IBM
1000 River Street
Essex Junction, VT 05452

February 28, 2013

US Environmental Protection Agency
Office of Enforcement and Compliance Assurance
Office of Federal Activities
International Compliance Assurance Division (2254A)
1200 Pennsylvania Ave., NW
Washington, DC 20460

Via UPS Mail

Re: International Shipments Report for 2012
IBM Essex Junction, VT (EPA ID No. VTD002084705)

To Whom It May Concern:

Attached is a summary of 2012 international shipments of hazardous waste for the IBM Corporation facility in Essex Junction, Vermont as required by 40 CFR 262.56(a) and Section 7-708(c) of the Vermont Hazardous Waste Management Regulations. Also included with this report is an update of the waste minimization activities at IBM. The waste minimization update includes a summary of chemical review procedures, a description of 2012 waste minimization efforts, and activity planned for 2013.

Please contact Clare Santos at (802) 288-6151 or at *santosc@us.ibm.com* with any questions or for further information.

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this and all attached documents, and that based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the submitted information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information including the possibility of fine and imprisonment.

Sincerely,

Janette Bombardier

Janette Bombardier
Director, IBM Vermont Site Operations & Senior Location Executive

cc: Ms. Lynn Metcalf
Vermont Department of Environmental Conservation
Waste Management Division (via email)

received
SDM 3/4/2013

Annual Report of International Shipments of Hazardous Waste
2012 Calendar Year

Exporter:	IBM Corporation
EPA I.D. Number:	VTD002084705
Site & Mailing Address:	1000 River Street Essex Junction, VT 05452
Contact:	Clare Santos
Calendar Year:	2012

Consignee 1:

Consignee Name	Consignee Site Address	Consignee EPA I.D. Number
Stablex Canada, Inc.	760 Boulevard Industrial Blainville, Quebec J7C 3V4 Canada	NYD980756415

Wastes Exported:

Description of Hazardous Waste Exported	EPA Hazardous Waste Number	DOT Hazard Class	Transporter(s)	Transporter(s) EPA I.D. Number	Total Waste Shipped (pounds)	Total Shipments
a. Filter Cake	F006	9	Transport Rollex LTEE	NYF006000053	5,104,277	125

2

2/27/2013

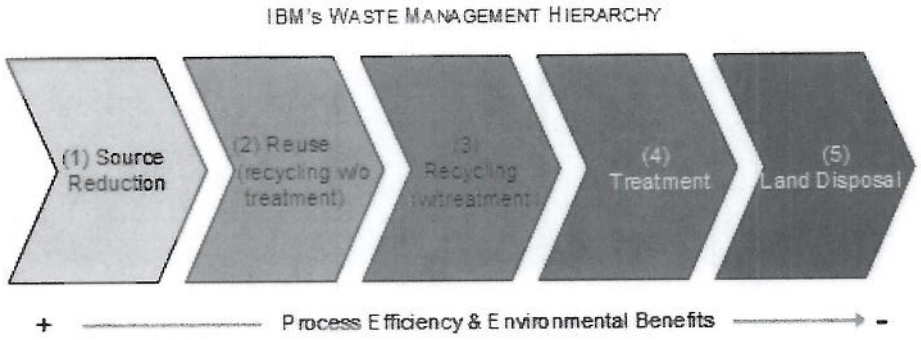
WASTE MINIMIZATION UPDATE

February 28, 2013

3

WASTE MINIMIZATION PROGRAMS AND PROCESSES

The IBM Corporation uses the following hierarchy in implementing waste minimization techniques:



IBM Vermont has focused on achieving waste minimization through the implementation and effective management of the following programs and processes, which directly or indirectly aid in minimizing the generation of hazardous waste. These programs and processes are continuously being refined to enhance the site's waste minimization efforts.

- Chemical Authorization Process
  - All chemicals that are new to the site or existing chemicals with a new use are reviewed for environmental and safety impacts. Less toxic substitutes are required when available.
- Process Environmental Impact Assessment
  - All new chemical using manufacturing and facilities equipment are reviewed to identify potential significant impacts to the environment from IBM processes; to consider feasible alternatives for avoiding potential impacts; and to ensure compliance with applicable legal and regulatory requirements.
- Waste Disposal Characterization
  - The site has a waste disposal process that allows containerized chemical waste to be tracked from the point of generation to the point of disposal. Based on the waste characteristics, the proper disposal method is established, including reuse and recycling when feasible.
- Toxics Use and Hazardous Waste Reduction Planning
  - IBM also has a plan identifying source reduction and waste minimization opportunities for all SARA 313 chemicals and hazardous waste streams that fall under the planning requirements, per the requirements of Vermont's ACT 100. Waste minimization efforts are reported to the State of Vermont in the annual Pollution Prevention Progress Report.
- Product Environmental Impact Assessment
  - In addition to its processes, IBM must also ensure that its products do not have a detrimental effect on the environment and that all products are introduced in compliance with Federal, State, community and IBM Corporate rules and regulations. A Product Environmental Profile is prepared to predict and minimize or eliminate adverse environmental effects of IBM products, both within the manufacturing facility and at the customer location.

