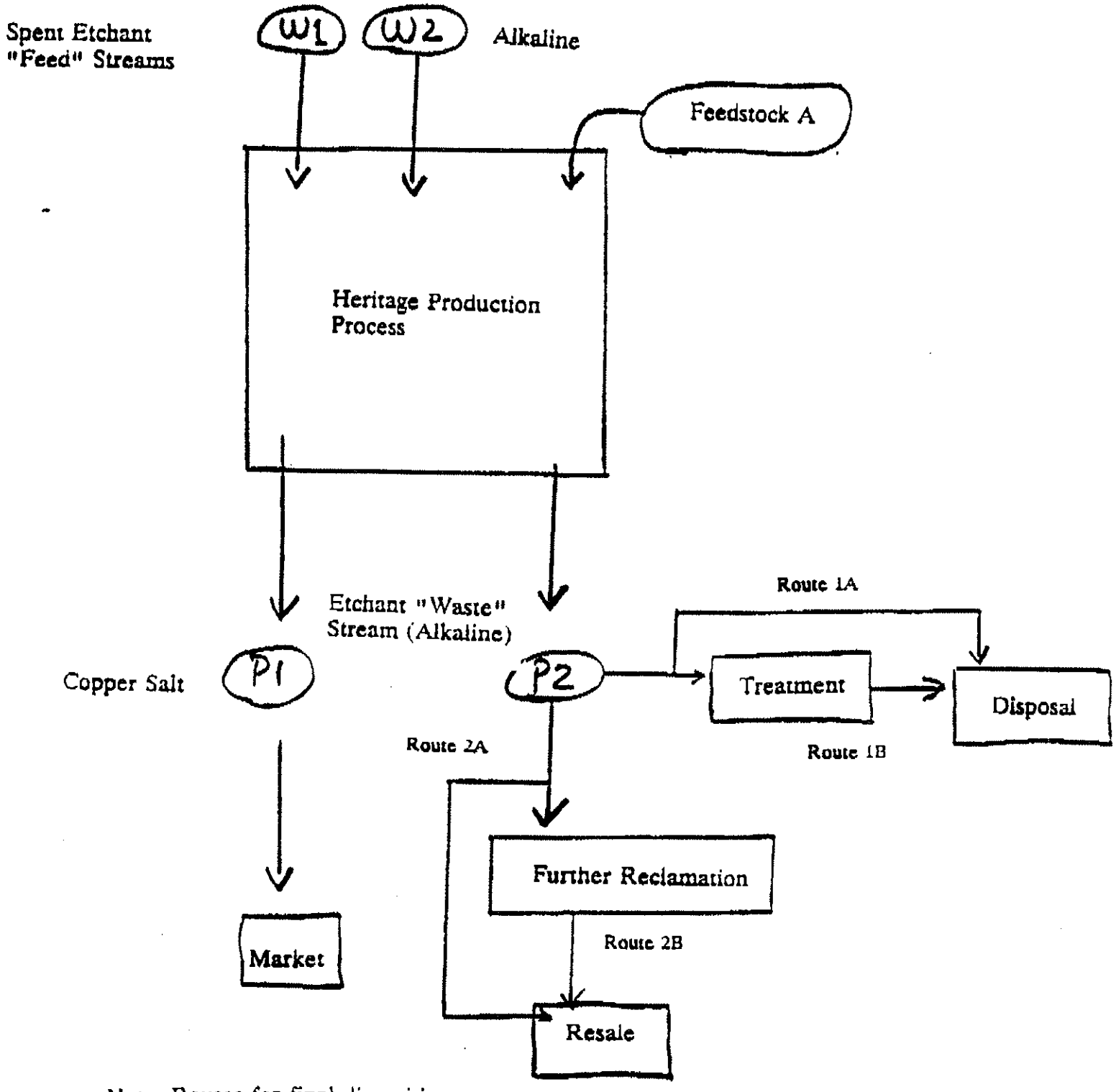
Exhibit 2 of this attachment further clarifies the Agency's interpretation about the use of a solid waste to produce two products by different means, one of which would exclude the waste as a solid waste, the other which would preserve its status as a solid waste. The memo states that "In the case where a given quantity of sludge is reclaimed both for metals recovery [in this case, the incoming sludge would not be a solid waste] and for fertilizer use [in this application they would be solid wastes], the sludge would be subject to 261.6(b) and (c) prior to reclamation because some of the sludge was used in a manner constituting disposal." That is, the sludge must be managed as a solid (and thereby a hazardous) waste prior to recycling even though one portion of the operation (reclamation of a characteristic sludge) would not subject to incoming sludge to regulation as a solid waste.

