# THE AVAILABILITY OF NO- TO LOW-COST FEEDSTOCKS FOR BIODIESEL AND ETHANOL IN PHILADELPHIA

***Final Report***

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# SECTION 1: INTRODUCTION

Interest is growing within the U.S. Department of Energy (DOE) and the U.S. Environmental Protection Agency (EPA) in increasing the production and use of "alternative fuels" for motor vehicles as a way to decrease emissions and reduce dependence on crude oil imported from other countries. Biodiesel and ethanol are clean-burning and renewable motor fuels that have the potential for addressing numerous environmental and economic objectives at the state, regional, and federal levels. These include:

· Decreased air emissions from motor fuel production, storage, and use;

· Increased production of motor fuels on a renewable basis;

· Decreased greenhouse gas emissions from mobile sources;

· Decreased imports of crude oil and increased energy security; and

· Increased local employment and income, and stimulate economic development.

## WHAT IS BIODIESEL?

Biodiesel is a liquid fuel produced from biomass materials that is very similar to petroleum-based diesel. Currently, at least five companies produce biodiesel on a commercial basis in the U.S., and have a production capacity estimated to be just under 60 million gallons/year. The fuel properties of biodiesel are very similar to those of petroleum diesel and biodiesel can be used (without special modifications or adjustments) in most engines designed for petroleum diesel. As a motor fuel, biodiesel has essentially the same energy content as petroleum diesel and, hence, engine performance and mileage are about the same. Biodiesel can be used as the only fuel or it can be blended with petroleum in just about any ratio.

## WHAT IS ETHANOL?

Ethanol is a liquid fuel with characteristics similar to gasoline. Ethanol can also be used for power generation, chemicals, food, beverages, and other products. Ethanol is produced from various types of biomass, including starch-rich materials such as corn and cheese whey, as well as cellulose-rich materials such as wood waste and waste paper. The process for producing ethanol from starch-rich materials, such as corn, is well developed and fully commercialized.

As of late 1997, 35 companies were commercially producing fuel ethanol in the U.S. (primarily from corn), and their production capacity was estimated to be nearly 1.7 billion gallons/year.

The process for producing ethanol from cellulosic materials is less technologically mature than processes that use starch-based materials, and no facilities in the U.S. currently produce ethanol from cellulosic materials on a commercial basis. However, many anticipate the emergence of a strong fuel ethanol industry based on cellulosic materials rather than starch crops in the future. Similar to biodiesel, ethanol can be used in engines designed for gasoline (although some modification or adjustment is required for fuels with 70% or more ethanol). Ethanol can be used alone as the only fuel in a vehicle, or it can be blended with gasoline. The ethanol fuel industry has adopted a standard fuel referred to as "E85" which is a mixture of 85% denatured ethanol and 15% gasoline. Both Ford Motor Company and the Chrysler Corporation offer E85 Flexible Fuel Vehicles (FFVs) for sale throughout the U.S. FFVs are capable of using only E85, only gasoline, or any combination of the two.

## THE NEED FOR NO- TO LOW-COST FEEDSTOCKS

Ultimately, the ability of alternative fuels such as biodiesel and ethanol to penetrate diesel and gasoline markets will depend largely on price. Feedstock costs are reported to account for 1/3 to 1/2 of total biodiesel production costs, and about 40% of total ethanol production costs. Hence, feedstock costs have a major impact on the price of both biodiesel and ethanol.

To date, most biodiesel has been produced from virgin soybean oil, with production costs reported to range from $2-$3.00/gallon. Yet, no- to low-cost waste or used oils or fats can also be used including:

· Waste oils, such as used restaurant grease and food processing oils; and

· Tallows and animal fats from slaughterhouse wastes, butcher wastes, and deceased animals.

With technology and process improvements, the cost of producing biodiesel from used or waste oils is projected by some involved in the biodiesel industry to range from $1-$1.50/gallon in the future. However, this has not actually been accomplished on a commercial basis yet.

Although ethanol is not yet produced from cellulosic biomass on a commercial basis in the U.S., DOE and a variety of private laboratories and companies seek to commercialize several conversion technologies in the near future. The current production cost for ethanol produced from cellulosic biomass is projected by the National Renewable Energy Laboratory (NREL) to

be $1.17/gallon. The production cost for a theoretical 300 million gallons/year ethanol plant using advanced technologies is projected by NREL to decrease the cost to $0.50/gallon in the future.

Companies interested in producing ethanol from cellulosic biomass in the near-term on a commercial basis do not expect to be able to produce ethanol that is cost-competitive unless they use feedstocks available at no- to low-cost. Arkenol, Inc., for example, is a leading developer of cellulosic ethanol plants in the U.S. that is considering constructing a cellulosic ethanol plant in the Philadelphia area. The company developed and patented proprietary improvements to a existing ethanol conversion technology which uses an acid hydrolysis process. According to Mark Carver, Vice President of Business Development at Arkenol, the company believes no- to low-cost cellulosic feedstocks will be required for Arkenol to produce ethanol at a price that is competitive in existing fuel and chemical markets.

## THE PURPOSE OF THIS REPORT

The purpose of this report is to identify and estimate the types of biomass in the Philadelphia area that could be used to produce biodiesel and cellulosic ethanol. Priority was placed on estimating the availability of biomass feedstocks that would be available at no- to low-cost. This is because it is generally expected that the cost of both biodiesel and ethanol will need to be lower than is currently being achieved by producers in order to be competitive in near-term fuel and chemical markets. Decreasing feedstock costs is one strategy for reducing total costs.

### The Biodiesel Feedstocks Assessed

For biodiesel, the feedstocks investigated in this study included used or waste animal and vegetable oils, fats, and greases collected and delivered to rendering facilities in the Philadelphia area. Although other materials can also be used to produce biodiesel (such as virgin soy oil and other vegetable oils), waste oils and greases were assessed because they are believed to be potentially available at substantially lower cost than virgin vegetable oils. Information on the quantities and prices of oils and greases potentially available was derived from information provided by renderers in the Philadelphia area. The renderers collect waste oils and greases from multiple sources and process the materials into various rendered products.

### The Ethanol Feedstocks Assessed

For ethanol, the feedstocks assessed included primarily clean, untreated wood waste and waste paper expected to be available to ethanol producers at no- to low-cost (defined for this study as $0 to $5/ton, including delivery). Information on the quantities of these feedstocks was obtained from a statewide database maintained by the Pennsylvania Department of

Environmental Protection (DEP). Other biomass materials exist in Pennsylvania (and nearby states), such as relatively low quality wood in the forest that is not otherwise being harvested for higher value timber, veneer, and pulp markets. However, such wood is not expected to be available at no- to low-cost to potential ethanol producers in the Philadelphia area. Various types of treated wood could also be available (from construction and demolition debris, for example). However, such wood is not expected to meet the feedstock specifications of ethanol producers, especially if the price to be paid is relatively low (which limits the amount of sorting, processing, and feedstock preparation a potential supplier can afford to do).

It is important to note that because the assessment focussed only on biomass feedstocks that could be used for biodiesel or ethanol as well as feedstocks expected to be available at no- to low-cost, estimates in this report represent only a portion of all biomass materials potentially available for other uses (such as co-firing) or at prices higher than those targeted by biodiesel and ethanol producers.

## GEOGRAPHIC AREA STUDIED

The geographic area included in this study consists of the area from which it is expected that biomass feedstocks could be procured at no- to low-cost. For waste oils and greases, the study area included the geographic area within about a 30- to 50-mile radius of Philadelphia. For wood waste and waste paper, the study area consisted of five counties located (or mostly located) within a 50-mile radius of Philadelphia including Bucks, Chester, Delaware, Montgomery, and Philadelphia County.

Additional feedstocks may be available from outside the study area at no- to low-cost, but they are not expected to be available in significant quantities. For potential biodiesel feedstocks, large, higher-paying markets already exist for rendered products produced from waste oils and greases. For potential cellulosic feedstocks, end use markets exist for a relatively large portion of "waste" or "residual" materials. In addition, disposal fees are relatively stable and there appears to be sufficient disposal capacity. Transportation costs (typically about $.10 to $.14 per ton for each mile the material is transported) limit how far potential feedstocks can be transported cost-effectively.

## THE NORTHEAST REGIONAL BIOMASS PROGRAM

This report is published by the Northeast Regional Biomass Program (NRBP) as part of its ongoing efforts to facilitate development of cost-effective and environmentally-acceptable biomass energy and liquid biofuels facilities in the Northeast region. The NRBP is one of five regional biomass programs funded throughout the nation by the U.S. Department of Energy. The NRBP is administered by the CONEG Policy Research Center, Inc. in Washington, D.C. Eleven states participate in the NRBP including Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, and Vermont.

The goal of the NRBP is to increase acceptance and application of biomass energy and liquid biofuels technologies by the private sector and state and local governments. To achieve this goal, the program seeks to identify barriers to increased use of biomass energy and liquid biofuels and to help alleviate those barriers by providing information and technical assistance to private and public decisionmakers. Objectives of the program are to:

· Establish the availability of biomass resources in the Northeast.

· Identify and alleviate barriers to biomass energy and liquid biofuels development.

· Encourage private investment in: commercial or nearly commercial biomass fuels harvesting, preparation, and conversion technologies; facilities that use biomass to produce energy and/or liquid biofuels; and market development activities that stimulate demand for biomass energy and liquid biofuels.

· Contribute to solid waste management solutions and biomass energy and liquid biofuels utilization goals.

· Contribute to the understanding of environmental impacts of biomass utilization for energy and liquid biofuels, assist in mitigating negative impacts, and provide education about the positive impacts.

· Improve the capabilities of state agencies with biomass-related responsibilities.

· Help member states coordinate efforts among the wide range of agencies involved in various aspects of resource management, energy production, energy utilization, and environmental and public health.

## PREVIOUS LIQUID BIOFUELS ANALYSES LEADING UP TO THIS STUDY

This study builds directly on previous work commissioned by the NRBP concerning the potential for producing liquid biofuels for transportation in the Northeast.

In 1994, the NRBP published **The Potential for Producing Ethanol from Biomass in the Northeast** completed by C.T. Donovan Associates, Inc. (CTD) and Dr. Lee Lynd. Conversion processes being developed for producing ethanol from biomass are described in the report, as are the physical and chemical characteristics of various types of biomass materials that affect their use for ethanol. Estimates of potential biomass feedstocks are provided at the state level for each of the 11 Northeast states. The study provides the first overview of the types and amounts of biomass materials potentially available for ethanol in the region overall.

In 1996, the NRBP published **Siting an Ethanol Plant in the Northeast** (also completed by CTD and Dr. Lynd). This report contains a variety of technical, regulatory, and market development information which can assist in the development and siting of biomass ethanol plants in the Northeast. Information is provided on market opportunities for fuel ethanol in the Northeast (in both public and private vehicle fleets), important site characteristics to consider when planning a facility, likely emissions from biomass ethanol facilities and the environmental regulations that would apply to a facility, and existing incentives for project developers and owners.

A logical next step that would build on the results of both studies would be to analyze more closely the potential for producing liquid biofuels in one or more specific locations in the Northeast. In 1997, the NRBP commissioned CTD to conduct a biomass feedstock resource assessment in the greater Philadelphia area. A biodiesel consortium had been formed in the local area that was interested in better understanding the potential for producing and using the fuel in public and private vehicles. In addition, at least one company was interested in developing a biomass ethanol plant in or near Philadelphia. Results of the assessment would be of use to a variety of public and private sector officials interested in biodiesel and biomass ethanol in the greater Philadelphia area.

## THE INTENDED USE OF THIS REPORT

Results of this study are of use to potential developers of biodiesel and cellulosic ethanol plants, alternative fuels specialists, and federal, regional, and state biomass energy planners in the Northeast region. Ultimately, if sufficient feedstocks are available at competitive prices, it is a goal of the NRBP (and others) to facilitate the development of a biodiesel and/or cellulosic ethanol plant in the Philadelphia area.

## UNITS USED IN THIS REPORT

In this report, all tons of wood waste are reported in green (or wet) tons, although the text is simplified to simply "tons." Tons represent U.S. short tons, or 2,000 pounds. A green (or wet) ton is the weight of a biomass material including the moisture content. By contrast, the term "bone dry ton" refers to the weight of a biomass material when it contains no moisture. Moisture content is the weight of moisture in a biomass material. Moisture content is commonly expressed as a percentage, obtained by dividing the weight of the moisture by the combined weight of biomass and moisture.

## SECTION 2:

## THE AVAILABILITY OF WASTE OILS AND GREASES FOR BIODIESEL IN PHILADELPHIA

Biodiesel is a clean-burning, renewable fuel made from animal or vegetable fats and oils, and alcohol. The fuel properties of biodiesel are very similar to those of petroleum diesel and biodiesel has the potential for replacing petroleum diesel in many applications. Biodiesel can be readily integrated into the existing petroleum diesel supply, transportation, and distribution infrastructure, and can be used by most diesel engines without modification or adjustment. In addition, biodiesel offers a variety of environmental, economic, and other societal benefits compared to petroleum diesel, summarized below.

· Biodiesel contains oxygen while petroleum diesel, consisting of only hydrocarbons, does not. The oxygen content of biodiesel promotes better fuel combustion and reduced carbon monoxide emissions. In addition, tailpipe emissions of particulates, hydrocarbons, and sulfur oxides are significantly lower for biodiesel than petroleum diesel.

· Biodiesel has a higher cetane rating than petroleum diesel, which reduces engine knock.

· Biodiesel has greater lubricity than petroleum diesel, which reduces engine wear.

· Biodiesel is significantly less toxic than petroleum diesel.

· Biodiesel is more biodegradable than petroleum diesel, which can decrease negative environmental impacts in the event of a spill.

· Since biodiesel is produced primarily from animal or vegetable oils, it can be produced on a long-term, renewable basis.

· The use of biodiesel as a replacement for petroleum diesel can decrease energy imports and enhance energy security in the U.S.

**TABLE 2-1:**

**BIODIESEL PRODUCERS IN THE U.S. (a)**

| FACILITY | LOCATION | CAPACITY (Gallons/yr) | FEEDSTOCKS |
|---|---|---|---|
| **Ag Environmental Products** | Sergeant Bluff Iowa | 6,850,000 | Virgin soy oil |
| **Columbus** | Chicago Illinois | 200,000 | Virgin soy oil, waste oil, tallow, sludge |
| **NOPEC Corporation** | Lakeland Florida | 22,000,000 | 50% virgin soy oil, 50% waste oil |
| **Pacific Biodiesel, Inc.** | Maui Hawaii | 150,000 | Waste oil |
| **Twin Rivers Technology, L.P.** | Quincy Massachusetts | 30,000,000 | May not be producing biodiesel, but purchasing it from others. |

(a) Based on information published in **Biofuels Update**, Volume Five, Issue One (Winter 1997), provided by NOPEC Corporation, and provided by staff of the National Renewable Energy Laboratory.

The use of bio-oils as motor fuel is not new or experimental. The first diesel engines were designed to run on peanut oil and biodiesel was produced as early as the 1930s in South Africa, where it was used in heavy duty vehicles. Key benefits of biodiesel (compared to other alternatives to petroleum-based fuels such as ethanol, liquified natural gas, or compressed natural gas) is that it can be used either alone as the sole diesel fuel, or it can be blended with petroleum diesel in any amount. In addition to its potential as fuel, biodiesel may be used as a lubricity additive or as an oxygenate in petroleum diesel.

Diesel engine modifications or adjustments are typically not required for biodiesel or biodiesel blends. However, the solvent nature of biodiesel can degrade materials used for some hoses, fuel lines, and gaskets in engines and equipment used for transporting, storing, and dispensing the fuel. Hence, certain parts used in such equipment may need to be replaced, before using biodiesel. In addition, biodiesel can biologically degrade or oxidize during storage. Hence, some changes in storage and use practices may be required (compared to those used when storing and using petroleum diesel).

## CURRENT BIODIESEL PRODUCTION IN THE U.S.

As shown in Table 2-1, five facilities in the U.S. currently have the capability to produce biodiesel. Their total production capacity is estimated to be just under 60 million gallons/year and not all of the facilities are believed to be operating at full capacity. For example, Twin Rivers Technology, L.P. in Quincy, Massachusetts has the capacity to produce up to 30 million gallons/year but information obtained for this study indicates the plant is not actually producing biodiesel at this time. On the other hand, interest in producing biodiesel is growing nationwide, and several companies are known to be planning new biodiesel production facilities, such as Columbus Foods in Chicago, Illinois.

Biodiesel is not yet widely available at multiple refueling stations throughout the nation and biodiesel producers are in the early stages of identifying specific markets for their product and serving those markets. Because biodiesel costs substantially more than petroleum diesel to produce at this time, producers are focussing on specialty and niche markets. For example, NOPEC (a biodiesel producer in Florida) has the capacity to produce 22 million gallons/year of biodiesel and currently supplies fuel to marine markets and the U.S. Postal Service in their area. In addition, further RD&D efforts are underway that are aimed at producing biodiesel with lower cost feedstocks, improving conversion processes, and thereby reducing production costs.

The U.S. Department of Energy was recently petitioned by the National Biodiesel Board to add "B-20" (a blend of 20% biodiesel and 80% petroleum diesel) to the definition of alternative fuels under the Alternative Fuel Transportation Program. This is expected to increase market demand for the blend, stimulate biodiesel production biodiesel, and ultimately decrease production costs.

## HOW BIODIESEL IS PRODUCED

Biodiesel is produced using a process referred to as "transesterification." The process consists of three key steps: transesterification, ester and glycerin separation, and ester purification. In addition, a pretreatment step may be needed depending on feedstock characteristics. Overall, the process employs a relatively simple chemical reaction. However, in order to make a high quality biodiesel product (needed for fuel markets) and to achieve high production rates and yields, a fairly complex production facility is required.

When producing biodiesel, transesterification refers to a process that involves combining an animal or vegetable oil and an alcohol in order to produce an alcohol ester (i.e. biodiesel). Animal or vegetable oils are essentially triglycerides, meaning they are comprised of three fatty acid molecules connected by a glycerin molecule which acts as a "backbone" to the oil molecule. During transesterification, the glycerin molecule is replaced by three alcohol molecules which form three alcohol esters and release one glycerin molecule. The type of ester created depends on the type of alcohol used. If ethanol is used, the ester is a ethyl ester; if methanol is used, it is a methyl ester.

The transesterification process is achieved by mixing the oil, alcohol, and catalyst. Heating may be required, depending on the oil. An excess amount (above stoichiometric) of alcohol is used primarily to ensure high ester yields. The process is greatly enhanced by the use of a catalyst, such as potassium hydroxide, sodium hydroxide, sodium methoxide, or sodium ethoxide. Once the reaction is complete, the glycerin and alcohol ester form two insoluble phases, allowing separation by gravity. The catalyst and excess alcohol are recovered from both the glycerin and the ester. The ester is further purified into biodiesel by water washing, distillation, and/or extraction to remove remaining glycerin, water, or other impurities. The excess alcohol and catalyst are reused again.

As noted above, glycerin is separated from the ester following transesterification. The catalyst and excess alcohol are recovered from the glycerin, as well as a layer of fat that forms. The glycerin is sold as "crude" glycerin, which has a high market price.

Overall, assuming the feedstock characteristics, transesterification temperature, reaction time, amount of excess alcohol, and amount of catalyst used are optimum, nearly all of the triglycerides in animal and vegetable oils are converted to alcohol esters. Conversion yields of greater than 99% are commonly reported in industry literature and it appears that for every pound of virgin vegetable oil used as feedstock, about one pound of biodiesel can be produced. For example, Proctor & Gamble found when producing biodiesel at its oleochemical plant in Kansas City, Kansas that for every 100 pounds of virgin soy oil used as feedstock, 11 pounds of methanol were used to produce slightly less than 100 pounds of biodiesel. In addition, the process produced about 11 pounds of crude glycerine. If ethanol were used instead of

methanol, the biodiesel yield and glycerin would likely remain about the same, however the amount of ethanol required would increase.

## FEEDSTOCKS THAT CAN BE USED TO PRODUCE BIODIESEL

There is no industry-wide standard or specification for feedstocks used for biodiesel production. The standard or specification required by a production facility depends on the process used for making biodiesel as well as company requirements for product yield and purity. Hence, feedstock specifications vary among producers. As noted above, biodiesel is produced from triglycerides found in bio-oils. Although all types of virgin, used, and waste bio-oils contain triglycerides, the choice of which to use for biodiesel production will be based on the:

· Physical and chemical characteristics of the bio-oil and how well they meet goals for production, yield, and purity;

· Competition for the bio-oil by other end users and markets; and

· Cost, consistency, and reliability of supply.

Most biodiesel produced today is made from virgin soy oil. Other vegetable oils (such as corn, canola, palm, coconut, cottonseed, sunflower, and rapeseed oil) may also be used. Various animal fats can also be used. The oils or fats may be in either their virgin state (i.e. prior to use in food preparation or other use), or in its used or waste state (after use in food preparation).