4

2012 WASTE MINIMIZATION RESULTS

Using 2005 as a baseline, the amount of production hazardous waste generated in 2012 was reduced by approximately 47.0% from 2005 (when indexed to production). The hazardous waste indexed to production increased by approximately 7.4% in 2012 relative to 2011.

RESTRICTION OF HAZARDOUS SUBSTANCES (ROHS)

IBM continued its efforts in 2012 on qualification and introduction of lead-free and lead reduced technologies. IBM worked with our internal and external customers to develop a strategy to phase out lead containing products.

REGISTRATION, EVALUATION, AUTHORIZATION AND RESTRICTION OF CHEMICAL SUBSTANCES (REACH)

IBM Microelectronics Division (MD) also continued the assessment of the newly proposed REACH Substances of Very High Concern (SVHC) list with regards to impact on MD products/packaging. As part of this assessment, IBM worked with supply chain to ensure new SVHC chemicals in 2012 are not in MD products and packaging. In addition, IBM evaluated impact of addition of phthalates to the REACH authorization list on MD products. MD worked with supply chain, and product development team to identify products/materials using phthalates and developed action plans for phthalate free replacements.

SOLVENT AND PHOTORESIST USAGE REDUCTION PROJECTS IN WAFER MANUFACTURING OPERATIONS

Bulk Gamma-Butyrolactone/N-Butyl Acetate (GBL/NBA) Solvent:

Converted four TEL tracks to bulk GBL/NBA solvent, thereby replacing the need for individual ten liter Nowpaks™. This project optimizes the use of the GBL/NBA solvent by switching to bulk delivery and helps reduce the waste generated from disposing of empty Nowpaks™.

End of Life of Color Imager Program:

Removal of color imager program which uses specific photochemicals for a low volume process reduces overall chemical usage and possibility for expired photoresist. In 2012, this waste was reduced by approximately 50 liters.

Solvent Block Project - Complete Implementation:

The photo engineers have redesigned and qualified a device on a lithographic process tool called a "solvent block" that greatly reduced both the volume of cleaning solvent used and the waste of these manufacturing process chemicals. The solvent block modified by IBM was manufactured locally at 5% of the cost of a similar solution offered by the tool manufacturer. This lower cost allowed IBM to justify the time, manpower and expense of installing the newly modified solvent block on sixteen lithographic process tools resulting in a yearly reduction of 73,277 liters in solvent use and hence, the corresponding chemical waste processing.

5

Single Path Chemical Dispense Reduction:

This project resulted in a significant reduction in the photochemical waste by reducing the periodic dispense on four photo tools by 50%. These tools are used exclusively for a technology for which production had dropped in 2012. This resulted in excessive periodic chemical dispense to the underutilized tools. The tools were turned down from a dual path to a single path apply thereby reducing the periodic dispense waste in each tool by half. Total chemical savings in 2012 were 38.4 liters.

Photochemical Deployment Reductions:

Photochemical waste was reduced in 2012 by reducing the number of photo tools on which the variety of photoresists are deployed. This action reduced the number of wasted partial or full Photoresist Nowpaks™ in 2012 by 67 liters.

No Polyimide Process on Certain Wafer Technologies:

In mid-2011 a process change was made to certain wafer technologies in which the Durimide 7510 photosensitive polyimide (PSPI) was replaced with a Mid-UV photoresist to resolve a fluorine contamination issue when stripping the PSPI from the wafer with greenhouse gas tetrafluoromethane (CF4). This process change was further deployed on additional process technologies in 2012, after it was determined as a technically feasible option for those wafer technologies and customers.

The annual savings as a result of this process change were 270 liters of HD4004 and 1836 liters of NMP. In addition, CF4 usage was reduced since the photoresist can be stripped with an oxygen plasma instead of using CF4.

Copper plating standards elimination:

In 2012, new analytical tools for conducting analysis on copper plating chemistries were installed. These tools eliminated the need for several copper plating standards. This reduced the waste by approximately 996 liters per year.