Two examples (see Exhibit 3 of this attachment) from the Guidance Manual on the RCRA Regulation of Recycled Hazardous Wastes (EPA-530/SW-86-015) were included in Heritage's position paper to support its claim that the copper salt production is legitimate use/reuse. It should be noted that neither of these examples address the regeneration of the alkaline etchant solution. Under Use/Reuse Spent Material 7, spent sulfuric acid (characteristic for corrosivity) is directly used as a raw material in the manufacture of iron oxide products, and thus qualifies for the use/reuse exclusion. Under Use/Reuse Spent Material 6, spent hydrofluoric acid etching solution from metallurgical industries (characteristic for corrosivity) is used to produce an impure potassium fluoride solution. Although the pottasium flouride is further refined before it is sold, the entire process does not constitute reclamation because potassium fluoride does not exist in the original waste stream and therefore is not "recovered" or a reclaimed component of that waste stream. Hence, the use/reuse exclusion applies.

The Agency does not take issue with Heritage's position that the copper salt production constitutes use/reuse in the context of these examples, apart from the legitimacy issue discussed below. It appears that the copper salt does not exist in the original waste streams. Note however, that these examples do not provide information about the disposition of the final waste liquids (if they exist). One can assume that they are discarded because the intent of each process is solely to produce one final product.

Exhibit 1

Simplified Schematic Diagram
Heritage Environmental Services
Copper Salt Production Process



Note: Routes for final disposition of "P2" stream are hypothetical.

Exhibit 2

9441.1987(11)

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

AUG 12 1987

OFFICE OF
SOLID WASTE AND EMERGENCY RESPONSE

Mr. Roy Lee Tate
804 Sugarloaf Lane
Anniston, Alabama 36201

Dear Mr. Tate:

This is in response to your letter of July 17, in which you requested an interpretation of whether and how the RCRA hazardous waste regulations apply to a zinc oxide dust being recycled. The dust is considered a sludge under 40 CFR §261.2. The status of the sludge is as follows:

1. If any material recovered from the sludge is sent for fertilizer use, the sludge is subject to 40 CFR §261.6(b) and (c), the requirements for recyclable materials. (When a sludge is used as fertilizer, it is a solid waste. See §261.2(3).)1/

2. The leach residues that are sent for metals recovery, once completely reclaimed, are not solid waste. (See §261.2(e).)

In the case where a given quantity of sludge is reclaimed both for metals recovery and for fertilizer use, the sludge would be subject to §261.6(b) and (c) prior to reclamation because some of the sludge was used in a manner constituting disposal.

Finally, you should note that the U.S. Court of Appeals for the District of Columbia reached a decision on July 31, 1987, that calls into question EPA's authority to regulate certain waste recycling activities. EPA is studying the opinion to determine its scope. Because the Court has not yet issued its mandate, the regulations currently in the Code of Federal Regulations defining what is "solid waste," and establishing regulations for recycled hazardous waste, remain in effect.

1/ In contrast, if the reclaimed zinc oxide is sent to produce zinc sulfate (and not for fertilizer), then the sludge is not solid waste and is not subject to the hazardous waste regulations. See §261.2(c)(3).

If you have further questions in this area, please contact Mike Petruska of my staff at (202) 475-6676.