Ultimately, the ability of biodiesel to penetrate petroleum diesel markets will depend largely on the price of the biodiesel. And the price of biodiesel will depend largely on prices paid for feedstock, since feedstock costs are reported to account for 1/3 to 1/2 of total biodiesel costs. Costs for biodiesel produced from virgin soy oil (based on production to date) are reported to range from about $2-$3.00/gallon. However, the price of petroleum diesel is currently about $1/gallon and is not projected to increase dramatically in the future. Hence, the ability to compete with petroleum diesel in the long run will likely require decreasing the overall cost of biodiesel.

As RD&D continues on the production of biodiesel, many expect that production costs will decrease as improvements are made in transesterification and purification processes, and as producers find and use lower cost feedstocks. Although most biodiesel production and cost analyses to date have focussed on the use of virgin soy oil, interest is growing in the use of waste oils and greases in order to reduce production costs and be more competitive in petroleum diesel markets. Future costs for biodiesel produced from waste oils and greases are projected to range from $1-$1.50/gallon. This lower cost incorporates both lower feedstock

costs and anticipated process and purification improvements, and is a projection that has not actually been achieved on a commercial basis yet.

Assuming feedstock costs do account for 1/2 of total biodiesel costs and the goal is to produce biodiesel that sells for up to $1.50/gallon, this indicates that biodiesel producers can pay up to, but not more than, about 9¢/pound for material used for feedstock. This is a very rough estimate of the upper limit that biodiesel producers could pay, based on relatively general information currently available in published literature. This price is used as the upper threshold in this study when evaluating the availability of potential feedstocks for biodiesel production in greater Philadelphia. However, it is important to note this price could vary in the future and the price producers can pay for feedstock is likely to vary among companies.

## FEEDSTOCK CHARACTERISTICS THAT AFFECT BIODIESEL RODUCTION

Key physical and chemical characteristics that affect the ability of virgin or waste oils and greases to be used for biodiesel include the titre, free fatty acid (FFA) content, moisture content and other impurities, and calorific content. The rendering industry processes waste oils, greases, animal fats, and animal carcasses into rendered products, such as edible and inedible lards, tallows, greases, and animal feed grade fats. The rendered products are then sold to a variety of markets that use them to produce food, soap, animal feed and other items. Standard definitions and specifications for oils and greases have been developed by trade associations, such as the American Fats and Oils Association and the National Renderers Association. The biodiesel industry refers to and uses some specifications developed for the rendering industry when describing and assessing potential biodiesel feedstocks.

### Titre

Titre is the temperature at which an oil changes from a solid to a liquid. Titre is a standard specification used by the rendering industry and defined by the National Renderers Association. Titre is important since the transesterification process is basically a liquid process, and oils with high titre (i.e. a high temperature is required to change the oil to a liquid) may require heating, which increase the energy requirements and production costs for a biodiesel plant.

### Free Fatty Acid Content

Free fatty acid (FFA) content is the amount of fatty acids (in weight percent) in an oil that is not connected to triglyceride molecules. The FFA content is a standard specification used by the rendering industry and defined by the National Renderers Association. During transesterifica- tion, free fatty acids react with alkalis and hydroxides to form soaps and water, both of which must be removed during ester purification in order to produce biodiesel. Hence,

the use of oils with a high free fatty acid can decrease biodiesel yield and thereby increase production costs. Oils with relatively high free fatty acid contents include used or waste oils and greases that were heated during food processing and preparation. Heating oils can cause hydrolysis and oxidation, which result in fatty acids to disconnect from triglyceride molecules and result in the fatty acids becoming "free." Ambient summer temperatures can increase the FFA content of oils.

**Moisture, Impurities, and Unsaponifiables**

The moisture content, presence of impurities, and presence of other non-triglycerides in an oil shoule be considered when evaluating potential feedstocks for biodiesel. Referred to as MIU (moisture content, impurities, and unsaponifiables), MIU is defined as the amount of water, filterable solids (such as bone fragments, food particles, or other solids), and other non-triglycerides in an oil (measured in weight percent). The MIU content is a standard specification used by the rendering industry and defined by the National Renderers Association. MIUs must be removed prior to biodiesel production or during ester purification.

**Calorific Content**

The calorific content of an oil refers to the energy content of the material and is measured in Btus or calories/unit weight. The energy content of potential feedstocks affects the energy content of the resulting biodiesel. Feedstocks with a higher energy content are preferred, however there is no biodiesel specification regarding energy content.

## BIODIESEL FEEDSTOCKS INCLUDED IN THIS STUDY

Several criteria were used when determining which biodiesel feedstocks to assess for this study. The feedstock(s) needed to:

· Have, in general, the appropriate physical and chemical characteristics for biodiesel production.

· Be produced (or be readily available) in substantial quantities in greater Philadelphia.

· Likely be available at a price up to but not more than about 9¢/pound.

Presented in Table 2-2 is a summary of the key characteristics of various bio-oils that can be

**TABLE 2-2:**

**OVERVIEW OF KEY BIODIESEL FEEDSTOCK CHARACTERISTICS**

| BIODIESEL FEEDSTOCK | PRESENCE OF CONTAMINANTS | COMPETITION FOR THE FEEDSTOCK | PREFERENCE FOR FEEDSTOCK BY BIODIESEL PRODUCERS | FU AV |
|---|---|---|---|---|
| **Virgin Vegetable Oils** (a) | None | High, due to use in food and food production | High | De inc for pro |
| **Used or Waste Oils and Greases** (b) | May contain fatty acids, moisture, and other impurities that affect yield and cost of producing biodiesel | Depends on location and extent of rendering industry | Increasing as interest grows in finding lower cost feedstocks, which waste oils and greases are typically assumed to be by those in biodiesel industry | Wi pro wa: and wa: gre |

(a) For example, oil from crops such as soybeans and corn grown in Pennsylvania and other states.

(b) For example, used or waste oils, greases, and fats generated in the Philadelphia area and collected and processed by rendering companies.

(c) Anecdotal information provided by one source reported the price paid by renderers to generators of used oil to be as low as 6¢/pound.

used for biodiesel. Preliminary research for this study indicated right away that virgin vegetable oils currently sell for prices much higher than what biodiesel producers are likely to be able to pay in the near-term to produce biodiesel on a commercial and competitive basis. Thus, the decision was made to focus on assessing the availability and price of waste oils and greases, since they were generally thought among those interested in the biodiesel industry to be available at lower prices.

Specifically, this study assessed the availability and price of used or waste animal and vegetable oils, fats, and greases collected and delivered to rendering plants in Philadelphia. The decision was made to focus on the activities of rendering plants that accept various used or waste vegetable and animal fats, oils, and greases since renderers would likely be who potential biodiesel producers would need to compete with in order to obtain waste oils and greases for feedstock.

## OVERVIEW OF THE WASTE OIL AND GREASE INFRASTRUCTURE

Waste oils and greases generated in the Philadelphia area are collected, processed, and marketed (to end users) by a large and well-established infrastructure of haulers and rendering plants. The haulers are either associated with a rendering plant or operate independently. They pick up used or waste oils and greases from restaurants, meat packing plants, livestock yards, grocery stores, butchers, and other companies or facilities. The used material is then delivered to rendering plants, where the oils and grease are processed into rendered oils and greases, such as edible and inedible tallows (containing animal fats), lards (containing pig fat), and various grades of grease. The rendered oils and greases are then sold in bulk to other companies that use them as ingredients in food, soap, animal feed, and other products. A list of processed oils and greases produced by the rendering industry and specifications they must meet to be sold as rendered products are presented in Table 2-3. As indicated by the table, a variety of rendered products are processed from waste oils and greases. Research for this study indicates that although those in the biodiesel industry describe these materials as wastes, markets exist for many, if not all, of the rendered products.

Based on information provided by the Fats and Proteins Research Foundation as well as research conducted for this study, five key renderers receive and process waste oils and greases in the Philadelphia area, including:

· Darling International, Inc.;

· Hatfield Quality Meats in Hatfield, Pennsylvania;

· Moyer Packing Company in Souderton, Pennsylvania;

**TABLE 2-3:**

**RENDERED PRODUCTS AND SPECIFICATIONS (a)**

| RENDERED PRODUCT | TITRE (b) (Minimum in °F) | FFA (c) (Maximum Weight in %) | MIU (d) (Maximum Weight in %) |
|---|---|---|---|
| **Edible Tallow** | 105.8 | 0.75 | (e) |
| **Lard (Edible)** | 100.4 | 0.50 | (e) |
| **Top White Tallow** | 105.8 | 2 | 1 |
| **All Beef Packer Tallow** | 107.6 | 2 | 1 |
| **Extra Fancy Tallow** | 105.8 | 3 | 1 |
| **Fancy Tallow** | 104.9 | 4 | 1 |
| **Bleachable Fancy Tallow** | 104.9 | 4 | 1 |
| **Prime Tallow** | 104.9 | 6 | 1 |
| **Special Tallow** | 104.0 | 10 | 1 |
| **No. 2 Tallow** | 104.0 | 35 | 2 |
| **A Tallow** | 102.2 | 15 | 2 |
| **Choice White Grease** | 96.8 | 4 | 1 |
| **Yellow Grease** | None | 15 | 2 |

(a) American Fats and Oils Association specifications for tallows and greases, as presented in Pocket Information Manual, A Buyer's Guide to Rendered Products published by the National Renderers Association.

(b) Titre is the temperature at which an oil, fat, or grease solidifies. The American Fats and Oil Association specification is in °Celsius, which was converted to °Fahrenheit.

(c) Free fatty acid content.

(d) Moisture, impurities, and unsaponifiables content.

(e) The standard is a maximum of 0.20 weight % moisture and a maximum of 0.05 weight % insoluable impurities.

· Taylor Packing Company in Wyalusing, Pennsylvania; and

· Valley Proteins, Inc. based in Winchester, West Virginia (and who operates two rendering plants in the Philadelphia area, one in Terre Hill, Pennsylvania and one in Baltimore, Maryland.)

## THE METHODOLOGY USED TO ASSESS THE AVAILABILITY AND PRICE OF WASTE OILS AND GREASES

The methodology used to estimate the availability of waste oils and greases for biodiesel production in Philadelphia in this study involved surveying the rendering industry in the area to determine the amount of waste oils and greases accepted, the price they pay for the unprocessed material, and the markets they supply with their rendered products. Although initially CTD intended to survey haulers instead, a list of independent haulers was not available from trade associations or other agencies. In addition, research indicated that some rendering plants do their own hauling so such a survey would be incomplete.

A cover letter and survey was completed and sent to each of the rendering companies serving the Philadelphia area. (A copy of the survey is presented in Appendix A.) Previous telephone interviews with two of the companies revealed that the rendering industry (in general) is highly competitive and that companies are not typically interested in providing information on the quantities of waste oils and greases they receive, the prices paid for the material, or the prices they are paid for rendered products. The cover letter emphasized that any information obtained from individual rendering companies would be treated as confidential, would only be used in aggregate with information from other companies, and would not be used or distributed in any way that linked quantities or prices to any one company. Of the five companies surveyed, four companies either responded by completing and returning the survey, or by providing information during a telephone interview.

## THE AMOUNTS AND PRICES OF OILS AND GREASES IN PHILADELPHIA

Based on the survey results, renderers serving the Philadelphia area accept from 3 to 5 million pounds/week of used or waste oils and greases, or 78,000 to 130,000 tons/year. Assuming a production yield of 40% to 60% by the renderers, at least 50,000 tons/year of rendered oils and greases are produced in the Philadelphia area. Assuming the rendered oils and greases have a density of 56 pounds/cubic foot, the 50,000 tons/year of rendered oils and greases is equivalent to about 13 million gallons/year of biodiesel. However a number of factors affect the ability to produce biodiesel from either the waste oils and greases, or the rendered products made from them. These include: certain characteristics of the oils and greases; prices already paid to the renderers for their products; and prices biodiesel producers can afford to pay for their feedstock.

## Important Characteristics of the Oils and Greases

The free fatty acid content of both waste oils and greases and rendered oils and greases varies greatly, depending on the type of material and the time of year. The FFA content of tallow reported by one renderer who processes only animal or slaughter oils and grease is 3% or less. The FFA content of rendered products processed from restaurant grease or used oil from food processing is reported to be 10% to 20%. The time of year has a significant effect on FFA content. During summer, when ambient temperatures are relatively high, the triglycerides in animal and vegetable oils tend to hydrolyze (i.e. break apart releasing fatty acids) faster than during other times of the year. This results in higher FFA contents during the summer in both waste oils and greases and the rendered products. This appears to be more of an issue with restaurant greases and used oils than with fats from animal slaughter and/or rendering. Staff at one company stated that the FFA of waste oils and greases can be as low as 6-7% during the winter and as high as 40-50% during the summer. The use of waste oils and greases with high FFA will likely increase production costs for biodiesel made from the materials and producers may choose to avoid waste oils and greases with too high a FFA, especially if the material is not available at a relatively low (or possibly negative) cost.

## The Current Price of Oils and Greases

None of the rendering companies surveyed for this study was willing to provide information on what they pay for waste oils and greases. Anecdotal information suggests that large generators of restaurant grease and used cooking oil are paid about 6¢/pound for the material. Whether this is true in the Philadelphia area could not be confirmed by the survey.

The price paid for rendered oils and greases in the Philadelphia area ranges from 13¢ to 22¢/ pound, with the average being about 17¢/pound. Information obtained from the survey indicate that in general prices paid for rendered oils and greases do not decrease as the FFA content increases. This was not expected, since a high FFA content generally indicates a lower quality rendered product. However, a reason why the price is not reduced by the high FFA content is probably that the largest market for rendered oils and greases from the Philadelphia area are animal feed markets on the Delmarva Peninsula. Located south of Philadelphia, the Delmarva Peninsula is the largest poultry producing area in the eastern U.S. There is a large demand for ingredients used in animal feed in the region, and specifications for animal feed allow the use of rendered oils and greases that have relatively high FFA contents.

## The Future Price of Oils and Greases

The price of either waste oils and greases or rendered oils and greases depends largely on the amount of material available relative to market demand. There is little indication that the generation of waste oils and greases will change significantly in the near future (say, the next five years) in the Philadelphia area and it is reasonable to expect that the price of both waste and rendered oils and greases will track with the rate of inflation. Factors that could decrease future generation of the material include new (and unexpected) regulations which curtail the hauling, storage, or processing of waste oils and greases, or substantial downturns in the restaurant or food processing industries. None of these factors seem likely to change significantly during the next five years in the Philadelphia area.

Similarly, there is little likelihood that existing markets for rendered oils and greases will decrease significantly during the next five years. The poultry industry on the Delmarva Peninsula is strong and is not expected to shrink significantly over the next five years and demand for animal feed (containing rendered oils and greases) is expected to remain strong.

## CONCLUSION:
## THE AVAILABILITY OF WASTE OILS AND GREASES FOR BIODIESEL

Presented in Table 2-4 is an overview of the amounts and prices waste oils and greases potentially available for biodiesel production in the greater Philadelphia area. As shown in the table, overall an estimated 78,000 to 130,000 tons/year of waste oils and greases are generated in the Philadelphia area. The waste oils and greases are handled by rendering companies that process the waste into tallows and greases, referred to as rendered products. The rendered products are then sold to other companies that use the materials as ingredients in food, soap, animal feed, and other products.

The 78,000 to 130,000 tons/year of waste oils and greases generated in the Philadelphia area are enough feedstock to produce nearly 13 million gallons/year of biodiesel. The ability of biodiesel producers to obtain the material will largely depend on how much they can pay for feedstock. There is already a well-established infrastructure in place that collects the material and provides it to the rendering industry. The rendering industry, in turn has strong markets for the material. Several renderers surveyed for this study indicated that biodiesel producers would need to pay a "premium" in order to divert either waste oils and greases or rendered oils and greases from renderers and from current end use markets (such as poultry feed markets on the Delmarva Peninsula). It is not known what generators of waste oils and greases are paid for their material. However, it is known that prices paid for rendered products range from 13¢ to 22¢/pound, and average about 17¢/pound. This indicates the "premium" price biodiesel producers would need to pay for rendered oils and greases is likely to be in the range of 20¢ to 25¢/pound.

**TABLE 2-4:**

**WASTE OILS AND GREASES POTENTIALLY AVAILABLE IN GREATER PHILADELPHIA**

| **WASTE OILS AND GREASES COLLECTED** (Tons/year) | **RENDERED OILS AND GREASES PRODUCED** (Tons/year) | **PRICES PAID FOR RENDERED OILS AND GREASES** (price/pound) |
|---|---|---|
| 78,000-130,000 | > 50,000 (a) | 13-22¢ (17¢ Average) |

(a) The primary market for rendered oils and greases produced in the Philadelphia area is animal feed used on the Delmarva Peninsula by the poultry industry. However, other markets, such as food products and soap manufacturing are also served by renderers in the area.

In addition, price is not the only factor that will limit the availability of waste oils and greases as well as rendered oils and greases to biodiesel producers. Currently, biodiesel producers can only utilize oils with FFA contents of about 5% or less. Results of this study indicate that most waste oils and greases and rendered oils and greases in the Philadelphia area have FFA contents greater than 5%. However, over time this may become less of a barrier to biodiesel production since future improvements in the transesterification and ester purification processes are expected and producers anticipate being able to use bio-oils with higher FFA contents.

## SECTION 3:

## THE AVAILABILITY OF WOOD WASTE AND PAPER WASTE

## FOR ETHANOL IN PHILADELPHIA

Ethanol is an alcohol that can be produced on a renewable basis from a variety of starch-rich biomass materials such as corn, as well as cellulosic biomass materials such as wood, waste paper, and paper sludge. The use of ethanol as a motor fuel is not new or experimental. The Model T, for instance, was originally designed to run on ethanol. During World War II, concern about potential disruption of petroleum supplies renewed interest in ethanol as a motor fuel in both the U.S. and Europe. Ethanol was used as an aviation fuel by the Germans. In the 1980's, ethanol production from corn increased in the U.S. primarily as a response to the oil shortages of the 1970s and as a way to find new markets for products from agricultural land in the Midwest.

Since then, the U.S. Department of Energy, National Renewable Energy Laboratory, other federal and state agencies, and a variety of private companies have also completed a variety of RD&D projects, with the aim of commercializing technologies that convert cellulosic biomass to ethanol. Numerous national and regional benefits could result from further development of the ethanol industry and increased use of ethanol for fuel, summarized below.

· Ethanol can be produced from indigenous renewable resources, thereby reducing dependence on finite petroleum resources, much of which is imported from other countries.

· Ethanol used as a replacement for petroleum-based motor vehicle fuels reduces emissions of carbon monoxide, nitrogen oxides, and volatile organic compounds, thereby improving air quality and reducing ground-level ozone and smog.

· Ethanol produced from biomass can reduce emissions of carbon dioxide, a contributor to global climate change.

· Ethanol produced from biomass can increase local employment and income, and stimulate economic development in urban areas (for facilities that use waste feedstock) and in rural areas (for facilities that use forestry or agricultural materials for feedstock).

Similar to gasoline, ethanol is a liquid motor fuel that can be used in spark-ignited engines. Ethanol can be used alone as the only fuel in a vehicle, or it can be blended with gasoline. If a blend is used containing no more than 10% ethanol, then the fuel can be used in engines designed to use gasoline with no modifications. When using a blend that contains more than 10% ethanol, the engine must be modified or adjusted for the fuel. The ethanol fuel industry has adopted a standard fuel referred to as "E85" which is a mixture of 85% denatured ethanol and 15% gasoline. Both Ford Motor Company and the Chrysler Corporation manufacture and sell vehicle models that have the capability of using ethanol and gasoline as fuel. Referred to as "Ethanol Flexible Fuel Vehicles" (or Ethanol FFVs), these vehicles use either gasoline, ethanol blends containing up to 85% ethanol, or a combination of gasoline and ethanol blends. The vehicles are available at about the same price as similar vehicles designed to only use gasoline.

## CURRENT ETHANOL PRODUCTION IN THE U.S.

Today, an estimated 35 companies in the U.S. have the capacity to produce nearly 1.7 billion gallons of ethanol per year. Most of the ethanol is blended with gasoline and used as motor fuel, although some is used for chemicals, food production, and other products. Most of the plants are located in the Midwest and use corn as the feedstock. Other feedstocks include cheese whey, cheese by-products, and sulfite waste liquor from pulp products. At least one brewery extracts ethanol from waste beer. Although ethanol is currently produced primarily from corn or starch-rich biomass, many anticipate the emergence of an ethanol fuel industry based on conversion of cellulose-rich biomass. This interest is motivated by significant advantages of cellulosic materials, including:

· Lower feedstock costs and lower overall production costs;

· A larger potential resource base;

· More environmentally-benign feedstock production; and

· More favorable process energy balance.

## HOW CELLULOSIC BIOMASS IS CONVERTED TO ETHANOL

Many different types of biomass materials can be used to produce ethanol. The ethanol conversion process utilizes fermentation, which is a biological process that converts simple sugars (primarily glucose) into ethanol. Starch, other carbohydrates, cellulose, and other compounds found in biomass can be "broken down" into simple sugars. When the primary compound in the biomass material being converted into ethanol is cellulose, the resulting ethanol is referred to as "cellulosic ethanol." It is important to note, however, that the resulting ethanol molecule is the same no matter what biomass material it is produced from, whether cellulosic or sugar or starch in nature. The term cellulosic ethanol simply refers to the type of biomass material used to produce the ethanol. Examples of cellulosic biomass include wood or woody crops, herbaceous crops, as well as products or waste materials produced from these materials, such as paper and paper sludge.