Water Phase from Bonder/Debonder Tool Segregated for On-site Treatment:

Water is segregated from the solvent waste for on-site treatment at the wastewater treatment plant to maximize on-site treatment and minimize the amount of waste being sent off site. This tool was brought online in August 2011. In 2012, 400 pounds/day of water was segregated for onsite treatment. If this water was not treated, it would have been sent offsite for disposal as part of the MUV waste stream thus reducing the reclaim potential for the PGMEA in the MUV waste stream.

6

RECOVERY OF FOMBLIN OILS USED IN PRECISION VACUUM PUMPS

Segregation of waste perfluorinated oil and equipment filters allows the perfluorinated oil to be recovered and returned to the site for reuse. In 2012, 3,983 pounds of used Fomblin oil were sent for reclaim instead of disposal.

ON-SITE TREATMENT OF WASTE AT WASTEWATER TREATMENT PLANT

The IBM Vermont manufacturing facility owns and operates a state-of-the-art, NPDES permitted on-site wastewater treatment plant. This wastewater treatment plant consists of four main wastewater treatment processes: Concentrated Wastewater Treatment, Biological Wastewater Treatment, Chemical Mechanical Polish Wastewater Treatment, and Industrial Wastewater Treatment. Utilizing the capabilities of these treatment processes allowed IBM to treat approximately 469,297 pounds of waste on-site in lieu of sending it off-site for treatment. On-site treatment dramatically reduces the number of waste shipments required, reducing the need for transportation of those wastes.

Table 1 below outlines the types and estimated quantities of waste treated in 2012:

Table 1

Waste Stream Name	*Portion of Treatment Facility Where Treatment Occurred*	*Total Treated (estimated pounds)*	*Percent of Waste Generated*
Deep Ultraviolet (DUV) Waste	Biological Wastewater Treatment Plant (BWTP)	388,500	71
Ethylene Glycol Solutions	Biological Wastewater Treatment Plant (BWTP)	650	100
Miscellaneous Containerized Waste	Chemical Mechanical Polish (CMP) Wastewater Treatment Plant	77,428	100
Miscellaneous Containerized Waste	Industrial Wastewater Treatment Plant (IWTP)	2,719	100
	TOTAL =	**469,297**	

DECONTAMINATION FACILITY OPERATIONS

The IBM Vermont facility operates a decontamination facility on site. This facility handles the sorting of contaminated as well as non-contaminated trash. The facility processes corrosive and solvent contaminated trash, scrap metal, plastic, and other materials. Contaminated items are cleaned and decontaminated, where applicable, and sorted into the appropriate waste streams.

The decontamination facility also segregates metals, high density plastics, computer boards and modules, wood, silicon parts, and other recyclables into the appropriate recycle streams. In addition, the facility has two bottle wash stations for cleaning empty chemical containers and a cleaning process for chemical Nowpak ™ containers.

Decontaminated items leave the facility as recyclable glass, plastic, or metal, or general trash instead of chemical or hazardous waste. In 2012, over 294,300 pounds of waste was decontaminated at this facility.

Table 2 below outlines the types and estimated quantities of waste decontaminated in 2012:

Table 2

Waste Stream Name	*Total Decontaminated (estimated pounds)*
Glass and Plastic Chemical & Nowpak ™ Bottles for Recycle	54,200
Other Plastics for Recycle	9,000
Corrosive Contaminated Trash	41,250
Other Non-Recyclable Trash	1000
Metal Reclaim	184,800
High Density Plastics	4,050
TOTAL =	**294,300**

DUV AND MID-ULTRAVIOLET (MUV) WASTE STREAMS FOR RECLAMATION

The main constituent in both the DUV and MUV waste streams is Propylene Glycol Monomethyl Ether Acetate (PGMEA). In 2012, the amount of DUV and MUV waste shipped off site was sent for reclaim was 565,860 pounds. The reclaimed PGMEA is used by other companies that can utilize the material at the purity level achieved by reclamation.

N- METHYL-2-PYRROLIDONE (NMP) WASTE RECLAMATION

In 2012, IBM worked to consolidated drummed and bulk NMP waste. This consolidated waste stream is sent off site for reclamation. The total amount of NMP waste sent for reclamation in 2012 was 138,260 pounds.

GLASS MASK RECLAIM

Masks are manufactured in the IBM Vermont mask house and consist of quartz plates covered on one side with a chromium oxynitride film. Phase shift masks also have a molybdenum silicide layer. Most used or defective masks have a market value and are shipped to a vendor where they are stripped to bare quartz. Once stripped of their images the glass is purchased by

8

the reclaim vendor for reuse. In 2012, 29,126 pounds of glass masks were sent for reclaim instead of being sent off-site for disposal.