Sincerely,

Matthew A. Straus, Chief
Waste Characterization Branch

EXHIBIT O

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 5
77 WEST JACKSON BOULEVARD
CHICAGO, IL 60604-3590

SEP 27 1995

REPLY TO THE ATTENTION OF:
HRP-8J

CERTIFIED MAIL: Z 411 905 475
RETURN RECEIPT REQUESTED

Thomas Linson, Chief
Hazardous Waste Management Branch
Office of Solid and Hazardous Waste Management
Indiana Department of Environmental Management
100 North Senate Avenue
Indianapolis, Indiana 46206-6015

RE: Spent Etchant Recycling
Heritage Environmental Services, Inc.
Indianapolis, Indiana

Dear Mr. Linson:

The United States Environmental Protection Agency (U.S. EPA) Region 5 recently transmitted a letter dated August 3, 1995, to you in which we asked the State of Indiana to respond to three issues regarding the copper salt production process at Heritage Environmental Services, Inc. (Heritage). Since that time, the Region has discussed these issues further with our headquarters and Heritage representatives. Heritage has also transmitted additional process and product/waste information to the Region to support its regulatory interpretation of the issues raised in our letter. Based on these correspondences, the Region would like to clarify its position on these issues for your consideration in preparing your response to our August 3, 1995, letter.

Before we present our opinion on each issue, the Region would like to acknowledge that Heritage appears to be producing a unique copper salt product. Supporting documentation from Heritage indicates that the process itself does not resemble other types of recycling operations which utilize these etchants, and more importantly, which manage the etchants as hazardous wastes prior to recycling. Further, Heritage has demonstrated to the Region that it has established a viable market for its copper salt product. We are providing these observations as a follow-up to our earlier concerns about several underlying legitimacy issues.

Additional information from Heritage indicates that the addition of "Feedstock A" (identified as "Issue 1" in our August 3, 1995, letter) does not constitute a reclamation step in the Heritage manufacturing process, provided that the "manufacturing process" identified in Heritage position paper to the State (February 22, 1994) is completed in one stage, without any intermediate reclamation occurring. Heritage has stated that this feedstock is a necessary component to produce the copper salt, and is not used for reclamation purposes. Further, according to Heritage, Feedstock A does not facilitate the recovery, nor contribute to the production of the alkaline etchant by-product. (The alkaline etchant by-product was identified as "P2" in our August 3, 1995, letter; it will hereafter be referred to as "alkaline brine".) Consequently, the Region believes that Heritage has adequately demonstrated that Feedstock A is utilized for purposes of production, not reclamation.

With regards to "Issue 3", Heritage has acknowledged that the incoming spent etchants may occasionally exhibit the toxicity characteristic (TC) for several TC metals. Heritage has stated however, that its process "effectively controls the concentrations of trace elements" in the copper salt product. Heritage has asserted that the levels of these contaminants in its product are typically a small fraction of the levels allowed by state animal feed control officers of the Association of American Feed Control Officials. According to Heritage, the substantive mass of these TC metals remains in the alkaline brine. Heritage has conducted testing to support these claims. Based on this information, the Region believes that the legitimacy concerns raised by Issue 3 are no longer applicable to the Heritage process.

Regarding Issue 2, we first wish to clarify our opinion about the incoming acid etchant solution, including cupric chloride. Based on information presented by Heritage, the Region believes that the acid etchant solution meets the criteria for use/reuse exclusion specified at 40 CFR 261.2(e). It is our opinion that the acid etchant is not a RCRA solid waste (and thus not a RCRA hazardous waste), when this waste is wholly utilized in the Heritage process (40 CFR 261.1(c)(5)(i)).

In cooperation with our headquarters, the Region has completed a rather exhaustive inquiry into the regulatory implications of the final disposition of the alkaline brine on the status of the incoming alkaline etchant. Heritage has asserted that the Agency's "point of generation" principle discussed in preamble language to various land disposal restrictions rulemakings should apply to the brine solution. Heritage believes that the alkaline brine is waste generated by its process and should not be linked back to the incoming alkaline etchant. The disposition of the brine would not therefore, impact the regulatory status of the incoming alkaline etchant.

The Region fully understands this position, but believes that RCRA regulation is specific about the extent to which this "as generated" interpretation can be applied to products and by-products from a manufacturing process which utilizes hazardous wastes (such as the Heritage process). The use/reuse provision contains specific restrictions (40 CFR 261.1(c)(5) and 261.2(e)) which must be met to exclude a waste (and thus anything generated from that waste) from the otherwise broad scope of reclamation as defined by RCRA regulation.