## CELLULOSIC FEEDSTOCKS THAT CAN BE USED TO PRODUCE ETHANOL

Examples of cellulosic biomass materials that are generally considered to be potential feedstocks for cellulosic ethanol are described below.

· Forestry wood waste produced as residue during commercial logging, silvicultural, and site conversion activities. These activities typically generate wood waste such as tops, limbs, branches, and cull or rotten trees that have little to no value to primary wood product industries such as sawmills, veneer mills, lumber mills, and pulp and paper mills.

· Mill residue produced by primary and secondary wood products industries including bark, chips, ends, sawdust, shavings, and slabs.

· Urban wood waste generated as, or commingled with commercial, industrial, or municipal solid waste. Examples include used pallets and shipping containers, construction and demolition wood waste, tree trimming debris, and brush.

· Waste paper including both pre- and post-consumer waste, mixed office paper, old newsprint,used corrugated cardboard, and newsprint. The waste paper may be available in a "source separated" form (consisting of only one type of paper), mixed with other types of paper, or commingled with other waste.

· Paper sludge produced during the production and/or recycling of paper.

· Agricultural crop residues generated during the growing or harvesting of agricultural crops, such as corn stover.

· Short rotation woody crops (SRWC), which are fast growing woody species (such as hybrid poplar, silver maple, and willow) that can be grown on plantations or farms for pulp or fuel. SRWC are not commercially grown in the Northeast for energy purposes at this time, but are presently grown in the Pacific Northwest on a limited basis for pulpwood. Some anticipate that substantial amounts of SRWC could be grown for fuel in the future on marginal or underutilized farmland.

· Herbaceous crops, which are fast-growing herbaceous crops (such as switchgrass and reed canary grass) specifically grown on plantations or farms for energy or fuel. Herbaceous crops are not commercially grown in the Northeast for fuel, but some anticipate that substantial amounts of herbaceous crops could be grown for fuel in the future on marginal or underutilized farmland.could potentially supply significant amounts of energy or fuel in the future.

## FEEDSTOCK CHARACTERISTICS THAT AFFECT ETHANOL PRODUCTION

There is no industry-wide standard or specification for feedstocks used for ethanol production. The feedstock characteristics required depend on the specific type of conversion process and technology used by an ethanol producer. Presented in Table 3-1 is an overview of key feedstock characteristics affecting ethanol production, as well as factors affecting feedstock availability and cost. Information in the table was compiled by C.T. Donovan Associates, Inc. and Dr. Lee Rybeck Lynd for a previous study and is based on work completed by the National Renewable Energy Laboratory, other research laboratories, and private companies involved in ethanol production. As with biodiesel, the choice of which feedstock(s) to use for ethanol production will be based on the:

· Physical and chemical characteristics of the feedstock(s) and how well they meet the requirements of the ethanol production plant;

· Competition for the feedstock(s) by other end users and markets; and the

· Cost and reliability of supply.

Typically, companies that produce ethanol on a commercial basis will seek those feedstocks which meet their specifications and are available at the lowest price on a long-term, reliable basis. Feedstock costs are reported to account for as much as 40% of total ethanol production costs, and companies seriously interested in producing cellulosic ethanol on a commercial basis in the near-term are seeking feedstocks at no- to low-cost. For example, Arkenol, Inc., a developer considering building a cellulosic ethanol plant in the Philadelphia area, plans to rely on no- to low-cost cellulosic feedstocks in order to produce ethanol that can be competitively sold as fuel, as a fuel additive or oxygenate, or for other purposes.

Arkenol also would like to obtain feedstocks at negative cost (meaning they would be paid a tipping fee for accepting the material), in order to produce ethanol that is competitively priced for certain markets.

However, C.T. Donovan Associates, Inc. does not anticipate that substantial volumes of feedstocks are likely to be available for ethanol production at negative cost. Our experience conducting biomass assessments and monitoring feedstock supply and cost indicates that market conditions can result in some materials being available at negative cost. However, due to various factors, this usually only lasts for a relatively short period of time. Key factors that result in wastes once available for negative cost to eventually be available only for a fee are summarized below:

· Once a reliable end use and a specific demand exist for a material, the material is usually is no longer perceived as a residue or waste by the company who generates or handles the material. Once they know another company has a specific demand for the material, their avoided disposal cost becomes less of a bargaining "chip" for the end user, especially if the company with the residue has unique capabilities to provide material that meets specifications of the end user.

· In order to be acceptable for use as feedstock, many residuals or waste must be processed in some manner, which becomes an out-of-pocket expense to the generator or supplier of the material. For example, a used pallet may be collected, stockpiled, chipped, screened, and passed under magnets which remove ferris metal before it is acceptable as feedstock. These processes incur for the waste generator or feedstock supplier and typically are reflected in the price charged to end users for the material.

· Feedstocks must be transported to the end user. Transportation is another out-of-pocket expense waste generators or feedstock suppliers incur when providing materials to end users.

**TABLE 3-1:**

**RELEVANT CHARACTERISTICS OF ETHANOL BIOMASS FEEDSTOCKS**

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**FEEDSTOCK CHARACTERISTICS AFFECTING ETHANOL PRODUCTION**

| | |
|---|---|
| **Carbohydrate Content** Determines with reactivity the potential ethanol yield.<br>Cellulose<br>Hemicellulose<br>Starch<br>Sugar | Affects conversion process cost and efficiency. |
| **Presence of Inhibitory Materials** | Affects the rate and therefore the cost of converting feedstocks to ethanol. |
| **Reactivity** | Determines with carbohydrate content the potential ethanol yield. |
| **Variability** | Affects the cost of ethanol production. |
| **Conversion Process Complexity** | Affects ethanol facility capital and operating costs. |
| **Potential Yield** | Refers to the amount of ethanol that may be produced from a feedstock. |
| **Feedstock Components That May Be Used for Co-Products** | Affects the cost of ethanol production. |

Source: The Potential for Producing Ethanol from Biomass in the Northeast, prepared by C.T. Donovan Associates, Inc. and Dr. Lee Lynd for the Northeast Regional Biomass Program, 1994.

**TABLE 3-1 (Continued):**

**RELEVANT CHARACTERISTICS OF ETHANOL BIOMASS FEEDSTOCKS**

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**FACTORS AFFECTING FEEDSTOCK AVAILABILITY AND COST**

| | |
|---|---|
| **Quantities Available** | Determines the degree to which economics of scale can be achieved.<br>Affects the size of an ethanol conversion facility. |
| **Consistent Supply**<br>Seasonality<br>Harvest Frequency<br>Supply Infrastructure | Affects storage facility requirements.<br>Affects conversion process selection. |
| **Availability of Land** for energy crops.<br>**(For Energy Crops)**<br>Yield/Area<br>Nutrient and Mineral Requirements | Impacts the amount and cost of feedstock |
| **Bulk Density** | Affects transportation costs of feedstocks. |
| **Stability During Storage** | Affects the variability of the feedstock.<br>Losses during storage reduce overall yields. |
| **Competing Uses** | Affects the price of feedstocks and overall production costs. |
| **Disposal Cost** for waste materials.<br>Residue Feedstocks<br>Production Residues | Affects the price of feedstocks produced from<br><br>Affects overall production cost. |

## CELLULOSIC FEEDSTOCKS INCLUDED IN THIS STUDY

As explained in Section 1, this study addresses the availability of feedstocks potentially available for ethanol production in greater Philadelphia at no- to low-cost. As also explained in Section 1, no- to low-cost feedstocks are defined for this study as those available to ethanol producers at $0 to $5/ton, including delivery. Presented in Table 3-2 is a summary of the key characteristics of various biomass materials that can be used to produce cellulosic ethanol.

As shown in Table 3-2, mill residues, wooden pallets and shipping containers, and waste paper are acceptable feedstocks for ethanol production and may be available at no- to low-cost. For these reasons, this study focussed on identifying the quantities of these materials potentially available at no- to low-cost for ethanol.

As also shown in Table 3-2, harvested wood (including both silvicultural and site conversion wood waste) is also acceptable for ethanol production, but is typically available at prices ranging from $15 to $23/ton. Since this is substantially higher than the price range being considered for ethanol production in the Philadelphia area in the near-term, it was not included in this study. In addition, both C/D and MSW wood waste are potentially available at no- to low-cost. However, C/D and MSW wood waste may include treated wood and non-wood materials which make the materials unacceptable for ethanol production. For this reason, they were not included in this assessment.

## THE METHODOLOGY USED TO ASSESS THE AVAILABILITY AND PRICE OF WOOD WASTE AND WASTE PAPER

The methodology used in this study to identify the amount of wood waste and waste paper potentially available for ethanol production involved analyzing the amounts of wood waste and waste paper generated in the five county, Greater Philadelphia area and determining the portion of material likely to be available for ethanol production at no- to low-cost.

### The Pennsylvania Residual Waste Database

The cornerstone of the methodology used in this study for determining the availability of wood waste and waste paper for ethanol was a statewide residual waste database maintained by the Pennsylvania Department of Environmental Protection. The database is a tremendous resource which provides information on waste management practices obtained directly from reports filed by thousands of businesses and industries throughout the state. Although CTD has completed biomass feedstock assessments in at least 15 states, Pennsylvania is the first state in which we have found such a database. The database exists in a raw, unanalyzed form and CTD spent substantial time accessing and analyzing the database for this study.

**TABLE 3-2:**
**OVERVIEW OF CELLULOSIC BIOMASS MATERIALS THAT ARE POTENTIAL FEEDSTOCKS FOR ETHANOL**

| CELLULOSIC ETHANOL FEEDSTOCK | PRESENCE OF CONTAMINANTS | COMPETITION FOR THE FEEDSTOCK | PREFERENCE FOR FEEDSTOCK BY ETHANOL PRODUCERS | F A |
|---|---|---|---|---|
| **Harvested Wood Waste** (a) | In general none. Some conversion technologies may require limits on the amount of softwood. | Typically low, but local markets vary significantly. | High. | M s d t S e s |
| **Mill Residues** | Primary mill residue same as harvested wood. Secondary mill residues may contain preservatives, adhesives, or surface coating that affect ethanol production, air or ash emissions, or wastewater discharges. | Typically high for primary mill residues and untreated secondary mill residues. | High. | E r d |
| **Wooden Pallets and Shipping Containers** | Similar to harvested wood, may contain softwoods. Some pallets and shipping containers may contain preservatives, adhesives, surface coatings, and spills of chemicals. | Typically high. Common uses for pallets are fuel, mulch, and compost amendment. | Medium. | E r |
| **C/D Wood** | May contain preservatives, adhesives, surface coating, and non-wood materials. C/D processing and separation technologies are constantly improving, but contamination is always a concern. | Typically low, but local markets can vary significantly. | Low. | E i p d d d |
| **MSW Wood** | Similar to C/D wood. | Typically low. | Low. | E i p d d w |
| **Waste Paper** | None to minimal. | Varies depending on | High. | U |

| | | | | |
|---|---|---|---|---|
| | | grade. For low or mixed grades of waste paper, competition is low. | | d p l v |
| **Food Processing Waste or Sludges** | None to minimal. | Unclear. | Low, does not contain cellulose. | U |

(a) Includes both silvicultural and site conversion wood waste.

(b) Market prices for various grades of waste paper for New York City, as reported in Waste News, March 23, 1998.

Residual waste is defined under Pennsylvania Code Title 25 Section 271.1 Definitions as "Garbage, refuse, other discarded material or other waste, including solid, liquid, semisolid or contained gaseous materials resulting from industrial, mining and agricultural operations." Essentially, this means residual wastes are non-hazardous industrial wastes, including wood waste and waste paper (among 95 other materials).

Under Pennsylvania Code Title 25, Chapter 287 Residual Waste, generators of more than 2,200 pounds of residual waste in a single month are required to submit biennial reports on the residual waste type, amount, management, and other information. The latest residual waste report required under Chapter 287 was for 1996 and was due to the Department of Environmental Protection (DEP), Bureau of Land Recycling and Waste Management on March 1, 1997. For purposes of the 1996 biennial report, the 2,200 pounds/month cutoff is interpreted to mean 13 tons/year. Generators required to submit reports must complete a report for each type of residual waste generated and generators of multiple types of residual waste must submit multiple reports. The reports include information on whether the waste is managed on-site or off-site, the off-site facility or facilities that accept the residual waste, how the off-site facility manages the waste, and how much waste is sent to each off-site facility.

The DEP Bureau of Land Recycling and Waste Management receives all reports and processes information in the reports into a database. The 1996 residual waste biennial waste database is available to the public (although it is rather lengthy and complicated) and can be analyzed by various database management systems such as Microsoft Access. Information on completing the biennial reports are contained in Compliance Materials for Generators of Residual Waste Including Generator's Residual Waste Biennial Report for 1996 published by the Bureau of Land Recycling and Waste Management. A copy of a blank report form from the Compliance Materials is included in Appendix B.

## How Wood Waste and Waste Paper are Defined in this Study

The many different types of wastes generated by industries and businesses and defined as residual waste in Pennsylvania are categorized into about 95 "residual waste codes" in the compliance manual for the database. (A copy of the list of codes is presented in Appendix B.) Three codes (as defined by the DEP) appear to include wood waste and waste paper that could be suitable as feedstock for ethanol production:

· Residual Waste Code 403: Wood Waste (Including Particle Board);

· Residual Waste Code 404: Paper, Cardboard Wastes, Laminated Paper; and

· Residual Waste Code 418: Sawdust (Including Wood Shavings).

It is important to note that other residual wastes categorized in other codes may also contain cellulosic materials which could be converted to ethanol. For example, Residual Waste Code 211: Other Industrial Sludge likely includes paper sludge and Code 419: Containers likely includes both wood and cardboard containers. However, these codes were not included in the analysis of potential feedstocks completed for this study since it is not possible to determine whether these codes actually do include cellulosic materials.

It is also important to note that other residual waste codes may contain starches or sugars that could be converted to ethanol. For instance, Residual Waste Code 430: Food Waste (Excluding Treatment Sludges) and Code 205: Food Processing Sludge may contain significant amounts of fermentable biomass. However, since this study focuses on cellulosic biomass, these residual wastes were not included in the analysis completed for this study.

## How the Residual Waste Database Was Analyzed

As part of the biennial reports, companies are required to report the types and amounts of waste generated by them as well as how they manage each waste. Generators are required to submit information on the on-site or off-site facility or facilities that accept the waste, as well as information on how that facility manages the material. This is done by selecting 1 of 13 "Unit Codes" for the receiving facility. A description of the unit codes is provided in Appendix B.

The database was analyzed to determine the amounts of wood waste (i.e. Codes 403 and 418) and waste paper (i.e. Code 404) in the five-county, greater Philadelphia area that are:

· Generated as residue or waste and need to be managed in some way;

· Reused, recycled, or beneficially used in some way;

· Incinerated and/or used for energy;

· Land applied;

· Stored on site; and

· Disposed of in landfills or other solid waste management facilities.

This information was then used to develop estimates of the amounts of wood waste (i.e. Codes 403 and 428) and waste paper (i.e. Code 404) that could be available at no- to low-cost for ethanol production. Research conducted for this study and past experience researching solid

waste management trends indicate it is reasonable to assume that the following wood waste and waste paper could be available for ethanol production at no- to low-cost:

· All wood waste and waste paper currently disposed of in landfills;

· All material currently stored on-site;

· 50% of material that is currently incinerated or used for energy; and

· 50% of material that is land applied.

To be conservative (i.e. to err on the side of undercounting, rather than overcounting the amount of material potentially available for ethanol), all other material is assumed to not be available at no- to low-cost. This includes all wood waste and waste paper currently reused or recycled in some way; 50% of material currently incinerated or used for energy; and 50% of material currently land applied.

## OVERVIEW OF THE AMOUNT OF WOOD WASTE AND WASTE PAPER AVAILABLE FOR ETHANOL

Results of the residual waste database analysis are presented in Table 3-3. The analysis indicates that over 1 million tons/year of wood waste and waste paper are generated in the five-county, greater Philadelphia area. Overall, approximately 209,000 tons/year (or about 20%) are believed to be potentially available for ethanol at no- to low-cost in the five counties. Presented below is an explanation of the information and assumptions used to estimate the amount of material believed to be available for ethanol.

### Reuse, Recycling, and Other Use

As shown in the table, about 800,000 tons/year (or about 78% of the total generated) are reused, recycled, or beneficially used in some way. This includes wood waste reported by generators as managed at Unit Code 01: Compost Facility; Unit Code 03: Industrial Kiln; Unit Code 08: Other; Unit Code 09: Recycler/Reuser; and Unit Code 12: Treatment (offsite only). In this study, these materials are assumed to not be available as feedstock for ethanol at no- to low-cost. To be conservative, it is assumed that since the materials already have end uses, a new end user (such as an ethanol producer) would need to pay for the materials to divert them from their current uses and that the prices paid would be higher than $0 to $5/ton (including delivery). In fact, this is probably not true for all of the materials and an ethanol producer may be able to find some materials currently managed in these ways at no- to low-cost. In addition, to be conservative Unit Code 8 is assumed to be used in some way and therefore not available at no-

**TABLE 3-3:**

**SUMMARY OF ETHANOL FEEDSTOCK POTENTIALLY AVAILABLE AT NO- TO-LOW COST (a) (b) (c)**

| RESIDUAL WASTE CODE AND DESCRIPTION | GENERATION (Tons/year) | REUSE, RECYCLING, OTHER USES (Tons/year) | INCINERATION, LAND APPLICATION (Tons/year) | LANDFILL, STORAGE (Tons/year) |
|---|---|---|---|---|
| **Code 403: Wood Waste (Including Particle Board)** | 600,926 | 561,833 | 15,271 | 23,822 |
| **Code 404: Paper, Cardboard Wastes, Laminated Paper** | 432,983 | 241,606 | 28,539 | 162,838 |
| **Code 418: Sawdust, Including Wood Shavings** | 9,255 | 7,996 | 842 | 417 |
| **TOTAL** | **1,043,164** | **811,435** | **44,652** | **187,077** |

(a) Residual waste codes and descriptions are defined in Generator's Residual Waste Biennial Report for 1996 published by the Pennsylvania Department of Environmental Protection. Generators of more than 2,200 pounds/month of residual waste (interpreted to mean 13 tons/year) are required to submit information on the residual waste type, amount, how the material is managed, and where the material is managed. Information submitted data is contained in a residual waste database maintained by the PA DEP Bureau of Land Recycling and Waste Management. Only codes that contain cellulosic waste materials are included in the table (and in this study).

(b) Generation is defined to be the sum of the amount reported as managed by reuse/recycling, other use, and landfill/storage.

(c) All cellulosic waste managed by landfilling and storage on-site is assumed to be available at no- to low-cost. In addition, 50% of material managed by incineration or land application is assumed to be available.

to low-cost. However, information available from the DEP does not actually specify what is being done with material managed under Unit Code 8.

**Incineration and Land Application**

As also shown in Table 3-3, over 44,000 tons/year of wood waste and waste paper (or about 4% of the total generated) are incinerated or land applied in the five-county, greater Philadelphia area. 50% of these materials are assumed in this study to be available for ethanol at no- to low-cost, while the rest is assumed to not be available. Some, but not all incineration and land application facilities, are assumed to charge tipping fees to accept the wastes. Others are assumed to pay for the material. Tipping fees are typically higher than $0 to $5/ton. Therefore, it is assumed that an ethanol producer would be able to divert some of this material by charging no fee or by paying a nominal fee for the material (i.e. up to $5/ton including delivery).

**Landfill Disposal and On-Site Storage**

As also shown in Table 3-3, the remaining 187,000 tons/year of wood waste and waste paper (or about 18% of the total generated) are disposed of in landfills or stored on-site in the five-county, greater Philadelphia area. All wastes managed in these ways are assumed in this study to be available for ethanol at no- to low-cost. For material that is disposed of in landfills, waste generators typically pay tipping fees for disposal and it is assumed that an ethanol producer would be able to divert all of this material by charging no fee or by paying a nominal fee for the material (i.e. up to $5/ton including delivery). For material that is being stored, it is assumed the material is stored either to avoid disposal tipping fees, or on speculation that a market will be developed in the future. In either case, it is likely that an ethanol producer would be able to divert all this material at no charge or by paying a nominal fee for the material (i.e. up to $5/ton including delivery).

## RESULTS OF ANALYSIS OF EACH FEEDSTOCK, COUNTY-BY-COUNTY

In addition to the overview discussed above, this study included analyzing the availability of wood waste and waste paper for ethanol at the county-level for each of the five counties in the greater Philadelphia area. Information on the amounts of material generated; reused, recycled, or beneficially used; incinerated or land applied; disposed of in landfills or stored; and potentially available for ethanol at no- to low-cost is presented for wood waste (Code 403) by county in Table 3-4, for waste paper (Code 404) by county in Table 3-5, and for sawdust (Code 418) by county in Table 3-6.