NOVAPURE RESIN REPLACEMENT

In 2011, IBM conducted a technical feasibility analysis to determine whether resin based scrubber canisters can be replaced with a new IBM designed water based air abatement technology on certain semiconductor manufacturing tools. Full qualification was completed on the new air abatement technology and as of September 2011, the resin based canisters have been eliminated in this tool group. This has resulted in a 8,945 pounds reduction of this waste stream in 2012 compared to 2011. This process change has resulted in significant cost savings as well.

GENERAL SOLVENT #4 WASTE MANAGEMENT IMPROVEMENTS

During the summer of 2011, as part of a pollution prevention study, the inputs into IBM Vermont's bulk General Solvent #4 (GS4) waste stream were reviewed for opportunities in improved waste management. Two waste streams were identified as possible opportunities: hydrocarbon oil waste and photoresist waste.

Hydrocarbon oil waste was found to be an input to GS4 that could be kept segregated as its own waste stream. By segregating the oil waste stream, IBM is able to investigate opportunities to fuel blend the oil or utilize a waste-to-energy disposal option instead of sending it for incineration as part of GS4.

Expired photoresist waste, consisting primarily of PGMEA, was also found to be an input to GS4 that could be segregated into its own waste stream. By segregating the photoresist waste into a separate waste stream, IBM is able to investigate opportunities to reclaim the PGMEA from this waste instead of sending it for incineration as part of GS4.

INDUSTRIAL WASTEWATER TREATMENT PLANT OPTIMIZATION

In 2012, the Industrial Wastewater Treatment Plant (IWTP) continued the shutdown of one process clarifier and shut down a second clarifier for approximately 10% of the year to save on the amount of sulfuric acid, lime, and polymer used in the overall treatment process. The shutdown of this clarifier also reduced the amount of IWTP sludge required for disposal. This is also a significant energy reduction. The overall treatment efficiency of the IWTP was maintained without the use of this clarifier.

The IWTP waste treatment plant also continued focus on chemical use reductions in 2012. Chemical usage was reduced through the following process optimizations:

- Shutdown of one treatment clarifier and part time shut down of a second clarifier;
- Running a slightly higher pH in the equalization basin;
- Running a slightly higher outfall pH;
- Developing a system that completely emptied polymer totes;
- Running defoamer only when needed (as opposed to running it all of the time);
- Sodium bisulfite usage reduction based on analytical outfall data; and
- Lime use reduction work to reduce the amount of lime used in the gravity thickeners.

Nitrate reduction efforts have been going strong and the treatment efficiencies are becoming much more stable at or below the target discharge level of 3.0 mg/l due to the continued diligence and support of the denitrification steps in the biological treatment sequential batch reactors (SBR's).

INDUSTRIAL WASTEWATER TREATMENT PLANT (IWTP) SLUDGE

Although the IWTP sludge falls under the F006 RCRA definition, it meets none of the original listing criteria for F006. Since the sludge is a functionally non-hazardous waste stream, IBM Vermont worked with EPA Region 1 to pursue a federal delisting of this waste.

In 2011, the site worked with EPA Region 1 to finalize a Quality Assurance Project Plan (QAPP). The QAPP outlined all required sampling and analysis for the delisting process. The QAPP was approved and signed by EPA Region 1 in January 2011. Samples were taken and analyzed according to the QAPP and results were submitted to EPA Region 1 in August 2011. EPA Region 1 ran the EPA's delisting model on the data and determined the results to be favorable for proceeding with the delisting.

In September 2012, EPA published the delisting in the Federal Register. Final confirmatory sampling and subsequent EPA approval is expected by the end of March 2013. IBM is pursuing the use of the delisted sludge as alternative daily cover at a Subtitle D landfill, which is considered a beneficial use for waste material.

WASTE MINIMIZATION PLANS FOR 2013

Actively work through the year in evaluating and implementing economically and technically feasible waste reduction and toxic reduction opportunities on focus chemicals identified in the pollution prevention and waste minimization plans.

HEAT TRANSFER FLUIDS

A variety of heat transfer fluids (HTFs) are used at IBM Vermont for cooling processes related to facilities and manufacturing operations. The current practice is to mix these HTFs together for disposal due to the small quantities generated of each type. In 2013, IBM will continue to evaluate possibilities to segregate the HTFs and send to other companies for further use and reclaim. Segregating these HTFs will also have tracking and reporting benefits under the new Green House Gas regulations.

SOLVENT AND RESIST DISPENSE VOLUME REDUCTIONS IN PHOTOLITHOGRAPHY OPERATIONS

Bulk Gamma-Butyrolactone/N-Butyl Acetate (GBL/NBA) Solvent:

Plan to convert nine or more TEL tracks to bulk GBL/NBA solvent instead of the use of individual ten liter Nowpaks™. This project will optimize the use of the GBL/NBA solvent by switching to bulk delivery and help reduce the waste generated from disposing of empty Nowpaks™.