The Region is concerned about the possible existence of "distinct (and separate) end components" in the alkaline brine which originate from the alkaline etchant. The Region acknowledges Heritage's position that the incoming alkaline etchant is chemically similar in composition to its "raw material" alkaline feedstock (dissolved non-hazardous copper-bearing wastes in an alkaline solution). We also understand that the alkaline brine is not solely comprised (by volume or by constituent) of the incoming alkaline etchant (approximately 40% according to Heritage). However, we are of the opinion that 40 CFR 261.1(c)(5)(i) implies that reclamation would be occurring if the alkaline brine exhibits distinct and separate end components of the incoming alkaline etchant, regardless of whether the components in the by-product are present "by design" or are incidental to the copper salt production process.

This conclusion is directly based on the definition of reclamation, which includes both regeneration (as in the reformulation of etchant) and recovery (for any purpose, but to recover a distinct component of the incoming waste stream). Under this interpretation, the end component(s) (if present) in the brine could be considered reclaimed (and thus the incoming alkaline etchant as a material being reclaimed) regardless of the brine's final disposition (excepting disposal) because the brine by-product is being used for some purpose. From a regulatory standpoint, that purpose is related to the "reclaimed" end component. Our interpretation of this restriction appears severe, but clearly obviates the need to establish arbitrary limits on the quantity of alkaline etchant in the brine to determine whether the brine is an "as generated" waste or a "reclaimed material".

In summary, the Region supports the State's determination that the production of the Heritage copper salt is consistent with the RCRA use/reuse exclusion, provided that the issues regarding the disposition of the alkaline brine (and its impact on the incoming alkaline etchant) are resolved. We believe that the Feedstock A and TC issues (Issues 1 and 3 respectively, in our August 3, 1995, letter) have been suitably addressed by Heritage. Although we have presented our opinion about several issues regarding this specific process, the Region recognizes the State's authority to make the final decision on this subject matter. However, we would appreciate a response to our opinions about the three issues discussed here and in our August 3, 1995 letter at your earliest convenience.

Thank you for your continued cooperation in resolving this complex regulatory issue with us. If you have any questions regarding this letter, please contact me at (312) 886-0988.

Sincerely yours,

Hak K. Cho, Chief
Indiana Section
RCRA Permitting Branch

cc: Gary Lindgren, Heritage Environmental Services, Inc. **CERTIFIED Z 411 905 476**
Tom Moran, Phibro-Tech, Inc. **CERTIFIED Z 411 905 477** ✓
Paul Borst, U.S. EPA headquarters
Charlotte Mooney, U.S. EPA headquarters
Jack Shinderle, Michigan DNR
Ted Dragovich, Illinois EPA

EXHIBIT P

COMMONWEALTH of VIRGINIA

DEPARTMENT OF ENVIRONMENTAL QUALITY

P.O. Box 10009
Richmond, Virginia 23240
(804) 762-4000

March 28, 1996

Gary F. Lindgren, CHMM
Vice President, Environmental Compliance
Heritage Environmental Services, Inc.
1901 West Morris Street
Indianapolis, IN 46221

Re: Reuse of Copper Containing Secondary Materials as Feedstock

Dear Mr. Lindgren:

The Department of Environmental Quality has evaluated your request for application of the Virginia Hazardous Waste Management Regulations (VHWMR) to the use/reuse of spent printed circuit board etchant solutions as feedstock in the manufacture of copper salts (specifically tri-basic cupric chloride) to be used as an animal feed additive. Heritage Environmental Services, Inc., and Micronutrients, have submitted extensive documentation in support of the position that spent etchant solutions used in this manner are conditionally excluded from regulation as a hazardous waste.

Based upon review of information submitted by Heritage and Micronutrients, this office has determined that materials discussed in your correspondence qualify for exclusion from regulation as a hazardous waste. This decision is based on the presumption that said materials are to be used as ingredients in an industrial process to make a product without first being reclaimed, and as such, are excluded from regulation as a hazardous waste under VHWMR Section 3.1.A.8.a. Furthermore, Heritage and Micronutrients have demonstrated that a use and ready market exists for products manufactured from the spent solutions described in your correspondence.

As we have discussed, generators of spent copper containing solutions recycled in this manner should maintain documentation under Section 3.D of the VHWMR demonstrating that the spent solutions meet the basis for exclusion from regulation as a solid waste (and

consequently, a hazardous waste). Such documentation may include, but is not limited to, contract agreements with the recycling facility and statements of use from the recyclers/end users.