**TABLE 3-4:**

**SUMMARY OF WOOD WASTE AVAILABLE AT NO- TO LOW-COST IN PHILADELPHIA (a) (b) (c)**

| COUNTY | RESIDUAL WASTE CODE 403: WOOD WASTE | | | | |
|---|---|---|---|---|---|
| | GENERATION) (Tons/year) | REUSE, RECYCLING, OTHER USES (Tons/year) | INCINERATION, LAND APPLICATION (Tons/year) | LANDFILL, STORAGE (Tons/year) | PO AVAIL TO ( |
| **Bucks** | 44,454 | 39,914 | 293 | 4,247 | |
| **Chester** | 10,430 | 521 | 7,659 | 2,250 | |
| **Delaware** | 448,486 | 442,360 | 1,854 | 4,272 | |
| **Montgomery** | 71,623 | 56,273 | 5,378 | 9,972 | |
| **Philadelphia** | 25,933 (d) | 22,765 | 87 | 3,081 (d) | |
| **TOTAL** | **600,926** | **561,833** | **15,271** | **23,822 (d)** | |

(a) As defined in Generator's Residual Waste Biennial Report for 1996 as Residual Waste Code 403: Wood Waste (Including Particle Board).

(b) Generation is defined to be the sum of the amount reported as managed by reuse/recycling, other uses, and landfill/storage.

(c) All wood waste managed by landfilling and storage on-site is assumed to be available at no- to low-cost. In addition, 50% of material managed by incineration or land application is assumed to be available.

(d) Does not include 11,100,000 tons/year of wood waste reported by one generator since the quantity is believed to be in error.

**TABLE 3-5:**

**SUMMARY OF WASTE PAPER AVAILABLE AT NO- TO LOW-COST IN PHILADELPHIA (a) (b) (c)**

| | RESIDUAL WASTE CODE 404: WASTE PAPER | | | |
|---|---|---|---|---|
| **COUNTY** | **GENERATION (Tons/year)** | **REUSE, RECYCLING, OTHER USES (Tons/year)** | **INCINERATION, LAND APPLICATION (Tons/year)** | **LANDFILL, STORAGE (Tons/year)** |
| **Bucks** | 50,202 | 42,875 | 527 | 6,800 |
| **Chester** | 198,614 | 70,379 | 16,275 | 111,960(d) |
| **Delaware** | 13,894 | 11,708 | 1,705 | 481 |
| **Montgomery** | 127,974 | 89,308 | 10,005 | 28,661 |
| **Philadelphia** | 42,299 | 27,336 | 27 | 14,936 |
| **TOTAL** | **432,983** | **241,606** | **28,539** | **162,838(d)** |

(a) As defined in Generator's Residual Waste Biennial Report for 1996 as Residual Waste Code 404: Waste Paper, Cardboard Wastes, Laminated Paper.

(b) Generation is defined to be the sum of the amount reported as managed by reuse/recycling, other uses, and landfill/storage.

(c) All paper waste managed by landfilling and storage on-site is assumed to be available at no- to low-cost. In addition, 50% of material managed by incineration or land application is assumed to be available.

(d) Includes 106,510 tons/year of waste paper (commingled with polypropylene and polyethylene film) generated by Herr Foods and disposed in a landfill. This amount is incorrectly reported in the database as being land applied.

**TABLE 3-6:**

**SUMMARY OF SAWDUST AVAILABLE AT NO- TO LOW-COST IN PHILADELPHIA AREA (a) (b) (c)**

| COUNTY | RESIDUAL WASTE CODE 418: SAWDUST | | | |
|---|---|---|---|---|
| | GENERATION (Tons/year) | REUSE, RECYCLING, OTHER USES (Tons/year) | INCINERATION, LAND APPLICATION (Tons/year) | LANDFILL, STORAGE (Tons/year) |
| **Bucks** | 0 | 0 | 0 | 0 |
| **Chester** | 0 | 0 | 0 | 0 |
| **Delaware** | 9,255 | 7,996 | 842 | 417 |
| **Montgomery** | 0 | 0 | 0 | 0 |
| **Philadelphia** | 0 | 0 | 0 | 0 |
| **TOTAL** | **9,255** | **7,996** | **842** | **417** |

(a) As defined in Generator's Residual Waste Biennial Report for 1996 as Residual Waste Code 418: Sawdust, including Wood Shavings.

(b) Generation is defined to be the sum of the amount reported as managed by reuse/recycling, other uses, and landfill/storage.

(c) All sawdust managed by landfilling and storage on-site is assumed to be available at no- to low-cost. In addition, 50% of material managed by incineration or land application is assumed to be available.

As shown in the tables, waste paper accounts for 177,000 ton/year, or about 84% of the total amount of material potentially available at no- to low-cost. Wood waste (not including sawdust) accounts for about 31,000 tons/year, or about 15% of the total amount of material potentially available at no- to low-cost. Sawdust accounts for less than 1,000 tons/year of material, or less than 1%.

Chester County accounts for more than 126,000 tons/year of material, or about 60% of the total. Montgomery County accounts for over 46,000 ton/year of material, or about 22% of the total. Philadelphia County accounts for over 18,000 tons/year of material, or about 9% of the total. Bucks County accounts for over 11,000 tons/year of material, or about 5% of the total. Delaware County accounts for over 7,000 tons/year of material, or about 4% of the total.

## RESULTS OF COMPANY-SPECIFIC LISTINGS

To assist potential end users of the feedstocks, as part of this study lists were developed of those companies believed to generate wood waste or waste paper that could be available at no- to low-cost. Wastes assumed to be potentially available at no- to low-cost are those described by the generator as being incinerated, land applied, stored on- or off-site, or disposed of in a landfill. A separate list was done for each type of feedstock (e.g. wood waste, waste paper, and sawdust). Each list contains the company name, the city and county where the company is located, a contact person and their title, their telephone number, the type of waste, and the amount of waste generated. Companies that generate wood waste potentially available at no- to low-cost are listed in Appendix C. Companies that generate waste paper potentially available at no- to low-cost are listed in Appendix D. Companies that generate sawdust potentially available at no- to low-cost are listed in Appendix E.

## THE AVAILABILITY OF NO- TO LOW-COST FEEDSTOCKS IN THE FUTURE

Estimates of feedstock reported in this study are for the year 1996. There is limited, if any, empirical basis for anticipating future feedstock quantities. This is because none of the materials are monitored or reported on an annual basis by federal or state agencies, hence there is no ability to project future trends based on historic trends. Many factors could affect the future availability and price of potential feedstocks for ethanol. For materials that are currently produced as waste, these include the overall economic viability and productivity of local businesses and industries that generate wood waste and waste paper, waste management options available for the materials and their associated costs, and potential competition for the material by other end uses and markets. If the local or national economy downturns, then it is likely that local businesses and industries will reduce or curtail production, resulting in a corresponding decrease in residual waste generation. While the opposite may also be true, the

relationship is not always the same. This is because industries or manufacturers at or near production capacity cannot always readily increase capacity (or may choose not to) during an upturned economy.

If disposal options for residual wastes decrease, disposal costs will tend to increase and more residual waste may become available for ethanol. The reverse is also true. If more disposal options become available, disposal costs will tend to decrease due to competition, and less material will be available. Discussions with solid waste management staff in the PA DEP central office and the Philadelphia regional office indicate no foreseeable, major trends in the state that will dramatically affect competition or prices. However, recent acquisitions and mergers in the waste management industry could have some affect on competition and prices in the Philadelphia area. Most likely, the impact will be slightly less competition and somewhat higher prices for disposal, which could cause more residual waste to become available for ethanol (or other end uses).

It appears that overall the amount of residual waste potentially available at no- to no-cost for ethanol production will likely remain relatively constant in the near future, say five years. However, it is important to emphasize that developers of biomass energy facilities typically seek to site facilities in locations where they are confident substantially more feedstock is available within or below their price range than they actually need. This provides a "margin of security" that helps offset the risks involved in projecting absolute quantities and prices. The same will likely be true for developers of cellulosic ethanol plants.

## CONCLUSION:
## THE AVAILABILITY OF WOOD WASTE AND WASTE PAPER FOR ETHANOL

Overall, approximately 200,000 tons/year of wood waste and waste paper generated in the five-county, greater Philadelphia area are potentially available for ethanol production at no- to low-cost. This is believed to be a conservative estimate that undercounts the total amount of feedstock potentially available for several reasons:

· The assessment only includes wood waste and waste paper reported by industries and businesses that are required to file biennial reports with the PA Department of Environmental Protection. While this includes thousands of companies, it does not include absolutely every agency, institution, and business in the state that may generate wood waste or waste paper.

· The assessment is based on conservative assumptions about the amount of material currently generated as waste that could be available for ethanol at no- to low-cost. Some material that is currently reused, recycled, or beneficially used may in fact be available for ethanol, although none is assumed to be available in this study. In addition, more than 50% of material currently incinerated or land applied might actually be available.

· Because the assessment is based on information in the statewide residual waste database, it focusses on wood waste, waste paper, and sawdust as defined by the state for the database. Certain categories of waste included in the database that may contain other sources of cellulosic material or materials containing starch or sugar were not included in the study because there was no basis for determining how much of the materials defined under such categories could be used for ethanol. Examples include Code 11: Other Industrial Sludge (which likely includes paper sludge); Code 419: Containers (which likely includes both wood and cardboard containers); Code 430: Food Waste (which likely includes significant amounts of fermentable biomass); and Code 205 Food Processing Sludge (which likely includes some fermentable biomass).

· In addition, other types of waste are not defined as residual waste, and therefore are not included in reports to PA DEP, but could potentially be used for ethanol. Examples include: construction and demolition (C/D) wood and municipal waste which may contain wood.

As apparent in the company-specific lists of potential sources of no- to low-cost wood waste, waste paper, and sawdust presented in Appendix C, D, and E (respectively), materials estimated to be available for ethanol at no- to low-cost are generated in relatively small amounts by lots of different companies. Only two companies generate more than 10,000 tons/year of material, including:

· Herr Foods in Nottingham, which generates 106,510 tons/year of a mixed paper and plastic film waste that is landfilled; and

· Cabot Performance Materials in Boyertown, which generates 16,463 tons/year of waste paper that is also landfilled.

An important challenge confronting potential ethanol producers is to obtain the wood waste and waste paper believed to be potentially available at no- to low-cost. Since most of the companies generate less than 1,000 tons/year of wood waste or waste paper, it will be time consuming to establish relationships with the companies. In addition, companies that generate small amounts of waste are less likely to be concerned about disposal costs, and potential cost savings from supplying the material to an ethanol plant instead of paying disposal fees. In addition, the decision to change the way the waste is currently managed so that an ethanol plant can use it may not be based primarily on cost. The ease of doing things the same way as before, concerns about the staff time required to make or manage a change, and other factors may influence the decision and may outweigh potential savings in waste management costs.

It could be most efficient and productive for potential ethanol producers to establish relationships with one or more large, solid waste haulers and/or landfills in the Philadelphia area in order to establish a system to divert cellulosic waste from generators before it is disposed.

# APPENDIX A:

# THE SURVEY OF RENDERERS

## INFORMATION REQUESTED OF RENDERING COMPANIES SERVING GREATER PHILADELPHIA

1. What types and amounts of animal and vegetable oils and greases does your company collect (or have delivered) for processing or rendering from the greater Philadelphia area? (Rough, order-of-magnitude estimates are sufficient.)

2. What are the average (or typical) moisture content, free fatty acid content, and solids content of the oils and greases collected?

3. What is your opinion about the availability of processed oils and greases for the production of biodiesel. In other words, what prices or other factors would cause you to supply your oils and greases to a biodiesel producer? (Assume biodiesel feedstocks require a maximum free fatty acid content of 5%.)

### PLEASE REMEMBER

**Any information provided by you and others will be considered strictly confidential, and will only be used in aggregate with information from other companies**. The information will not be distributed or reported in any way that links quantities with specific companies or plants. Please send this page via facsimile or mail it directly **by no later than November 15, 1997** to:

Mr. Jeffrey Fehrs, P.E.
C.T. Donovan Associates, Inc.
P.O. Box 5665, 22 Church Street
Burlington, Vermont 05495
(802) 658-9385 (802) 862-1514 FAX

THANK YOU VERY MUCH !!

# APPENDIX B:

# THE PENNSYLVANIA RESIDUAL WASTE DATABASE

**TABLE B-1:**

**RESIDUAL WASTE FACILITIES UNIT CODES AND ASSUMPTIONS REGARDING AVAILABILITY**

| UNIT CODE | DESCRIPTION | COMMENTS |
|---|---|---|
| 01 | Composting Facility | Composting is assumed to be beneficial use |
| 02 | Incinerator | Assumed to include both incinerators and industr purchasing fuel |
| 03 | Industrial Kiln | Assumed to include both industrial boilers and ot facilities that purchase fuel |
| 04 | Underground Injection Well | For liquid wastes, does not apply to wood waste |
| 05 | Landfill | Disposal |
| 06 | Land Application | Assumed to include both wood waste and waste applied for benefecial use as a soil amendment a |
| 07 | Surface Impoundment | For liquid wastes, does not apply to wood waste |
| 08 | Other | Assumed to include only recycling or beneficial u |
| 09 | Recycler/Reuser | |
| 10 | Wastewater Discharge to POTW | For liquid wastes, does not apply to wood waste |
| 11 | Wastewater receiving Onsite Treatment Followed by Discharge Under NPDES Permit or to POTW | For liquid wastes, does not apply to wood waste |
| 12 | Treatment (Offsite Only) | Assumed to mean treatment for recycling or bene |
| 13 | Storage (Onsite Only) | Assume to mean stockpiling prior to disposal |
| No Code | Unit code not provided by generator | Assumed to recycling or beneficial use |

# APPENDIX C:

## Wood Waste Reported as Landfill

| County Name | Waste Quantity | Facility Name | Location City | Conact Name | Cont |
|---|---|---|---|---|---|
| BUCKS | 740 | JG FURNITURE SYSTEMS INC | QUAKERTOWN | DON BOISSELLE | MFG MANA |
| BUCKS | 511 | AVERY DENNISON FASSON ROLL DIVISION | QUAKERTOWN | ROY GETZ | ENVIRO C |
| BUCKS | 417 | PARAMOUNT PACKAGING CORP | CHALFONT | RICHARD JASPER | DIR REG A |
| BUCKS | 386 | WEBCRAFT TECHNOLOGIES INC | CHALFONT | MANUEL CABALLERO | PROCESS |
| BUCKS | 386 | WEBCRAFT TECHNOLOGIES INC | CHALFONT | MANUEL CABALLERO | PROCESS |
| BUCKS | 378 | AVERY DENNISON FASSON ROLL DIVISION | QUAKERTOWN | ROY GETZ | ENVIRO C |
| BUCKS | 243 | ALFA LAVAL SEPARATION INC | WARMINSTER | TODD W GROSS | FACILITY E |
| BUCKS | 136 | ALFA LAVAL SEPARATION INC | WARMINSTER | TODD W GROSS | FACILITY E |
| BUCKS | 121 | GENERAL FELT INDUSTRIES INC | FAIRLESS HILLS | KENNETH DEVLIN | PLANT EN |
| BUCKS | 103 | CLEVELAND STEEL CONTAINER CORP | QUAKERTOWN | DONALD DULIN | VP & GEN |
| BUCKS | 75 | BETZ LABORATORIES INC | LANGHORNE | BINA LEAHY | PLANT MA |
| BUCKS | 74 | GENERAL FELT INDUSTRIES INC | FAIRLESS HILLS | KENNETH DEVLIN | PLANT EN |
| BUCKS | 72 | SCANFORMS INC | BRISTOL | GREGORY DEFOE | MAINTENA |
| BUCKS | 72 | SCANFORMS INC | BRISTOL | GREGORY DEFOE | MAINTENA |
| BUCKS | 48 | AVERY DENNISON FASSON ROLL DIVISION | QUAKERTOWN | ROY GETZ | ENVIRO C |
| BUCKS | 39 | WEBCRAFT TECHNOLOGIES INC | CHALFONT | MANUEL CABALLERO | PROCESS |
| BUCKS | 39 | WEBCRAFT TECHNOLOGIES INC | CHALFONT | MANUEL CABALLERO | PROCESS |
| BUCKS | 39 | WEBCRAFT TECHNOLOGIES INC | CHALFONT | MANUEL CABALLERO | PROCESS |
| BUCKS | 39 | WEBCRAFT TECHNOLOGIES INC | CHALFONT | MANUEL CABALLERO | PROCESS |
| BUCKS | 30 | GENERAL FELT INDUSTRIES INC | FAIRLESS HILLS | KENNETH DEVLIN | PLANT EN |
| BUCKS | 25 | CLEVELAND STEEL CONTAINER CORP | QUAKERTOWN | DONALD DULIN | VP & GEN |
| BUCKS | 24 | SCANFORMS INC | BRISTOL | GREGORY DEFOE | MAINTENA |
| BUCKS | 24 | SCANFORMS INC | BRISTOL | GREGORY DEFOE | MAINTENA |
| BUCKS | 24 | GENERAL FELT INDUSTRIES INC | FAIRLESS HILLS | KENNETH DEVLIN | PLANT EN |
| BUCKS | 22 | CHILDERS PRODUCTS CO INC | LEVITTOWN | MATTHEW HYNOSKI | ASST PLA |
| BUCKS | 14 | CRANE CO CHEMPUMP DIVISION | WARRINGTON | ROY IMSICK | FAC SVCS |
| BUCKS | 14 | AVERY DENNISON FASSON ROLL DIVISION | QUAKERTOWN | ROY GETZ | ENVIRO C |
| BUCKS | 13 | SCANFORMS INC | BRISTOL | GREGORY DEFOE | MAINTENA |
| BUCKS | 13 | SCANFORMS INC | BRISTOL | GREGORY DEFOE | MAINTENA |
| BUCKS | 11 | SCANFORMS INC | BRISTOL | GREGORY DEFOE | MAINTENA |
| BUCKS | 11 | SCANFORMS INC | BRISTOL | GREGORY DEFOE | MAINTENA |
| BUCKS | 10 | SCANFORMS INC | BRISTOL | GREGORY DEFOE | MAINTENA |
| BUCKS | 10 | PARAMOUNT PACKAGING CORP | CHALFONT | RICHARD JASPER | DIR REG A |
| BUCKS | 10 | SCANFORMS INC | BRISTOL | GREGORY DEFOE | MAINTENA |
| BUCKS | 9 | GENERAL FELT INDUSTRIES INC | FAIRLESS HILLS | KENNETH DEVLIN | PLANT EN |
| BUCKS | 7 | CHILDERS PRODUCTS CO INC | LEVITTOWN | MATTHEW HYNOSKI | ASST PLA |
| BUCKS | 5 | SCANFORMS INC | BRISTOL | GREGORY DEFOE | MAINTENA |
| BUCKS | 5 | AVERY DENNISON FASSON ROLL DIVISION | QUAKERTOWN | ROY GETZ | ENVIRO C |
| BUCKS | 5 | CLEVELAND STEEL CONTAINER CORP | QUAKERTOWN | DONALD DULIN | VP & GEN |
| BUCKS | 5 | CHILDERS PRODUCTS CO INC | LEVITTOWN | MATTHEW HYNOSKI | ASST PLA |
| BUCKS | 5 | SCANFORMS INC | BRISTOL | GREGORY DEFOE | MAINTENA |
| BUCKS | 5 | BETZ LABORATORIES INC | LANGHORNE | BINA LEAHY | PLANT MA |
| BUCKS | 4 | FINMAC CORP SUBSIDIARY OF HULL CORP | WARMINSTER | ERIC KRATSCHMER | SPCL PRO |
| BUCKS | 4 | ALFA LAVAL SEPARATION INC | WARMINSTER | TODD W GROSS | FACILITY E |
| BUCKS | 3 | FINMAC CORP SUBSIDIARY OF HULL CORP | WARMINSTER | ERIC KRATSCHMER | SPCL PRO |
| BUCKS | 2 | CLEVELAND STEEL CONTAINER CORP | QUAKERTOWN | DONALD DULIN | VP & GEN |
| BUCKS | 2 | CRANE CO CHEMPUMP DIVISION | WARRINGTON | ROY IMSICK | FAC SVCS |
| BUCKS | 1 | CRANE CO CHEMPUMP DIVISION | WARRINGTON | ROY IMSICK | FAC SVCS |
| BUCKS | 1 | FINMAC CORP SUBSIDIARY OF HULL CORP | WARMINSTER | ERIC KRATSCHMER | SPCL PRO |
| BUCKS | 1 | AVERY DENNISON FASSON ROLL DIVISION | QUAKERTOWN | ROY GETZ | ENVIRO C |
| BUCKS | 1 | CRANE CO CHEMPUMP DIVISION | WARRINGTON | ROY IMSICK | FAC SVCS |
| BUCKS | 1 | CRANE CO CHEMPUMP DIVISION | WARRINGTON | ROY IMSICK | FAC SVCS |