Optimizing Photochemical Usage:

Photochemical waste returned as partial or full Nowpaks™ will be tracked and evaluated to determine why the chemical was not fully utilized. Chemical usage trends will also be tracked by toolset to identify any areas for improvement. This is an ongoing activity from 2010.

In addition, reduce photochemical waste through source reductions and shelf life extensions. Photochemical waste will be avoided by reducing the number of photo tools on which the variety of photoresists are deployed, thereby reducing the number of wasted partial or full Photoresist NowpaksTM . In addition, the site engineers will be working with the chemical suppliers to extend the shelf life of the photoresists, where it is determined that the chemical quality remains suitable. This will allow these photoresists to be utilized rather than be disposed of as Hazardous Waste.

Investigate Bonder/Debonder Process for Chemical Use Optimization:

Investigate chemical use optimization on the bonder/debonder process including PGMEA recirculation and adhesive use reduction for:

- Recycle PGMEA solvent for wafer debonding adhesive removal, and
- TZNR-A0006 PM adhesive shot size reduction.

PGMEA use reduction in photolithography processes:

Investigate PGMEA use reduction options in various photolithography processes:

- Via solvent wash elimination - extra PGMEA solvent wash for via levels using a different photoresist (UVIIHS-0.8 DUV photoresist);
- Reduced PGMEA photoresist strip for G polyimide - eliminate redundant solvent usage;
- Reduce PGMEA solvent wafer rework volume by 10%.

DUV Waste Investigation:

Increase monitoring of DUV waste treated onsite by installing a flow meter. Continue to investigate the potential source of DUV waste increase observed in 2012.

ETHYLENE GLYCOL USE IN CHILLERS

A 50/50 ethylene glycol and water mixture is used as a tool maintenance chemical on a large number of semiconductor manufacturing tools in the facility. For the long term, continue to evaluate switching to an alternate chemistry and solid state chillers that would completely eliminate the use of ethylene glycol in this application.

INDUSTRIAL WASTEWATER TREATMENT PLANT OPTIMIZATION

In 2013, the IWTP plans to focus on the following projects:

- Lime use reduction in the thickeners which will reduce the sludge volume generated; and
- Lowering the pH of the treatment clarifiers, which will also use less lime and reduce the sludge volume generated, as well as use less sulfuric acid to get the pH back to neutral before discharging the water to the river.
- Working with smart data. This includes expanded use of the SPC Lab application as well as the using the PI View data recording application in new and enhanced ways. The treatment plant also plans to develop dashboards for the IW, Bioplant, and CMP treatment steps. This focus on data should not only help with treatment efficiencies, but help trend chemical usage. With this better tracking the IW plant will be able to see trending and look at chemical usage and reductions in a smarter fashion.

INDUSTRIAL WASTEWATER TREATMENT PLANT (IWTP) SLUDGE

The target completion of the federal delisting process is expected by the end of first quarter 2013. IBM is pursuing the use of the delisted sludge as alternative daily cover at a Subtitle D landfill, which is considered a beneficial use for waste material.

ON-SITE TREATMENT OF SOLVENT, MISCELLANEOUS CONTAINERIZED WASTE STREAMS

Biotreatment of DUV waste and ethylene/propylene glycol will continue in 2013, including continued efforts to determine the maximum practical loading for these waste streams in the BWTP.

12

Miscellaneous containerized waste treatment through portions of the Industrial Wastewater Treatment Plant (IWTP) will also continue in 2013 as allowed.

DECONTAMINATION FACILITY OPERATIONS

The decontamination facility will continue to process corrosive and solvent contaminated trash, scrap metal, chemical bottles, high density plastic, and other materials in 2013. In 2013, IBM plans to continue to improve the efficiency of the decontamination processes and evaluate additional waste streams for addition to the decontamination processes.

13

UPS CampusShip: View/Print Label

1. **Ensure there are no other shipping or tracking labels attached to your package.** Select the Print button on the print dialog box that appears. Note: If your browser does not support this function select Print from the File menu to print the label.

2. **Fold the printed sheet containing the label at the line so that the entire shipping label is visible. Place the label on a single side of the package and cover it completely with clear plastic shipping tape. Do not cover any seams or closures on the package with the label.** Place the label in a UPS Shipping Pouch. If you do not have a pouch, affix the folded label using clear plastic shipping tape over the entire label.

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   Customers with a Daily Pickup
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