Please be advised that the spent etchants are conditionally excluded from regulation only if directly used as an ingredient in a process to make a product, and that if they are sent to an intermediate storage or treatment facility prior to reuse, may not qualify for specific exclusion under VHWMR Section 3.1.A.8.a. Additionally, the spent solutions may be subject to the requirements for transporting hazardous materials under the USDOT, Virginia Regulations Governing the Transport of Hazardous Materials, or other applicable state transportation regulations.

If you have any questions or need further assistance on this matter, please call me at (304) 698-4199.

Sincerely,

Steven E. Frazier
Hazardous Waste Technical Advisor
Office of Technical Assistance/Waste

EXHIBIT Q

STATE OF COLORADO

Bill Owens, Governor
Jane E. Norton, Executive Director

Dedicated to protecting and improving the health and environment of the people of Colorado

4300 Cherry Creek Dr. S.
Denver, Colorado 80246-1530
Phone (303) 692-2000
TDD Line (303) 691-7700
Located in Glendale, Colorado

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Laboratory and Radiation Services Division
8100 Lowry Blvd.
Denver, Colorado 80230-6928
(303) 692-3090

Colorado Department
of Public Health
and Environment

December 3, 2001

Mr. Fred A. Steward, President
Micronutrients
1550 Research Way
Indianapolis, IN 46231

RE: Regulatory Interpretation Regarding the Use of Spent Copper Etch in the Manufacture of Tri-basic Copper Chloride

Dear Mr. Stewart:

The Colorado Department of Public Health and Environment (the Department) has received your request, dated November 26, 2001, for a regulatory determination regarding the reuse of spent copper etch in the manufacturing of tri-basic copper chloride (TBCC). Based upon the information you provided, Micronutrients, a Division of Heritage Technologies, manufactures TBCC for use as an animal feed supplement. Micronutrients has indicated that spent copper etch generated by the circuit board industry provides a source of copper that can be directly used as a feed material in the manufacture of TBCC. Micronutrients has further indicated that the copper etch does not require reclamation before being used in the manufacturing process. The following provides the Department's determination on this matter.

The Colorado Hazardous Waste Regulations at 6 Colorado Code of Regulations (CCR) 1007-3, section 261.2(e)(1)(i) provides an exclusion from the definition of a solid waste for materials that are directly used or reused as ingredients in an industrial process, provided that the materials are not first reclaimed. The information submitted by Micronutrients indicates that the spent copper etch is the preferred feedstock in the manufacture of TBCC. Additionally, the spent copper etch is a direct feed material to the crystallization reactor that produces the TBCC without prior reclamation. Based upon the information provided, the Department agrees that the spent copper etch does not meet the definition of a solid waste when it is being directly used as an ingredient in the manufacture of TBCC and is not first reclaimed.

Although the Department agrees that the spent copper etch is not a solid waste when recycled as described above, each generator of such material is required to maintain documentation regarding the legitimacy of the recycling practice. The regulations at 6 CCR 1007-3, section 261.2(f) indicate that generators involved in hazardous waste enforcement actions who raise claims that a certain material is not a solid waste or is conditionally exempt from regulation must demonstrate that there is a known

market or disposition for the material and that they meet the terms of the exclusion or exemption. The generator must be able to provide appropriate documentation (such as contracts showing that a second person uses the material as an ingredient in a production process) to demonstrate that the material is not a waste or is exempt from regulation.

Provided the recycling operation conducted by Micronutrients is conducted as described in the submitted material, the Department concurs that the spent copper etch is excluded from the definition of a solid waste. However, this determination may not be valid if the recycling process is altered such that the spent copper etch requires reclamation prior to being used in the manufacture of TBCC. Additionally, although the spent etch is excluded from the definition of a solid waste, such material may remain a hazardous material and may be subject to Department of Transportation requirements applicable to the shipment of hazardous materials.

Please contact me at (303) 692-3386 if you have further questions regarding this determination.

Sincerely,

Edward Smith

Edward Smith
Hazardous Waste Compliance Unit

cc: Joe Schieffelin, CDPHE
Fred Dowsett, CDPHE