| | | | | | |
|---|---|---|---|---|---|
| BUCKS | 1 | CRANE CO CHEMPUMP DIVISION | WARRINGTON | ROY IMSICK | FAC SVCS |
| BUCKS | 1 | AVERY DENNISON FASSON ROLL DIVISION | QUAKERTOWN | ROY GETZ | ENVIRO C |
| BUCKS | 1 | FINMAC CORP SUBSIDIARY OF HULL CORP | WARMINSTER | ERIC KRATSCHMER | SPCL PRC |
| BUCKS | 1 | CHILDERS PRODUCTS CO INC | LEVITTOWN | MATTHEW HYNOSKI | ASST PLA |
| BUCKS | 1 | CHILDERS PRODUCTS CO INC | LEVITTOWN | MATTHEW HYNOSKI | ASST PLA |
| BUCKS | 1 | FINMAC CORP SUBSIDIARY OF HULL CORP | WARMINSTER | ERIC KRATSCHMER | SPCL PRC |
| BUCKS | 1 | CRANE CO CHEMPUMP DIVISION | WARRINGTON | ROY IMSICK | FAC SVCS |
| BUCKS | 1 | FINMAC CORP SUBSIDIARY OF HULL CORP | WARMINSTER | ERIC KRATSCHMER | SPCL PRC |
| CHESTER | 780 | BECKETT CORP | LIONVILLE | THOMAS KAUFMANN | VICE PRES |
| CHESTER | 658 | GRACO CHILDRENS PRODUCTS INC | ELVERSON | LEE HASTIE | ENVIRO M |
| CHESTER | 161 | AXEL JOHNSON METALS INC | EXTON | RONALD M DENNIS | PROCESS |
| CHESTER | 115 | GRACO CHILDRENS PRODUCTS INC | ELVERSON | LEE HASTIE | ENVIRO M |
| CHESTER | 67 | GRACO CHILDRENS PRODUCTS INC | ELVERSON | LEE HASTIE | ENVIRO M |
| CHESTER | 51 | JONATHANS WOODCRAFT | PARKESBURG | JONATHAN STOLTZFUS | PARTNER |
| CHESTER | 48 | SARTOMER CO INC | WEST CHESTER | DAVID CAMPBELL | ENV COMP |
| CHESTER | 42 | SARTOMER CO INC | WEST CHESTER | DAVID CAMPBELL | ENV COMP |
| CHESTER | 38 | LONDON GROVE INDUSTRIES INC | WEST GROVE | ALAN KUMMERER | OPERATIC |
| CHESTER | 36 | SARTOMER CO INC | WEST CHESTER | DAVID CAMPBELL | ENV COMP |
| CHESTER | 31 | AXEL JOHNSON METALS INC | EXTON | RONALD M DENNIS | PROCESS |
| CHESTER | 30 | EDLON PRODUCTS INC | AVONDALE | CRAIG HENNESSEY | MFG ENGI |
| CHESTER | 25 | AXEL JOHNSON METALS INC | EXTON | RONALD M DENNIS | PROCESS |
| CHESTER | 24 | WHITFORD CORP | FRAZER | ROBERT L TROUT | MANAGER |
| CHESTER | 24 | WHITFORD CORP | FRAZER | ROBERT L TROUT | MANAGER |
| CHESTER | 16 | ACTION MANUFACTURING CO PLANT 5 | ATGLEN | MICHAEL BITTNER | ENV COMP |
| CHESTER | 14 | SARTOMER CO INC | WEST CHESTER | DAVID CAMPBELL | ENV COMP |
| CHESTER | 12 | SARTOMER CO INC | WEST CHESTER | DAVID CAMPBELL | ENV COMP |
| CHESTER | 9 | SARTOMER CO INC | WEST CHESTER | DAVID CAMPBELL | ENV COMP |
| CHESTER | 6 | EDLON PRODUCTS INC | AVONDALE | CRAIG HENNESSEY | MFG ENGI |
| CHESTER | 6 | WHITFORD CORP | FRAZER | ROBERT L TROUT | MANAGER |
| CHESTER | 6 | GENERAL ELECTRIC CO | MALVERN | HAL HECKMAN | SAFETY M |
| CHESTER | 5 | BECKETT CORP | LIONVILLE | THOMAS KAUFMANN | VICE PRES |
| CHESTER | 4 | BECKETT CORP | LIONVILLE | THOMAS KAUFMANN | VICE PRES |
| CHESTER | 4 | BECKETT CORP | LIONVILLE | THOMAS KAUFMANN | VICE PRES |
| CHESTER | 4 | SARTOMER CO INC | WEST CHESTER | DAVID CAMPBELL | ENV COMP |
| CHESTER | 4 | BECKETT CORP | LIONVILLE | THOMAS KAUFMANN | VICE PRES |
| CHESTER | 3 | SARTOMER CO INC | WEST CHESTER | DAVID CAMPBELL | ENV COMP |
| CHESTER | 3 | WHITFORD CORP | FRAZER | ROBERT L TROUT | MANAGER |
| CHESTER | 2 | BECKETT CORP | LIONVILLE | THOMAS KAUFMANN | VICE PRES |
| CHESTER | 2 | BECKETT CORP | LIONVILLE | THOMAS KAUFMANN | VICE PRES |
| CHESTER | 2 | WHITFORD CORP | FRAZER | ROBERT L TROUT | MANAGER |
| CHESTER | 2 | EDLON PRODUCTS INC | AVONDALE | CRAIG HENNESSEY | MFG ENGI |
| CHESTER | 1 | GENERAL ELECTRIC CO | MALVERN | HAL HECKMAN | SAFETY M |
| CHESTER | 1 | GENERAL ELECTRIC CO | MALVERN | HAL HECKMAN | SAFETY M |
| CHESTER | 1 | SARTOMER CO INC | WEST CHESTER | DAVID CAMPBELL | ENV COMP |
| CHESTER | 1 | AXEL JOHNSON METALS INC | EXTON | RONALD M DENNIS | PROCESS |
| CHESTER | 1 | SARTOMER CO INC | WEST CHESTER | DAVID CAMPBELL | ENV COMP |
| CHESTER | 1 | GENERAL ELECTRIC CO | MALVERN | HAL HECKMAN | SAFETY M |
| CHESTER | 1 | SARTOMER CO INC | WEST CHESTER | DAVID CAMPBELL | ENV COMP |
| CHESTER | 1 | WHITFORD CORP | FRAZER | ROBERT L TROUT | MANAGER |
| CHESTER | 1 | GENERAL ELECTRIC CO | MALVERN | HAL HECKMAN | SAFETY M |
| CHESTER | 1 | GENERAL ELECTRIC CO | MALVERN | HAL HECKMAN | SAFETY M |
| CHESTER | 1 | SARTOMER CO INC | WEST CHESTER | DAVID CAMPBELL | ENV COMP |
| CHESTER | 1 | WHITFORD CORP | FRAZER | ROBERT L TROUT | MANAGER |
| CHESTER | 1 | EDLON PRODUCTS INC | AVONDALE | CRAIG HENNESSEY | MFG ENGI |
| DELAWARE | 3853 | WITCO CHEMICAL CORP | TRAINER | MARK S CHRISTENSEN | ENVIRO M |
| DELAWARE | 200 | BOEING DEFENSE & SPACE CORP HELICOPTERS | RIDLEY PARK | BRIDGET C SCIAMANNA | ENVIRO EI |
| DELAWARE | 143 | BOEING DEFENSE & SPACE CORP HELICOPTERS | RIDLEY PARK | BRIDGET C SCIAMANNA | ENVIRO EI |
| DELAWARE | 20 | BOEING DEFENSE & SPACE CORP HELICOPTERS | RIDLEY PARK | BRIDGET C SCIAMANNA | ENVIRO EI |
| DELAWARE | 15 | BOEING DEFENSE & SPACE CORP HELICOPTERS | RIDLEY PARK | BRIDGET C SCIAMANNA | ENVIRO EI |
| DELAWARE | 14 | BOEING DEFENSE & SPACE CORP HELICOPTERS | RIDLEY PARK | BRIDGET C SCIAMANNA | ENVIRO EI |
| DELAWARE | 8 | BOEING DEFENSE & SPACE CORP HELICOPTERS | RIDLEY PARK | BRIDGET C SCIAMANNA | ENVIRO EI |

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|---|---|---|---|---|---|
| DELAWARE | 7 | BOEING DEFENSE & SPACE CORP HELICOPTERS | RIDLEY PARK | BRIDGET C SCIAMANNA | ENVIRO EI |
| DELAWARE | 6 | BOEING DEFENSE & SPACE CORP HELICOPTERS | RIDLEY PARK | BRIDGET C SCIAMANNA | ENVIRO EI |
| DELAWARE | 4 | BOEING DEFENSE & SPACE CORP HELICOPTERS | RIDLEY PARK | BRIDGET C SCIAMANNA | ENVIRO EI |
| DELAWARE | 2 | FIBRE METAL PRODUCTS CO | CONCORDVILLE | GARY J THURWANGER | PROJECT |
| MONTGOMERY | 3667 | WAMPLER LONGACRE TURKEY INC | FRANCONIA | RUDY H HOESS | ENVIRO C |
| MONTGOMERY | 692 | LAMINATORS INC | HATFIELD | R SAWYER | MGR QUA |
| MONTGOMERY | 692 | LAMINATORS INC | HATFIELD | R SAWYER | MGR QUA |
| MONTGOMERY | 636 | KNOLL GROUP | EAST GREENVILLE | LOUIS G NEWETT | ENV SAFE |
| MONTGOMERY | 627 | SUPERIOR TUBE CO | EVANSBURG | WILLIAM N STERRETT | DIRECTOR |
| MONTGOMERY | 568 | FORD ELECTRONICS & REFRIGERATION CORP | LANSDALE | JOSEPHINE HISTAND | ENVIRO EI |
| MONTGOMERY | 500 | MRS SMITHS FROZEN FOODS CO INC | POTTSTOWN | MIKE KRICK | PLANT SP |
| MONTGOMERY | 430 | KNOLL GROUP | EAST GREENVILLE | LOUIS G NEWETT | ENV SAFE |
| MONTGOMERY | 182 | SUPERIOR TUBE CO | EVANSBURG | WILLIAM N STERRETT | DIRECTOR |
| MONTGOMERY | 170 | KNOLL GROUP | EAST GREENVILLE | LOUIS G NEWETT | ENV SAFE |
| MONTGOMERY | 156 | GASBOY INTERNATIONAL INC | LANSDALE | GENE H STEFFEN | ENVIRO M |
| MONTGOMERY | 148 | SPS TECHNOLOGIES INC | JENKINTOWN | STEPHEN PIERCE | ENVIRO EI |
| MONTGOMERY | 144 | BROOKS INSTRUMENT | HATFIELD | JEFF DORFMAN | ENVIRO M |
| MONTGOMERY | 104 | PECORA CORP | HARLEYSVILLE | FRED MACCONNELL | PLANT MA |
| MONTGOMERY | 103 | PECORA CORP | HARLEYSVILLE | FRED MACCONNELL | PLANT MA |
| MONTGOMERY | 98 | KNOLL GROUP | EAST GREENVILLE | LOUIS G NEWETT | ENV SAFE |
| MONTGOMERY | 95 | STABILUS | COLMAR | JOE D HOBBS | ENVIRO EI |
| MONTGOMERY | 94 | POTTSTOWN PLATING WORKS INC | POTTSTOWN | JOHN C WELKIO | ENVIRO D |
| MONTGOMERY | 92 | AMERICAN BANKNOTE CO | HORSHAM | ERIC T BINNS | GENERAL |
| MONTGOMERY | 82 | KNOLL GROUP | EAST GREENVILLE | LOUIS G NEWETT | ENV SAFE |
| MONTGOMERY | 67 | STANLEY TOOLS | ROYERSFORD | JEFF KOPENITZ | QA MANA |
| MONTGOMERY | 61 | SPS TECHNOLOGIES INC | JENKINTOWN | STEPHEN PIERCE | ENVIRO EI |
| MONTGOMERY | 48 | AMERICAN BANKNOTE CO | HORSHAM | ERIC T BINNS | GENERAL |
| MONTGOMERY | 41 | GASBOY INTERNATIONAL INC | LANSDALE | GENE H STEFFEN | ENVIRO M |
| MONTGOMERY | 39 | BETZ LABORATORIES INC LABORATORY SUPPLY | HORSHAM | CHET SADOSKY | MANAGER |
| MONTGOMERY | 36 | SUPERIOR TUBE CO | EVANSBURG | WILLIAM N STERRETT | DIRECTOR |
| MONTGOMERY | 34 | GASBOY INTERNATIONAL INC | LANSDALE | GENE H STEFFEN | ENVIRO M |
| MONTGOMERY | 33 | EHST CUSTOM KITCHENS INC | BOYERTOWN | DENNIS P WELLER | PRESIDEN |
| MONTGOMERY | 31 | STABILUS | COLMAR | JOE D HOBBS | ENVIRO EI |
| MONTGOMERY | 30 | STANLEY TOOLS | ROYERSFORD | JEFF KOPENITZ | QA MANA |
| MONTGOMERY | 30 | SUPERIOR TUBE CO | EVANSBURG | WILLIAM N STERRETT | DIRECTOR |
| MONTGOMERY | 26 | POTTSTOWN PLATING WORKS INC | POTTSTOWN | JOHN C WELKIO | ENVIRO D |
| MONTGOMERY | 21 | HULL CORP | HATBORO | ERIC KRATSCHMER | SPEC PRO |
| MONTGOMERY | 20 | WOODWAY MANUFACTURING CO INC | HATFIELD | PAUL BAGINSKI | VICE PRES |
| MONTGOMERY | 20 | HULL CORP | HATBORO | ERIC KRATSCHMER | SPEC PRO |
| MONTGOMERY | 16 | STABILUS | COLMAR | JOE D HOBBS | ENVIRO EI |
| MONTGOMERY | 16 | PICCARI PRESS INC | COLMAR | CARL PICCARI | VICE PRES |
| MONTGOMERY | 14 | AMERICAN BANKNOTE CO | HORSHAM | ERIC T BINNS | GENERAL |
| MONTGOMERY | 12 | KNOLL GROUP | EAST GREENVILLE | LOUIS G NEWETT | ENV SAFE |
| MONTGOMERY | 12 | BROOKS INSTRUMENT | HATFIELD | JEFF DORFMAN | ENVIRO M |
| MONTGOMERY | 8 | COMMODORE BUSINESS MACHINES | NORRISTOWN | ANTHONY R WILSON | FACILITIES |
| MONTGOMERY | 7 | WOODWAY MANUFACTURING CO INC | HATFIELD | PAUL BAGINSKI | VICE PRES |
| MONTGOMERY | 6 | POTTSTOWN PLATING WORKS INC | POTTSTOWN | JOHN C WELKIO | ENVIRO D |
| MONTGOMERY | 5 | KNOLL GROUP | EAST GREENVILLE | LOUIS G NEWETT | ENV SAFE |
| MONTGOMERY | 5 | SUPERIOR TUBE CO | EVANSBURG | WILLIAM N STERRETT | DIRECTOR |
| MONTGOMERY | 5 | KNOLL GROUP | EAST GREENVILLE | LOUIS G NEWETT | ENV SAFE |
| MONTGOMERY | 5 | STANLEY TOOLS | ROYERSFORD | JEFF KOPENITZ | QA MANA |
| MONTGOMERY | 5 | BETZ LABORATORIES INC LABORATORY SUPPLY | HORSHAM | CHET SADOSKY | MANAGER |
| MONTGOMERY | 5 | PICCARI PRESS INC | COLMAR | CARL PICCARI | VICE PRES |
| MONTGOMERY | 4 | KNOLL GROUP | EAST GREENVILLE | LOUIS G NEWETT | ENV SAFE |
| MONTGOMERY | 3 | HULL CORP | HATBORO | ERIC KRATSCHMER | SPEC PRO |
| MONTGOMERY | 3 | COMMODORE BUSINESS MACHINES | NORRISTOWN | ANTHONY R WILSON | FACILITIES |
| MONTGOMERY | 3 | BETZ LABORATORIES INC LABORATORY SUPPLY | HORSHAM | CHET SADOSKY | MANAGER |
| MONTGOMERY | 2 | KNOLL GROUP | EAST GREENVILLE | LOUIS G NEWETT | ENV SAFE |
| MONTGOMERY | 2 | HULL CORP | HATBORO | ERIC KRATSCHMER | SPEC PRO |
| MONTGOMERY | 2 | SPS TECHNOLOGIES INC | JENKINTOWN | STEPHEN PIERCE | ENVIRO EI |
| MONTGOMERY | 1 | COMMODORE BUSINESS MACHINES | NORRISTOWN | ANTHONY R WILSON | FACILITIES |

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| MONTGOMERY | 1 | COMMODORE BUSINESS MACHINES | NORRISTOWN | ANTHONY R WILSON | FACILITIES |
| MONTGOMERY | 1 | COMMODORE BUSINESS MACHINES | NORRISTOWN | ANTHONY R WILSON | FACILITIES |
| MONTGOMERY | 1 | SUPERIOR TUBE CO | EVANSBURG | WILLIAM N STERRETT | DIRECTOR |
| MONTGOMERY | 1 | HULL CORP | HATBORO | ERIC KRATSCHMER | SPEC PRO |
| MONTGOMERY | 1 | BROOKS INSTRUMENT | HATFIELD | JEFF DORFMAN | ENVIRO M |
| MONTGOMERY | 1 | PECORA CORP | HARLEYSVILLE | FRED MACCONNELL | PLANT MA |
| MONTGOMERY | 1 | PECORA CORP | HARLEYSVILLE | FRED MACCONNELL | PLANT MA |
| MONTGOMERY | 1 | SUPERIOR TUBE CO | EVANSBURG | WILLIAM N STERRETT | DIRECTOR |
| MONTGOMERY | 1 | SUPERIOR TUBE CO | EVANSBURG | WILLIAM N STERRETT | DIRECTOR |
| MONTGOMERY | 1 | SUPERIOR TUBE CO | EVANSBURG | WILLIAM N STERRETT | DIRECTOR |
| MONTGOMERY | 1 | HULL CORP | HATBORO | ERIC KRATSCHMER | SPEC PRO |
| MONTGOMERY | 1 | PECORA CORP | HARLEYSVILLE | FRED MACCONNELL | PLANT MA |
| PHILADELPHIA | 1162 | NABISCO BISCUIT CO | PHILADELPHIA | WALTER G GOGOLA | ENGINEER |
| PHILADELPHIA | 780 | KURZ HASTINGS INC | PHILADELPHIA | ROBERT L WALLACE | SAFETY E |
| PHILADELPHIA | 231 | OXFORD BOOKBINDING | PHILADELPHIA | JOSEPH GRITZ | PRESIDEN |
| PHILADELPHIA | 120 | KURZ HASTINGS INC | PHILADELPHIA | ROBERT L WALLACE | SAFETY E |
| PHILADELPHIA | 74 | DEFENSE PERSONNEL SUPPORT CENTER | PHILADELPHIA | WILLIAM M STEM | CHIEF ENV |
| PHILADELPHIA | 64 | JACOB HOLTZ CO | PHILADELPHIA | DAVID RENTZ | PRESIDEN |
| PHILADELPHIA | 60 | BAUM PRINTING INC | PHILADELPHIA | LINDA BABISH | OFFICE MA |
| PHILADELPHIA | 60 | KURZ HASTINGS INC | PHILADELPHIA | ROBERT L WALLACE | SAFETY E |
| PHILADELPHIA | 41 | MA BRUDER & SONS INC | PHILADELPHIA | DON DEUTSCH | CORP ENG |
| PHILADELPHIA | 35 | BAUM PRINTING INC | PHILADELPHIA | LINDA BABISH | OFFICE MA |
| PHILADELPHIA | 35 | BAUM PRINTING INC | PHILADELPHIA | LINDA BABISH | OFFICE MA |
| PHILADELPHIA | 35 | JACOB HOLTZ CO | PHILADELPHIA | DAVID RENTZ | PRESIDEN |
| PHILADELPHIA | 30 | JACOB HOLTZ CO | PHILADELPHIA | DAVID RENTZ | PRESIDEN |
| PHILADELPHIA | 27 | PENN VENTILATOR CO INC | PHILADELPHIA | LESTER J GAAL | SAFETY E |
| PHILADELPHIA | 23 | GATX TERMINALS CORP | PHILADELPHIA | THOMAS J STAFINIAK | SPEC PRO |
| PHILADELPHIA | 18 | BAUM PRINTING INC | PHILADELPHIA | LINDA BABISH | OFFICE MA |
| PHILADELPHIA | 17 | PENN VENTILATOR CO INC | PHILADELPHIA | LESTER J GAAL | SAFETY E |
| PHILADELPHIA | 17 | MA BRUDER & SONS INC | PHILADELPHIA | DON DEUTSCH | CORP ENG |
| PHILADELPHIA | 14 | PEARL PRESSMAN LIBERTY INC | PHILADELPHIA | MICHAEL ROSEN | ESTIMATO |
| PHILADELPHIA | 14 | BAUM PRINTING INC | PHILADELPHIA | LINDA BABISH | OFFICE MA |
| PHILADELPHIA | 14 | BAUM PRINTING INC | PHILADELPHIA | LINDA BABISH | OFFICE MA |
| PHILADELPHIA | 13 | ACTION MANUFACTURING CO PLANT 6 | PHILADELPHIA | MICHAEL BITTNER | MANAGER |
| PHILADELPHIA | 12 | HALL WOOLFORD TANK CO INC | PHILADELPHIA | JACK HILLMAN | GENERAL |
| PHILADELPHIA | 12 | ACTION MANUFACTURING CO PLANT 6 | PHILADELPHIA | MICHAEL BITTNER | MANAGER |
| PHILADELPHIA | 11 | PEARL PRESSMAN LIBERTY INC | PHILADELPHIA | MICHAEL ROSEN | ESTIMATO |
| PHILADELPHIA | 10 | ACTION MANUFACTURING CO PLANT 6 | PHILADELPHIA | MICHAEL BITTNER | MANAGER |
| PHILADELPHIA | 9 | GRAPHIC ARTS INC | PHILADELPHIA | DAVE SALTER | PLANT MA |
| PHILADELPHIA | 9 | PEARL PRESSMAN LIBERTY INC | PHILADELPHIA | MICHAEL ROSEN | ESTIMATO |
| PHILADELPHIA | 9 | PEARL PRESSMAN LIBERTY INC | PHILADELPHIA | MICHAEL ROSEN | ESTIMATO |
| PHILADELPHIA | 8 | GRAPHIC ARTS INC | PHILADELPHIA | DAVE SALTER | PLANT MA |
| PHILADELPHIA | 6 | ACTION MANUFACTURING CO PLANT 6 | PHILADELPHIA | MICHAEL BITTNER | MANAGER |
| PHILADELPHIA | 6 | SPD TECHNOLOGIES INC | PHILADELPHIA | JOSEPH SIENKIEWICZ | COMPLIAN |
| PHILADELPHIA | 6 | JACOB HOLTZ CO | PHILADELPHIA | DAVID RENTZ | PRESIDEN |
| PHILADELPHIA | 6 | SPD TECHNOLOGIES INC | PHILADELPHIA | JOSEPH SIENKIEWICZ | COMPLIAN |
| PHILADELPHIA | 6 | NABISCO BISCUIT CO | PHILADELPHIA | WALTER G GOGOLA | ENGINEER |
| PHILADELPHIA | 6 | GENERAL ELECTRIC CO SPECIALTY BREAKER | PHILADELPHIA | MICHAEL R FAIRLEY | FACILITY M |
| PHILADELPHIA | 6 | SPD TECHNOLOGIES INC | PHILADELPHIA | JOSEPH SIENKIEWICZ | COMPLIAN |
| PHILADELPHIA | 6 | SPD TECHNOLOGIES INC | PHILADELPHIA | JOSEPH SIENKIEWICZ | COMPLIAN |
| PHILADELPHIA | 5 | SPD TECHNOLOGIES INC | PHILADELPHIA | JOSEPH SIENKIEWICZ | COMPLIAN |
| PHILADELPHIA | 5 | PEARL PRESSMAN LIBERTY INC | PHILADELPHIA | MICHAEL ROSEN | ESTIMATO |
| PHILADELPHIA | 3 | SPD TECHNOLOGIES INC | PHILADELPHIA | JOSEPH SIENKIEWICZ | COMPLIAN |
| PHILADELPHIA | 3 | GENERAL ELECTRIC CO SPECIALTY BREAKER | PHILADELPHIA | MICHAEL R FAIRLEY | FACILITY M |
| PHILADELPHIA | 3 | SPD TECHNOLOGIES INC | PHILADELPHIA | JOSEPH SIENKIEWICZ | COMPLIAN |
| PHILADELPHIA | 3 | SPD TECHNOLOGIES INC | PHILADELPHIA | JOSEPH SIENKIEWICZ | COMPLIAN |
| PHILADELPHIA | 3 | PENN VENTILATOR CO INC | PHILADELPHIA | LESTER J GAAL | SAFETY E |
| PHILADELPHIA | 3 | PEARL PRESSMAN LIBERTY INC | PHILADELPHIA | MICHAEL ROSEN | ESTIMATO |
| PHILADELPHIA | 3 | SPD TECHNOLOGIES INC | PHILADELPHIA | JOSEPH SIENKIEWICZ | COMPLIAN |
| PHILADELPHIA | 2 | SPD TECHNOLOGIES INC | PHILADELPHIA | JOSEPH SIENKIEWICZ | COMPLIAN |
| PHILADELPHIA | 2 | OXFORD BOOKBINDING | PHILADELPHIA | JOSEPH GRITZ | PRESIDEN |

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| PHILADELPHIA | 2 | GRAPHIC ARTS INC | PHILADELPHIA | DAVE SALTER | PLANT MA |
| PHILADELPHIA | 2 | SPD TECHNOLOGIES INC | PHILADELPHIA | JOSEPH SIENKIEWICZ | COMPLIAN |
| PHILADELPHIA | 2 | GRAPHIC ARTS INC | PHILADELPHIA | DAVE SALTER | PLANT MA |
| PHILADELPHIA | 2 | HALL WOOLFORD TANK CO INC | PHILADELPHIA | JACK HILLMAN | GENERAL |
| PHILADELPHIA | 2 | PENN VENTILATOR CO INC | PHILADELPHIA | LESTER J GAAL | SAFETY E |
| PHILADELPHIA | 1 | ACTION MANUFACTURING CO PLANT 6 | PHILADELPHIA | MICHAEL BITTNER | MANAGER |
| PHILADELPHIA | 1 | OXFORD BOOKBINDING | PHILADELPHIA | JOSEPH GRITZ | PRESIDEN |
| PHILADELPHIA | 1 | OXFORD BOOKBINDING | PHILADELPHIA | JOSEPH GRITZ | PRESIDEN |
| PHILADELPHIA | 1 | DEFENSE PERSONNEL SUPPORT CENTER | PHILADELPHIA | WILLIAM M STEM | CHIEF ENV |
| PHILADELPHIA | 1 | PENN VENTILATOR CO INC | PHILADELPHIA | LESTER J GAAL | SAFETY E |
| PHILADELPHIA | 1 | ACTION MANUFACTURING CO PLANT 6 | PHILADELPHIA | MICHAEL BITTNER | MANAGER |
| PHILADELPHIA | 1 | ACTION MANUFACTURING CO PLANT 6 | PHILADELPHIA | MICHAEL BITTNER | MANAGER |
| PHILADELPHIA | 1 | SPD TECHNOLOGIES INC | PHILADELPHIA | JOSEPH SIENKIEWICZ | COMPLIAN |
| PHILADELPHIA | 1 | SPD TECHNOLOGIES INC | PHILADELPHIA | JOSEPH SIENKIEWICZ | COMPLIAN |
| PHILADELPHIA | 1 | SPD TECHNOLOGIES INC | PHILADELPHIA | JOSEPH SIENKIEWICZ | COMPLIAN |
| PHILADELPHIA | 1 | SPD TECHNOLOGIES INC | PHILADELPHIA | JOSEPH SIENKIEWICZ | COMPLIAN |
| PHILADELPHIA | 1 | PENN VENTILATOR CO INC | PHILADELPHIA | LESTER J GAAL | SAFETY E |
| PHILADELPHIA | 1 | PENN VENTILATOR CO INC | PHILADELPHIA | LESTER J GAAL | SAFETY E |
| PHILADELPHIA | 1 | ACTION MANUFACTURING CO PLANT 6 | PHILADELPHIA | MICHAEL BITTNER | MANAGER |

# Wood Waste Reported as Stored

| County Name | Waste Quantity | Facility Name | Location City | Conact Name | |
|---|---|---|---|---|---|
| CHESTER | 3 | GRACO CHILDRENS PRODUCTS INC | ELVERSON | LEE HASTIE | E |
| MONTGOMERY | 2 | BETZ LABORATORIES INC LABORATORY SUPPLY | HORSHAM | CHET SADOSKY | M |
| PHILADELPHIA | 10 | ACTION MANUFACTURING CO PLANT 6 | PHILADELPHIA | MICHAEL BITTNER | M |

# Wood Waste Reported As Incinerated

| County Name | Waste Quantity | Facility Name | Location City | Conact |
|---|---|---|---|---|
| BUCKS | 197 | PRE FINISHED METALS CO PRIOR COATED ME | MORRISVILLE | BONNIE L PRAY |
| BUCKS | 68 | PRE FINISHED METALS CO PRIOR COATED ME | MORRISVILLE | BONNIE L PRAY |
| BUCKS | 16 | BETZ LABORATORIES INC | LANGHORNE | BINA LEAHY |
| BUCKS | 11 | AVERY DENNISON FASSON ROLL DIVISION | QUAKERTOWN | ROY GETZ |
| BUCKS | 1 | CHILDERS PRODUCTS CO INC | LEVITTOWN | MATTHEW HYN |
| CHESTER | 5401 | SARTOMER CO INC | WEST CHESTER | DAVID CAMPBE |
| CHESTER | 1137 | SARTOMER CO INC | WEST CHESTER | DAVID CAMPBE |
| CHESTER | 934 | SARTOMER CO INC | WEST CHESTER | DAVID CAMPBE |
| CHESTER | 68 | SANOFI WINTHROP INC EASTMAN PHARMACEUTICALS | MALVERN | PETER W WILS |
| CHESTER | 54 | BECKETT CORP | LIONVILLE | THOMAS KAUF |
| CHESTER | 38 | ACTION MANUFACTURING CO PLANT 5 | ATGLEN | MICHAEL BITTN |
| CHESTER | 17 | SANOFI WINTHROP INC EASTMAN PHARMACEUTICALS | MALVERN | PETER W WILS |
| CHESTER | 4 | WHITFORD CORP | FRAZER | ROBERT L TRC |
| CHESTER | 3 | WHITFORD CORP | FRAZER | ROBERT L TRC |
| CHESTER | 1 | WHITFORD CORP | FRAZER | ROBERT L TRC |
| DELAWARE | 445 | GOODMARK FOODS INC | FOLCROFT | ROBERT MIDDL |
| DELAWARE | 424 | BOEING DEFENSE & SPACE CORP HELICOPTERS DIVISION | RIDLEY PARK | BRIDGET C SCI |
| DELAWARE | 400 | ALAN MCILVAIN JR | MARCUS HOOK | WILLIAM COOK |
| DELAWARE | 200 | BOEING DEFENSE & SPACE CORP HELICOPTERS DIVISION | RIDLEY PARK | BRIDGET C SCI |
| DELAWARE | 96 | BOEING DEFENSE & SPACE CORP HELICOPTERS DIVISION | RIDLEY PARK | BRIDGET C SCI |
| DELAWARE | 53 | FIBRE METAL PRODUCTS CO | CONCORDVILLE | GARY J THURV |
| DELAWARE | 46 | BOEING DEFENSE & SPACE CORP HELICOPTERS DIVISION | RIDLEY PARK | BRIDGET C SCI |
| DELAWARE | 37 | FIBRE METAL PRODUCTS CO | CONCORDVILLE | GARY J THURV |
| DELAWARE | 30 | BOEING DEFENSE & SPACE CORP HELICOPTERS DIVISION | RIDLEY PARK | BRIDGET C SCI |
| DELAWARE | 30 | GOODMARK FOODS INC | FOLCROFT | ROBERT MIDDL |
| DELAWARE | 25 | BOEING DEFENSE & SPACE CORP HELICOPTERS DIVISION | RIDLEY PARK | BRIDGET C SCI |
| DELAWARE | 16 | FIBRE METAL PRODUCTS CO | CONCORDVILLE | GARY J THURV |
| DELAWARE | 12 | CORK INDUSTRIES INC | FOLCROFT | MICHAEL F MCI |
| DELAWARE | 10 | BOEING DEFENSE & SPACE CORP HELICOPTERS DIVISION | RIDLEY PARK | BRIDGET C SCI |
| DELAWARE | 9 | BOEING DEFENSE & SPACE CORP HELICOPTERS DIVISION | RIDLEY PARK | BRIDGET C SCI |
| DELAWARE | 6 | FIBRE METAL PRODUCTS CO | CONCORDVILLE | GARY J THURV |
| DELAWARE | 4 | CORK INDUSTRIES INC | FOLCROFT | MICHAEL F MCI |
| DELAWARE | 3 | CORK INDUSTRIES INC | FOLCROFT | MICHAEL F MCI |
| DELAWARE | 3 | CORK INDUSTRIES INC | FOLCROFT | MICHAEL F MCI |
| DELAWARE | 2 | DUPONT PRINTING & PUBLISHING OPERATIONS | BOOTHWYN | D GUY SCRAM |
| DELAWARE | 2 | BOEING DEFENSE & SPACE CORP HELICOPTERS DIVISION | RIDLEY PARK | BRIDGET C SCI |
| DELAWARE | 1 | DUPONT PRINTING & PUBLISHING OPERATIONS | BOOTHWYN | D GUY SCRAM |
| MONTGOMERY | 2822 | KNOLL GROUP | EAST GREENVILLE | LOUIS G NEWE |
| MONTGOMERY | 1236 | PHILADELPHIA NEWSPAPERS INC | CONSHOHOCKEN | ANTHONY MON |
| MONTGOMERY | 568 | KNOLL GROUP | EAST GREENVILLE | LOUIS G NEWE |
| MONTGOMERY | 240 | PHILADELPHIA NEWSPAPERS INC | CONSHOHOCKEN | ANTHONY MON |
| MONTGOMERY | 184 | SPS TECHNOLOGIES INC | JENKINTOWN | STEPHEN PIER |
| MONTGOMERY | 131 | KNOLL GROUP | EAST GREENVILLE | LOUIS G NEWE |
| MONTGOMERY | 122 | STROEHMANN BAKERIES NORRISTOWN | NORRISTOWN | DANIEL W BAR |
| MONTGOMERY | 20 | KNOLL GROUP | EAST GREENVILLE | LOUIS G NEWE |
| MONTGOMERY | 15 | SPS TECHNOLOGIES INC | JENKINTOWN | STEPHEN PIER |

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| MONTGOMERY | 10 | SPS TECHNOLOGIES INC | JENKINTOWN | STEPHEN PIER |
| MONTGOMERY | 5 | KNOLL GROUP | EAST GREENVILLE | LOUIS G NEWE |
| MONTGOMERY | 5 | TRANSICOIL INC | TROOPER | MARK M JOHNS |
| MONTGOMERY | 4 | TRANSICOIL INC | TROOPER | MARK M JOHNS |
| MONTGOMERY | 2 | PHILADELPHIA NEWSPAPERS INC | CONSHOHOCKEN | ANTHONY MON |
| MONTGOMERY | 1 | COMMODORE BUSINESS MACHINES | NORRISTOWN | ANTHONY R WI |
| MONTGOMERY | 1 | TRANSICOIL INC | TROOPER | MARK M JOHNS |
| MONTGOMERY | 1 | TRANSICOIL INC | TROOPER | MARK M JOHNS |
| MONTGOMERY | 1 | COMMODORE BUSINESS MACHINES | NORRISTOWN | ANTHONY R WI |
| MONTGOMERY | 1 | TRANSICOIL INC | TROOPER | MARK M JOHNS |
| MONTGOMERY | 1 | SPS TECHNOLOGIES INC | JENKINTOWN | STEPHEN PIER |
| MONTGOMERY | 1 | TRANSICOIL INC | TROOPER | MARK M JOHNS |
| MONTGOMERY | 1 | TRANSICOIL INC | TROOPER | MARK M JOHNS |
| MONTGOMERY | 1 | HULL CORP | HATBORO | ERIC KRATSCH |
| MONTGOMERY | 1 | COMMODORE BUSINESS MACHINES | NORRISTOWN | ANTHONY R WI |
| MONTGOMERY | 1 | COMMODORE BUSINESS MACHINES | NORRISTOWN | ANTHONY R WI |
| MONTGOMERY | 1 | COMMODORE BUSINESS MACHINES | NORRISTOWN | ANTHONY R WI |
| MONTGOMERY | 1 | SPS TECHNOLOGIES INC | JENKINTOWN | STEPHEN PIER |
| MONTGOMERY | 1 | TRANSICOIL INC | TROOPER | MARK M JOHNS |
| PHILADELPHIA | 21 | DEFENSE PERSONNEL SUPPORT CENTER | PHILADELPHIA | WILLIAM M STE |
| PHILADELPHIA | 11 | DEFENSE PERSONNEL SUPPORT CENTER | PHILADELPHIA | WILLIAM M STE |
| PHILADELPHIA | 11 | DEFENSE PERSONNEL SUPPORT CENTER | PHILADELPHIA | WILLIAM M STE |
| PHILADELPHIA | 11 | DEFENSE PERSONNEL SUPPORT CENTER | PHILADELPHIA | WILLIAM M STE |
| PHILADELPHIA | 8 | BAUM PRINTING INC | PHILADELPHIA | LINDA BABISH |
| PHILADELPHIA | 6 | NABISCO BISCUIT CO | PHILADELPHIA | WALTER G GO |
| PHILADELPHIA | 5 | BAUM PRINTING INC | PHILADELPHIA | LINDA BABISH |
| PHILADELPHIA | 4 | NABISCO BISCUIT CO | PHILADELPHIA | WALTER G GO |
| PHILADELPHIA | 3 | GATX TERMINALS CORP | PHILADELPHIA | THOMAS J STA |
| PHILADELPHIA | 1 | DEFENSE PERSONNEL SUPPORT CENTER | PHILADELPHIA | WILLIAM M STE |
| PHILADELPHIA | 1 | DEFENSE PERSONNEL SUPPORT CENTER | PHILADELPHIA | WILLIAM M STE |
| PHILADELPHIA | 1 | DEFENSE PERSONNEL SUPPORT CENTER | PHILADELPHIA | WILLIAM M STE |
| PHILADELPHIA | 1 | ACTION MANUFACTURING CO PLANT 6 | PHILADELPHIA | MICHAEL BITTN |
| PHILADELPHIA | 1 | ACTION MANUFACTURING CO PLANT 6 | PHILADELPHIA | MICHAEL BITTN |
| PHILADELPHIA | 1 | GATX TERMINALS CORP | PHILADELPHIA | THOMAS J STA |
| PHILADELPHIA | 1 | GATX TERMINALS CORP | PHILADELPHIA | THOMAS J STA |

# Wood Waste Reported As Land Applied

| County Name | Waste Quantity | Facility Name | Location City | Conact Name | Contact Title |
|---|---|---|---|---|---|
| CHESTER | 2 | ACTION MANUFACTURING CO PLANT 5 | ATGLEN | MICHAEL BITTNER | ENV COMP MGR |

# APPENDIX D:

# COMPANIES WITH WASTE PAPER POTENTIALLY AVAILABLE

## Waste Paper Reported As Landfilled

| County Name | Waste Quantity | Facility Name | Location City | Conact |
|---|---|---|---|---|
| BUCKS | 1647 | FRES CO SYSTEM USA INC | TELFORD | FRANK LOSAGI |
| BUCKS | 711 | KLEARFOLD INC | WARRINGTON | MICHAEL J ROS |
| BUCKS | 558 | KLEARFOLD INC | WARRINGTON | MICHAEL J ROS |
| BUCKS | 511 | AVERY DENNISON FASSON ROLL DIVISION | QUAKERTOWN | ROY GETZ |
| BUCKS | 417 | PARAMOUNT PACKAGING CORP | CHALFONT | RICHARD JASP |
| BUCKS | 386 | WEBCRAFT TECHNOLOGIES INC | CHALFONT | MANUEL CABAL |
| BUCKS | 386 | WEBCRAFT TECHNOLOGIES INC | CHALFONT | MANUEL CABAL |
| BUCKS | 378 | AVERY DENNISON FASSON ROLL DIVISION | QUAKERTOWN | ROY GETZ |
| BUCKS | 144 | BETZ LABORATORIES INC | TREVOSE | E D HOCHBERG |
| BUCKS | 140 | SUPERPAC INC | SOUTHAMPTON | WILLIAM J SEIT |
| BUCKS | 121 | GENERAL FELT INDUSTRIES INC | FAIRLESS HILLS | KENNETH DEVL |
| BUCKS | 105 | LEMMON CO | SELLERSVILLE | GEORGE BROV |
| BUCKS | 103 | CLEVELAND STEEL CONTAINER CORP | QUAKERTOWN | DONALD DULIN |
| BUCKS | 79 | ASSOCIATED RUBBER INC | QUAKERTOWN | GARY A SCOTT |
| BUCKS | 75 | BETZ LABORATORIES INC | LANGHORNE | BINA LEAHY |
| BUCKS | 74 | GENERAL FELT INDUSTRIES INC | FAIRLESS HILLS | KENNETH DEVL |
| BUCKS | 72 | SCANFORMS INC | BRISTOL | GREGORY DEF |
| BUCKS | 72 | SCANFORMS INC | BRISTOL | GREGORY DEF |
| BUCKS | 58 | JG FURNITURE SYSTEMS INC | QUAKERTOWN | DON BOISSELL |
| BUCKS | 57 | FBF INDUSTRIES INC | SOUTHAMPTON | DANIEL SCHER |
| BUCKS | 48 | AVERY DENNISON FASSON ROLL DIVISION | QUAKERTOWN | ROY GETZ |
| BUCKS | 39 | WEBCRAFT TECHNOLOGIES INC | CHALFONT | MANUEL CABAL |
| BUCKS | 39 | WEBCRAFT TECHNOLOGIES INC | CHALFONT | MANUEL CABAL |
| BUCKS | 39 | WEBCRAFT TECHNOLOGIES INC | CHALFONT | MANUEL CABAL |
| BUCKS | 39 | WEBCRAFT TECHNOLOGIES INC | CHALFONT | MANUEL CABAL |
| BUCKS | 37 | SUPERPAC INC | SOUTHAMPTON | WILLIAM J SEIT |
| BUCKS | 34 | AMERICAN STONE MIX INC | BRISTOL | JAMES E CARR |
| BUCKS | 31 | JG FURNITURE SYSTEMS INC | QUAKERTOWN | DON BOISSELL |
| BUCKS | 30 | GENERAL FELT INDUSTRIES INC | FAIRLESS HILLS | KENNETH DEVL |
| BUCKS | 25 | CLEVELAND STEEL CONTAINER CORP | QUAKERTOWN | DONALD DULIN |
| BUCKS | 24 | GENERAL FELT INDUSTRIES INC | FAIRLESS HILLS | KENNETH DEVL |
| BUCKS | 24 | SCANFORMS INC | BRISTOL | GREGORY DEF |
| BUCKS | 24 | SCANFORMS INC | BRISTOL | GREGORY DEF |
| BUCKS | 22 | CHILDERS PRODUCTS CO INC | LEVITTOWN | MATTHEW HYN |
| BUCKS | 14 | CRANE CO CHEMPUMP DIVISION | WARRINGTON | ROY IMSICK |
| BUCKS | 14 | AVERY DENNISON FASSON ROLL DIVISION | QUAKERTOWN | ROY GETZ |
| BUCKS | 13 | SCANFORMS INC | BRISTOL | GREGORY DEF |
| BUCKS | 13 | SCANFORMS INC | BRISTOL | GREGORY DEF |
| BUCKS | 13 | WONDER CHEMICAL CORP | FAIRLESS HILLS | HAROLD SCHU |
| BUCKS | 12 | MG INDUSTRIES | MORRISVILLE | ROBERT J LOM |
| BUCKS | 12 | MG INDUSTRIES | MORRISVILLE | ROBERT J LOM |
| BUCKS | 11 | SCANFORMS INC | BRISTOL | GREGORY DEF |
| BUCKS | 11 | SCANFORMS INC | BRISTOL | GREGORY DEF |
| BUCKS | 10 | SCANFORMS INC | BRISTOL | GREGORY DEF |
| BUCKS | 10 | PARAMOUNT PACKAGING CORP | CHALFONT | RICHARD JASP |
| BUCKS | 10 | SCANFORMS INC | BRISTOL | GREGORY DEF |
| BUCKS | 9 | GENERAL FELT INDUSTRIES INC | FAIRLESS HILLS | KENNETH DEVL |

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|---|---|---|---|---|
| BUCKS | 7 | CHILDERS PRODUCTS CO INC | LEVITTOWN | MATTHEW HYN |
| BUCKS | 6 | DELBAR PRODUCTS INC | TELFORD | CRAIG BENFIEL |
| BUCKS | 6 | DELBAR PRODUCTS INC | TELFORD | CRAIG BENFIEL |
| BUCKS | 5 | CLEVELAND STEEL CONTAINER CORP | QUAKERTOWN | DONALD DULIN |
| BUCKS | 5 | AVERY DENNISON FASSON ROLL DIVISION | QUAKERTOWN | ROY GETZ |
| BUCKS | 5 | SCANFORMS INC | BRISTOL | GREGORY DEF |
| BUCKS | 5 | CHILDERS PRODUCTS CO INC | LEVITTOWN | MATTHEW HYN |
| BUCKS | 5 | SCANFORMS INC | BRISTOL | GREGORY DEF |
| BUCKS | 5 | BETZ LABORATORIES INC | LANGHORNE | BINA LEAHY |
| BUCKS | 4 | DELBAR PRODUCTS INC | TELFORD | CRAIG BENFIEL |
| BUCKS | 4 | C LEVER CO INC | BENSALEM | CYRIL LEVER |
| BUCKS | 4 | FINMAC CORP SUBSIDIARY OF HULL CORP | WARMINSTER | ERIC KRATSCH |
| BUCKS | 3 | FINMAC CORP SUBSIDIARY OF HULL CORP | WARMINSTER | ERIC KRATSCH |
| BUCKS | 2 | DELBAR PRODUCTS INC | PERKASIE | CRAIG BENFIEL |
| BUCKS | 2 | CRANE CO CHEMPUMP DIVISION | WARRINGTON | ROY IMSICK |
| BUCKS | 2 | CLEVELAND STEEL CONTAINER CORP | QUAKERTOWN | DONALD DULIN |
| BUCKS | 1 | CRANE CO CHEMPUMP DIVISION | WARRINGTON | ROY IMSICK |
| BUCKS | 1 | CRANE CO CHEMPUMP DIVISION | WARRINGTON | ROY IMSICK |
| BUCKS | 1 | ASSOCIATED RUBBER INC | QUAKERTOWN | GARY A SCOTT |
| BUCKS | 1 | CRANE CO CHEMPUMP DIVISION | WARRINGTON | ROY IMSICK |
| BUCKS | 1 | CRANE CO CHEMPUMP DIVISION | WARRINGTON | ROY IMSICK |
| BUCKS | 1 | AVERY DENNISON FASSON ROLL DIVISION | QUAKERTOWN | ROY GETZ |
| BUCKS | 1 | CRANE CO CHEMPUMP DIVISION | WARRINGTON | ROY IMSICK |
| BUCKS | 1 | CHILDERS PRODUCTS CO INC | LEVITTOWN | MATTHEW HYN |
| BUCKS | 1 | AVERY DENNISON FASSON ROLL DIVISION | QUAKERTOWN | ROY GETZ |
| BUCKS | 1 | FINMAC CORP SUBSIDIARY OF HULL CORP | WARMINSTER | ERIC KRATSCH |
| BUCKS | 1 | ASSOCIATED RUBBER INC | QUAKERTOWN | GARY A SCOTT |
| BUCKS | 1 | FINMAC CORP SUBSIDIARY OF HULL CORP | WARMINSTER | ERIC KRATSCH |
| BUCKS | 1 | CHILDERS PRODUCTS CO INC | LEVITTOWN | MATTHEW HYN |
| BUCKS | 1 | FINMAC CORP SUBSIDIARY OF HULL CORP | WARMINSTER | ERIC KRATSCH |
| BUCKS | 1 | DELBAR PRODUCTS INC | PERKASIE | CRAIG BENFIEL |
| BUCKS | 1 | DELBAR PRODUCTS INC | PERKASIE | CRAIG BENFIEL |
| BUCKS | 1 | DELBAR PRODUCTS INC | TELFORD | CRAIG BENFIEL |
| BUCKS | 1 | DELBAR PRODUCTS INC | TELFORD | CRAIG BENFIEL |
| BUCKS | 1 | PERKASIE INDUSTRIES CORP | PERKASIE | WILLIAM R KEN |
| BUCKS | 1 | ASSOCIATED RUBBER INC | QUAKERTOWN | GARY A SCOTT |
| BUCKS | 1 | ASSOCIATED RUBBER INC | QUAKERTOWN | GARY A SCOTT |
| BUCKS | 1 | FINMAC CORP SUBSIDIARY OF HULL CORP | WARMINSTER | ERIC KRATSCH |
| CHESTER | 106510 | HERR FOODS INC | NOTTINGHAM | STEVE MORAN |
| CHESTER | 780 | BECKETT CORP | LIONVILLE | THOMAS KAUF |
| CHESTER | 656 | MUSHROOM COOPERATIVE CANNING CO | KENNETT SQUARE | DENNIS NEWH |
| CHESTER | 501 | NVF CO TECHNICAL PRODUCTS DIVISION | KENNETT SQUARE | WILLIAM WITT |
| CHESTER | 464 | SEALED AIR CORP | MODENA | GEORGE E DU |
| CHESTER | 428 | WORTHINGTON STEEL | MALVERN | MELANIE J YOU |
| CHESTER | 370 | VALLEY FORGE TAPE & LABEL CO INC | EXTON | J MICHAEL PES |
| CHESTER | 252 | ORE IDA FOODS INC | WEST CHESTER | DANIEL HEISER |
| CHESTER | 218 | NVF CO TECHNICAL PRODUCTS DIVISION | KENNETT SQUARE | WILLIAM WITT |
| CHESTER | 212 | HERR FOODS INC | NOTTINGHAM | STEVE MORAN |
| CHESTER | 193 | HARTMAN PLASTICS INC | HONEY BROOK | ROBERT HART |
| CHESTER | 177 | ICI FLUOROPOLYMERS DIVISION OF ICI AMERICAS INC | DOWNINGTOWN | JOHN P BONNE |
| CHESTER | 161 | AXEL JOHNSON METALS INC | EXTON | RONALD M DEN |
| CHESTER | 128 | HERR FOODS INC | NOTTINGHAM | STEVE MORAN |
| CHESTER | 128 | HERR FOODS INC | NOTTINGHAM | STEVE MORAN |
| CHESTER | 77 | QUEBECOR PRINTING ATGLEN INC | ATGLEN | DIANE POTTS |
| CHESTER | 75 | ORE IDA FOODS INC | WEST CHESTER | DANIEL HEISER |
| CHESTER | 69 | ICI FLUOROPOLYMERS DIVISION OF ICI AMERICAS INC | DOWNINGTOWN | JOHN P BONNE |
| CHESTER | 48 | SARTOMER CO INC | WEST CHESTER | DAVID CAMPBE |
| CHESTER | 42 | SARTOMER CO INC | WEST CHESTER | DAVID CAMPBE |
| CHESTER | 36 | SARTOMER CO INC | WEST CHESTER | DAVID CAMPBE |
| CHESTER | 35 | ORE IDA FOODS INC | WEST CHESTER | DANIEL HEISER |
| CHESTER | 31 | AXEL JOHNSON METALS INC | EXTON | RONALD M DEN |

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|---|---|---|---|---|
| CHESTER | 30 | EDLON PRODUCTS INC | AVONDALE | CRAIG HENNES |
| CHESTER | 25 | AXEL JOHNSON METALS INC | EXTON | RONALD M DEN |
| CHESTER | 25 | MUSHROOM COOPERATIVE CANNING CO | KENNETT SQUARE | DENNIS NEWHA |
| CHESTER | 24 | WHITFORD CORP | FRAZER | ROBERT L TRO |
| CHESTER | 24 | TAYLOR INDUSTRIES INC | PARKERFORD | BRUCE W TAYL |
| CHESTER | 24 | WHITFORD CORP | FRAZER | ROBERT L TRO |
| CHESTER | 24 | AMERICAN INKS & COATINGS CORP | PHOENIXVILLE | S JAY MORROV |
| CHESTER | 17 | WORTHINGTON STEEL | MALVERN | MELANIE J YOU |
| CHESTER | 14 | SARTOMER CO INC | WEST CHESTER | DAVID CAMPBE |
| CHESTER | 12 | DAVLYN MANUFACTURING CO INC | SPRING CITY | THOMAS WEIL |
| CHESTER | 12 | SARTOMER CO INC | WEST CHESTER | DAVID CAMPBE |
| CHESTER | 11 | DAVLYN MANUFACTURING CO INC | SPRING CITY | THOMAS WEIL |
| CHESTER | 11 | NVF CO TECHNICAL PRODUCTS DIVISION | KENNETT SQUARE | WILLIAM WITT |
| CHESTER | 9 | SARTOMER CO INC | WEST CHESTER | DAVID CAMPBE |
| CHESTER | 8 | TAYLOR INDUSTRIES INC | PARKERFORD | BRUCE W TAYL |
| CHESTER | 6 | EDLON PRODUCTS INC | AVONDALE | CRAIG HENNES |
| CHESTER | 6 | TAYLOR INDUSTRIES INC | PARKERFORD | BRUCE W TAYL |
| CHESTER | 6 | GENERAL ELECTRIC CO | MALVERN | HAL HECKMAN |
| CHESTER | 6 | WHITFORD CORP | FRAZER | ROBERT L TRO |
| CHESTER | 5 | BECKETT CORP | LIONVILLE | THOMAS KAUFI |
| CHESTER | 4 | HERR FOODS INC | NOTTINGHAM | STEVE MORAN |
| CHESTER | 4 | SARTOMER CO INC | WEST CHESTER | DAVID CAMPBE |
| CHESTER | 4 | BECKETT CORP | LIONVILLE | THOMAS KAUFI |
| CHESTER | 4 | BECKETT CORP | LIONVILLE | THOMAS KAUFI |
| CHESTER | 4 | WORTHINGTON STEEL | MALVERN | MELANIE J YOU |
| CHESTER | 4 | BECKETT CORP | LIONVILLE | THOMAS KAUFI |
| CHESTER | 3 | WORTHINGTON STEEL | MALVERN | MELANIE J YOU |
| CHESTER | 3 | SARTOMER CO INC | WEST CHESTER | DAVID CAMPBE |
| CHESTER | 3 | WHITFORD CORP | FRAZER | ROBERT L TRO |
| CHESTER | 2 | BECKETT CORP | LIONVILLE | THOMAS KAUFI |
| CHESTER | 2 | WORTHINGTON STEEL | MALVERN | MELANIE J YOU |
| CHESTER | 2 | WHITFORD CORP | FRAZER | ROBERT L TRO |
| CHESTER | 2 | BECKETT CORP | LIONVILLE | THOMAS KAUFI |
| CHESTER | 2 | EDLON PRODUCTS INC | AVONDALE | CRAIG HENNES |
| CHESTER | 2 | JACKSON IMMUNORESEARCH LABS INC | WEST GROVE | WILLIAM STEGE |
| CHESTER | 1 | ORE IDA FOODS INC | WEST CHESTER | DANIEL HEISER |
| CHESTER | 1 | GENERAL ELECTRIC CO | MALVERN | HAL HECKMAN |
| CHESTER | 1 | DAVLYN MANUFACTURING CO INC | SPRING CITY | THOMAS WEIL |
| CHESTER | 1 | EDLON PRODUCTS INC | AVONDALE | CRAIG HENNES |
| CHESTER | 1 | GENERAL ELECTRIC CO | MALVERN | HAL HECKMAN |
| CHESTER | 1 | SARTOMER CO INC | WEST CHESTER | DAVID CAMPBE |
| CHESTER | 1 | ORE IDA FOODS INC | WEST CHESTER | DANIEL HEISER |
| CHESTER | 1 | WHITFORD CORP | FRAZER | ROBERT L TRO |
| CHESTER | 1 | SARTOMER CO INC | WEST CHESTER | DAVID CAMPBE |
| CHESTER | 1 | ORE IDA FOODS INC | WEST CHESTER | DANIEL HEISER |
| CHESTER | 1 | WORTHINGTON STEEL | MALVERN | MELANIE J YOU |
| CHESTER | 1 | WORTHINGTON STEEL | MALVERN | MELANIE J YOU |
| CHESTER | 1 | WORTHINGTON STEEL | MALVERN | MELANIE J YOU |
| CHESTER | 1 | ORE IDA FOODS INC | WEST CHESTER | DANIEL HEISER |
| CHESTER | 1 | WHITFORD CORP | FRAZER | ROBERT L TRO |
| CHESTER | 1 | SARTOMER CO INC | WEST CHESTER | DAVID CAMPBE |
| CHESTER | 1 | WORTHINGTON STEEL | MALVERN | MELANIE J YOU |
| CHESTER | 1 | DAVLYN MANUFACTURING CO INC | SPRING CITY | THOMAS WEIL |
| CHESTER | 1 | DOPACO INC | DOWNINGTOWN | JANICE SULLIV |
| CHESTER | 1 | SARTOMER CO INC | WEST CHESTER | DAVID CAMPBE |
| CHESTER | 1 | GENERAL ELECTRIC CO | MALVERN | HAL HECKMAN |
| CHESTER | 1 | ORE IDA FOODS INC | WEST CHESTER | DANIEL HEISER |
| CHESTER | 1 | GENERAL ELECTRIC CO | MALVERN | HAL HECKMAN |
| CHESTER | 1 | GENERAL ELECTRIC CO | MALVERN | HAL HECKMAN |
| CHESTER | 1 | AXEL JOHNSON METALS INC | EXTON | RONALD M DEN |
| DELAWARE | 200 | BOEING DEFENSE & SPACE CORP HELICOPTERS DIVISION | RIDLEY PARK | BRIDGET C SCI |

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|---|---|---|---|---|
| DELAWARE | 143 | BOEING DEFENSE & SPACE CORP HELICOPTERS DIVISION | RIDLEY PARK | BRIDGET C SCI |
| DELAWARE | 39 | PPG INDUSTRIES INC | FOLCROFT | MICHAEL CARI |
| DELAWARE | 20 | BOEING DEFENSE & SPACE CORP HELICOPTERS DIVISION | RIDLEY PARK | BRIDGET C SCI |
| DELAWARE | 15 | BOEING DEFENSE & SPACE CORP HELICOPTERS DIVISION | RIDLEY PARK | BRIDGET C SCI |
| DELAWARE | 14 | CUSTOM COMPOUNDING INC | ASTON | EDWARD STRU |
| DELAWARE | 14 | BOEING DEFENSE & SPACE CORP HELICOPTERS DIVISION | RIDLEY PARK | BRIDGET C SCI |
| DELAWARE | 8 | BOEING DEFENSE & SPACE CORP HELICOPTERS DIVISION | RIDLEY PARK | BRIDGET C SCI |
| DELAWARE | 7 | CUSTOM COMPOUNDING INC | ASTON | EDWARD STRU |
| DELAWARE | 7 | BOEING DEFENSE & SPACE CORP HELICOPTERS DIVISION | RIDLEY PARK | BRIDGET C SCI |
| DELAWARE | 6 | BOEING DEFENSE & SPACE CORP HELICOPTERS DIVISION | RIDLEY PARK | BRIDGET C SCI |
| DELAWARE | 4 | BOEING DEFENSE & SPACE CORP HELICOPTERS DIVISION | RIDLEY PARK | BRIDGET C SCI |
| DELAWARE | 2 | FIBRE METAL PRODUCTS CO | CONCORDVILLE | GARY J THURW |
| DELAWARE | 1 | FRANKLIN MINT | FRANKLIN CENTER | PETE MCBRIEN |
| DELAWARE | 1 | FRANKLIN MINT | FRANKLIN CENTER | PETE MCBRIEN |
| MONTGOMERY | 16463 | CABOT PERFORMANCE MATERIALS | BOYERTOWN | ANTHONY T CA |
| MONTGOMERY | 3667 | WAMPLER LONGACRE TURKEY INC | FRANCONIA | RUDY H HOESS |
| MONTGOMERY | 1714 | OCCIDENTAL CHEMICAL CORP | POTTSTOWN | BRADLEY A OK |
| MONTGOMERY | 774 | CABOT PERFORMANCE MATERIALS | BOYERTOWN | ANTHONY T CA |
| MONTGOMERY | 568 | FORD ELECTRONICS & REFRIGERATION CORP | LANSDALE | JOSEPHINE HIS |
| MONTGOMERY | 500 | MRS SMITHS FROZEN FOODS CO INC | POTTSTOWN | MIKE KRICK |
| MONTGOMERY | 480 | RORER PHARMACEUTICAL CORP | FORT WASHINGTON | DAVID W BUTLI |
| MONTGOMERY | 333 | OCCIDENTAL CHEMICAL CORP | POTTSTOWN | BRADLEY A OK |
| MONTGOMERY | 279 | OCCIDENTAL CHEMICAL CORP | POTTSTOWN | BRADLEY A OK |
| MONTGOMERY | 249 | LEHIGH VALLEY DAIRIES INC | LANSDALE | AUSTIN W RAC |
| MONTGOMERY | 200 | ROSENBERGER COLD STORAGE & TRANSPORT | HATFIELD | CHARLES KULF |
| MONTGOMERY | 200 | COLORCON A DIVISION OF BPSI | WEST POINT | ALBERT FALA |
| MONTGOMERY | 192 | CONTAINER CORP OF AMERICA | NORTH WALES | JOHN G CAMEF |
| MONTGOMERY | 165 | LEHIGH VALLEY DAIRIES INC | FORT WASHINGTON | CHRISTOPHER |
| MONTGOMERY | 163 | OCCIDENTAL CHEMICAL CORP | POTTSTOWN | BRADLEY A OK |
| MONTGOMERY | 152 | KEYSTONE YARWAY CORP | BLUE BELL | GERALD ANDEI |
| MONTGOMERY | 152 | CABOT PERFORMANCE MATERIALS | BOYERTOWN | ANTHONY T CA |
| MONTGOMERY | 148 | SPS TECHNOLOGIES INC | JENKINTOWN | STEPHEN PIER |
| MONTGOMERY | 144 | BROOKS INSTRUMENT | HATFIELD | JEFF DORFMAN |
| MONTGOMERY | 127 | ELF ATOCHEM NORTH AMERICA INC | KING OF PRUSSIA | F RAYMOND AN |
| MONTGOMERY | 127 | ELF ATOCHEM NORTH AMERICA INC | KING OF PRUSSIA | F RAYMOND AN |
| MONTGOMERY | 108 | SAFEGUARD BUSINESS SYSTEMS INC | NORTH WALES | LES DARRELL |
| MONTGOMERY | 106 | PRECISION TUBE CO INC | NORTH WALES | CHARLES BLAC |
| MONTGOMERY | 104 | PECORA CORP | HARLEYSVILLE | FRED MACCON |
| MONTGOMERY | 103 | PECORA CORP | HARLEYSVILLE | FRED MACCON |
| MONTGOMERY | 95 | STABILUS | COLMAR | JOE D HOBBS |
| MONTGOMERY | 94 | POTTSTOWN PLATING WORKS INC | POTTSTOWN | JOHN C WELKI |
| MONTGOMERY | 94 | FORMS INC SPECTRA GRAPHICS | WILLOW GROVE | KIMBERLY SLA |
| MONTGOMERY | 92 | AMERICAN BANKNOTE CO | HORSHAM | ERIC T BINNS |
| MONTGOMERY | 91 | SGS THOMSON MICROELECTRONICS INC | MONTGOMERYVILLE | JAMES BISCARI |
| MONTGOMERY | 90 | OCCIDENTAL CHEMICAL CORP | POTTSTOWN | BRADLEY A OK |
| MONTGOMERY | 80 | ALDERFER BOLOGNA CO INC | HARLEYSVILLE | ADRIENNE KILK |
| MONTGOMERY | 70 | ORTHO MCNEIL PHARMACEUTICAL | SPRING HOUSE | MICHAEL ESPO |
| MONTGOMERY | 67 | STANLEY TOOLS | ROYERSFORD | JEFF KOPENITZ |
| MONTGOMERY | 61 | SPS TECHNOLOGIES INC | JENKINTOWN | STEPHEN PIER |
| MONTGOMERY | 52 | RAHNS SPECIALTY METALS | RAHNS | LANE KREIDER |
| MONTGOMERY | 48 | AMERICAN BANKNOTE CO | HORSHAM | ERIC T BINNS |
| MONTGOMERY | 48 | SAFEGUARD BUSINESS SYSTEMS INC | HARLEYSVILLE | LIZ PRYWITOW |
| MONTGOMERY | 42 | RORER PHARMACEUTICAL CORP | FORT WASHINGTON | DAVID W BUTLI |
| MONTGOMERY | 39 | BETZ LABORATORIES INC LABORATORY SUPPLY | HORSHAM | CHET SADOSK |
| MONTGOMERY | 31 | STABILUS | COLMAR | JOE D HOBBS |
| MONTGOMERY | 30 | SIMCO CO INC | HATFIELD | MICHAEL S OLI |
| MONTGOMERY | 30 | STANLEY TOOLS | ROYERSFORD | JEFF KOPENITZ |
| MONTGOMERY | 29 | AMERICAN BANK NOTE HOLOGRAPHICS INC | HUNTINGDON VALLEY | STEVEN RENNI |
| MONTGOMERY | 27 | OCCIDENTAL CHEMICAL CORP | POTTSTOWN | BRADLEY A OK |
| MONTGOMERY | 26 | POTTSTOWN PLATING WORKS INC | POTTSTOWN | JOHN C WELKI |
| MONTGOMERY | 21 | A & L HANDLES INC | POTTSTOWN | PHILIP STONIEI |

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|---|---|---|---|---|
| MONTGOMERY | 21 | HULL CORP | HATBORO | ERIC KRATSCH |
| MONTGOMERY | 20 | HULL CORP | HATBORO | ERIC KRATSCH |
| MONTGOMERY | 16 | PICCARI PRESS INC | COLMAR | CARL PICCARI |
| MONTGOMERY | 16 | STABILUS | COLMAR | JOE D HOBBS |
| MONTGOMERY | 14 | AMERICAN BANKNOTE CO | HORSHAM | ERIC T BINNS |
| MONTGOMERY | 12 | BROOKS INSTRUMENT | HATFIELD | JEFF DORFMAN |
| MONTGOMERY | 12 | ALDERFER BOLOGNA CO INC | HARLEYSVILLE | ADRIENNE KILK |
| MONTGOMERY | 8 | OCCIDENTAL CHEMICAL CORP | POTTSTOWN | BRADLEY A OK |
| MONTGOMERY | 6 | A & L HANDLES INC | POTTSTOWN | PHILIP STONIER |
| MONTGOMERY | 6 | POTTSTOWN PLATING WORKS INC | POTTSTOWN | JOHN C WELKI |
| MONTGOMERY | 5 | BETZ LABORATORIES INC LABORATORY SUPPLY | HORSHAM | CHET SADOSKY |
| MONTGOMERY | 5 | PICCARI PRESS INC | COLMAR | CARL PICCARI |
| MONTGOMERY | 5 | FORMS INC SPECTRA GRAPHICS | WILLOW GROVE | KIMBERLY SLAT |
| MONTGOMERY | 5 | STANLEY TOOLS | ROYERSFORD | JEFF KOPENITZ |
| MONTGOMERY | 4 | OCCIDENTAL CHEMICAL CORP | POTTSTOWN | BRADLEY A OK |
| MONTGOMERY | 3 | AMERICAN BANK NOTE HOLOGRAPHICS INC | HUNTINGDON VALLEY | STEVEN RENNE |
| MONTGOMERY | 3 | HULL CORP | HATBORO | ERIC KRATSCH |
| MONTGOMERY | 3 | BETZ LABORATORIES INC LABORATORY SUPPLY | HORSHAM | CHET SADOSKY |
| MONTGOMERY | 3 | CABOT PERFORMANCE MATERIALS | BOYERTOWN | ANTHONY T CA |
| MONTGOMERY | 2 | CABOT PERFORMANCE MATERIALS | BOYERTOWN | ANTHONY T CA |
| MONTGOMERY | 2 | HULL CORP | HATBORO | ERIC KRATSCH |
| MONTGOMERY | 2 | SPS TECHNOLOGIES INC | JENKINTOWN | STEPHEN PIER |
| MONTGOMERY | 2 | SGS THOMSON MICROELECTRONICS INC | MONTGOMERYVILLE | JAMES BISCARI |
| MONTGOMERY | 1 | PECORA CORP | HARLEYSVILLE | FRED MACCON |
| MONTGOMERY | 1 | OCCIDENTAL CHEMICAL CORP | POTTSTOWN | BRADLEY A OK |
| MONTGOMERY | 1 | BROOKS INSTRUMENT | HATFIELD | JEFF DORFMAN |
| MONTGOMERY | 1 | HULL CORP | HATBORO | ERIC KRATSCH |
| MONTGOMERY | 1 | SGS THOMSON MICROELECTRONICS INC | MONTGOMERYVILLE | JAMES BISCARI |
| MONTGOMERY | 1 | HULL CORP | HATBORO | ERIC KRATSCH |
| MONTGOMERY | 1 | SGS THOMSON MICROELECTRONICS INC | MONTGOMERYVILLE | JAMES BISCARI |
| MONTGOMERY | 1 | PECORA CORP | HARLEYSVILLE | FRED MACCON |
| MONTGOMERY | 1 | PECORA CORP | HARLEYSVILLE | FRED MACCON |
| PHILADELPHIA | 3000 | NEWMAN & CO INC | PHILADELPHIA | DAVID NEWMAI |
| PHILADELPHIA | 2100 | NEWMAN & CO INC | PHILADELPHIA | DAVID NEWMAI |
| PHILADELPHIA | 1630 | HYGRADE FOOD PRODUCTS ASSOCIATES | PHILADELPHIA | BEVERLY A HAI |
| PHILADELPHIA | 1162 | NABISCO BISCUIT CO | PHILADELPHIA | WALTER G GO |
| PHILADELPHIA | 982 | AMERICAN PACKAGING CORP | PHILADELPHIA | GREGORY J BO |
| PHILADELPHIA | 780 | KURZ HASTINGS INC | PHILADELPHIA | ROBERT L WAL |
| PHILADELPHIA | 570 | PUROLITE CO | PHILADELPHIA | ERIC JOHNSON |
| PHILADELPHIA | 535 | NEWMAN & CO INC | PHILADELPHIA | DAVID NEWMAI |
| PHILADELPHIA | 535 | NEWMAN & CO INC | PHILADELPHIA | DAVID NEWMAI |
| PHILADELPHIA | 435 | FRANKFORD CANDY & CHOCOLATE CO | PHILADELPHIA | EDWIN BARTH |
| PHILADELPHIA | 258 | PHILADELPHIA GAS WORKS | PHILADELPHIA | MICHAEL L LIGI |
| PHILADELPHIA | 258 | PHILADELPHIA GAS WORKS | PHILADELPHIA | MICHAEL L LIGI |
| PHILADELPHIA | 240 | PHILADELPHIA GAS WORKS | PHILADELPHIA | MICHAEL L LIGI |
| PHILADELPHIA | 231 | OXFORD BOOKBINDING | PHILADELPHIA | JOSEPH GRITZ |
| PHILADELPHIA | 216 | PHILADELPHIA GAS WORKS | PHILADELPHIA | MICHAEL L LIGI |
| PHILADELPHIA | 205 | PHILADELPHIA GAS WORKS | PHILADELPHIA | MICHAEL L LIGI |
| PHILADELPHIA | 185 | PUROLITE CO | PHILADELPHIA | ERIC JOHNSON |
| PHILADELPHIA | 129 | PUROLITE CO | PHILADELPHIA | ERIC JOHNSON |
| PHILADELPHIA | 121 | NAMICO INC | PHILADELPHIA | COLBY H SNYD |
| PHILADELPHIA | 121 | LAFRANCE CORP | PHILADELPHIA | THOMAS J SAL |
| PHILADELPHIA | 120 | KURZ HASTINGS INC | PHILADELPHIA | ROBERT L WAL |
| PHILADELPHIA | 102 | PHILADELPHIA GAS WORKS | PHILADELPHIA | MICHAEL L LIGI |
| PHILADELPHIA | 74 | HYGRADE FOOD PRODUCTS ASSOCIATES | PHILADELPHIA | BEVERLY A HAI |
| PHILADELPHIA | 65 | FIBRE YARNS & FILLERS INC | PHILADELPHIA | FRANK HEPPEI |
| PHILADELPHIA | 60 | BAUM PRINTING INC | PHILADELPHIA | LINDA BABISH |
| PHILADELPHIA | 60 | KURZ HASTINGS INC | PHILADELPHIA | ROBERT L WAL |
| PHILADELPHIA | 49 | PUROLITE CO | PHILADELPHIA | ERIC JOHNSON |
| PHILADELPHIA | 48 | CAS PACK CORP | PHILADELPHIA | W RUSSELL SM |
| PHILADELPHIA | 41 | ARBILL INDUSTRIES INC | PHILADELPHIA | RON BOROFSK |

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|---|---|---|---|---|
| PHILADELPHIA | 41 | MA BRUDER & SONS INC | PHILADELPHIA | DON DEUTSCH |
| PHILADELPHIA | 35 | BAUM PRINTING INC | PHILADELPHIA | LINDA BABISH |
| PHILADELPHIA | 35 | BAUM PRINTING INC | PHILADELPHIA | LINDA BABISH |
| PHILADELPHIA | 30 | G WHITFIELD RICHARDS CO | PHILADELPHIA | S P BARATTA |
| PHILADELPHIA | 28 | LAFRANCE CORP | PHILADELPHIA | THOMAS J SAL |
| PHILADELPHIA | 27 | PENN VENTILATOR CO INC | PHILADELPHIA | LESTER J GAAL |
| PHILADELPHIA | 22 | G WHITFIELD RICHARDS CO | PHILADELPHIA | S P BARATTA |
| PHILADELPHIA | 18 | BAUM PRINTING INC | PHILADELPHIA | LINDA BABISH |
| PHILADELPHIA | 18 | HYGRADE FOOD PRODUCTS ASSOCIATES | PHILADELPHIA | BEVERLY A HAI |
| PHILADELPHIA | 17 | PENN VENTILATOR CO INC | PHILADELPHIA | LESTER J GAAL |
| PHILADELPHIA | 17 | MA BRUDER & SONS INC | PHILADELPHIA | DON DEUTSCH |
| PHILADELPHIA | 16 | UNITED COLOR MANUFACTURING INC | PHILADELPHIA | ROBERT MCNU |
| PHILADELPHIA | 14 | BAUM PRINTING INC | PHILADELPHIA | LINDA BABISH |
| PHILADELPHIA | 14 | BAUM PRINTING INC | PHILADELPHIA | LINDA BABISH |
| PHILADELPHIA | 14 | PEARL PRESSMAN LIBERTY INC | PHILADELPHIA | MICHAEL ROSE |
| PHILADELPHIA | 13 | ACTION MANUFACTURING CO PLANT 6 | PHILADELPHIA | MICHAEL BITTN |
| PHILADELPHIA | 12 | HILLOCK ANODIZING INC | PHILADELPHIA | JOHN HILLOCK |
| PHILADELPHIA | 12 | AMERICAN PACKAGING CORP | PHILADELPHIA | GREGORY J BO |
| PHILADELPHIA | 12 | PENN FISHING TACKLE MANUFACTURING CO | PHILADELPHIA | ROBERT DOUG |
| PHILADELPHIA | 12 | ACTION MANUFACTURING CO PLANT 6 | PHILADELPHIA | MICHAEL BITTN |
| PHILADELPHIA | 11 | PEARL PRESSMAN LIBERTY INC | PHILADELPHIA | MICHAEL ROSE |
| PHILADELPHIA | 10 | ACTION MANUFACTURING CO PLANT 6 | PHILADELPHIA | MICHAEL BITTN |
| PHILADELPHIA | 9 | GRAPHIC ARTS INC | PHILADELPHIA | DAVE SALTER |
| PHILADELPHIA | 9 | FIBRE YARNS & FILLERS INC | PHILADELPHIA | FRANK HEPPER |
| PHILADELPHIA | 9 | PEARL PRESSMAN LIBERTY INC | PHILADELPHIA | MICHAEL ROSE |
| PHILADELPHIA | 9 | PEARL PRESSMAN LIBERTY INC | PHILADELPHIA | MICHAEL ROSE |
| PHILADELPHIA | 9 | LAFRANCE CORP | PHILADELPHIA | THOMAS J SAL |
| PHILADELPHIA | 8 | GRAPHIC ARTS INC | PHILADELPHIA | DAVE SALTER |
| PHILADELPHIA | 7 | LAFRANCE CORP | PHILADELPHIA | THOMAS J SAL |
| PHILADELPHIA | 6 | SPD TECHNOLOGIES INC | PHILADELPHIA | JOSEPH SIENK |
| PHILADELPHIA | 6 | GENERAL ELECTRIC CO SPECIALTY BREAKER | PHILADELPHIA | MICHAEL R FAI |
| PHILADELPHIA | 6 | SPD TECHNOLOGIES INC | PHILADELPHIA | JOSEPH SIENK |
| PHILADELPHIA | 6 | NABISCO BISCUIT CO | PHILADELPHIA | WALTER G GO |
| PHILADELPHIA | 6 | ACTION MANUFACTURING CO PLANT 6 | PHILADELPHIA | MICHAEL BITTN |
| PHILADELPHIA | 6 | SPD TECHNOLOGIES INC | PHILADELPHIA | JOSEPH SIENK |
| PHILADELPHIA | 6 | SPD TECHNOLOGIES INC | PHILADELPHIA | JOSEPH SIENK |
| PHILADELPHIA | 5 | PENN FISHING TACKLE MANUFACTURING CO | PHILADELPHIA | ROBERT DOUG |
| PHILADELPHIA | 5 | SPD TECHNOLOGIES INC | PHILADELPHIA | JOSEPH SIENK |
| PHILADELPHIA | 5 | PEARL PRESSMAN LIBERTY INC | PHILADELPHIA | MICHAEL ROSE |
| PHILADELPHIA | 5 | PENN FISHING TACKLE MANUFACTURING CO | PHILADELPHIA | ROBERT DOUG |
| PHILADELPHIA | 4 | VALDEZ FOODS INC | PHILADELPHIA | PERFECTO VAL |
| PHILADELPHIA | 3 | GENERAL ELECTRIC CO SPECIALTY BREAKER | PHILADELPHIA | MICHAEL R FAI |
| PHILADELPHIA | 3 | PENN VENTILATOR CO INC | PHILADELPHIA | LESTER J GAAL |
| PHILADELPHIA | 3 | PEARL PRESSMAN LIBERTY INC | PHILADELPHIA | MICHAEL ROSE |
| PHILADELPHIA | 3 | SPD TECHNOLOGIES INC | PHILADELPHIA | JOSEPH SIENK |
| PHILADELPHIA | 3 | LAFRANCE CORP | PHILADELPHIA | THOMAS J SAL |
| PHILADELPHIA | 3 | SPD TECHNOLOGIES INC | PHILADELPHIA | JOSEPH SIENK |
| PHILADELPHIA | 3 | SPD TECHNOLOGIES INC | PHILADELPHIA | JOSEPH SIENK |
| PHILADELPHIA | 3 | SPD TECHNOLOGIES INC | PHILADELPHIA | JOSEPH SIENK |
| PHILADELPHIA | 3 | UNITED COLOR MANUFACTURING INC | PHILADELPHIA | ROBERT MCNU |
| PHILADELPHIA | 2 | PENN VENTILATOR CO INC | PHILADELPHIA | LESTER J GAAL |
| PHILADELPHIA | 2 | SPD TECHNOLOGIES INC | PHILADELPHIA | JOSEPH SIENK |
| PHILADELPHIA | 2 | SPD TECHNOLOGIES INC | PHILADELPHIA | JOSEPH SIENK |
| PHILADELPHIA | 2 | LAFRANCE CORP | PHILADELPHIA | THOMAS J SAL |
| PHILADELPHIA | 2 | GRAPHIC ARTS INC | PHILADELPHIA | DAVE SALTER |
| PHILADELPHIA | 2 | OXFORD BOOKBINDING | PHILADELPHIA | JOSEPH GRITZ |
| PHILADELPHIA | 2 | GRAPHIC ARTS INC | PHILADELPHIA | DAVE SALTER |
| PHILADELPHIA | 1 | ACTION MANUFACTURING CO PLANT 6 | PHILADELPHIA | MICHAEL BITTN |
| PHILADELPHIA | 1 | OXFORD BOOKBINDING | PHILADELPHIA | JOSEPH GRITZ |
| PHILADELPHIA | 1 | OXFORD BOOKBINDING | PHILADELPHIA | JOSEPH GRITZ |
| PHILADELPHIA | 1 | LAFRANCE CORP | PHILADELPHIA | THOMAS J SAL |

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|---|---|---|---|---|
| PHILADELPHIA | 1 | LAFRANCE CORP | PHILADELPHIA | THOMAS J SAL |
| PHILADELPHIA | 1 | PENN FISHING TACKLE MANUFACTURING CO | PHILADELPHIA | ROBERT DOUG |
| PHILADELPHIA | 1 | ACTION MANUFACTURING CO PLANT 6 | PHILADELPHIA | MICHAEL BITTN |
| PHILADELPHIA | 1 | PENN VENTILATOR CO INC | PHILADELPHIA | LESTER J GAAL |
| PHILADELPHIA | 1 | ACTION MANUFACTURING CO PLANT 6 | PHILADELPHIA | MICHAEL BITTN |
| PHILADELPHIA | 1 | PENN VENTILATOR CO INC | PHILADELPHIA | LESTER J GAAL |
| PHILADELPHIA | 1 | SPD TECHNOLOGIES INC | PHILADELPHIA | JOSEPH SIENK |
| PHILADELPHIA | 1 | SPD TECHNOLOGIES INC | PHILADELPHIA | JOSEPH SIENK |
| PHILADELPHIA | 1 | SPD TECHNOLOGIES INC | PHILADELPHIA | JOSEPH SIENK |
| PHILADELPHIA | 1 | SPD TECHNOLOGIES INC | PHILADELPHIA | JOSEPH SIENK |
| PHILADELPHIA | 1 | VALDEZ FOODS INC | PHILADELPHIA | PERFECTO VAL |
| PHILADELPHIA | 1 | REGAL INTERNATIONAL LEATHER INC | PHILADELPHIA | ALEX DOULOS |
| PHILADELPHIA | 1 | REGAL INTERNATIONAL LEATHER INC | PHILADELPHIA | ALEX DOULOS |
| PHILADELPHIA | 1 | PENN VENTILATOR CO INC | PHILADELPHIA | LESTER J GAAL |
| PHILADELPHIA | 1 | ACTION MANUFACTURING CO PLANT 6 | PHILADELPHIA | MICHAEL BITTN |

# Waste Paper Reported As Stored

| County Name | Waste Quantity | Facility Name | Location City | Conact Name | |
|---|---|---|---|---|---|
| BUCKS | 4 | BETZ LABORATORIES INC | TREVOSE | E D HOCHBERG | M |
| BUCKS | 2 | BETZ LABORATORIES INC | TREVOSE | E D HOCHBERG | M |
| BUCKS | 1 | BETZ LABORATORIES INC | TREVOSE | E D HOCHBERG | M |
| MONTGOMERY | 2 | BETZ LABORATORIES INC LABORATORY SUPPLY | HORSHAM | CHET SADOSKY | M |
| PHILADELPHIA | 10 | ACTION MANUFACTURING CO PLANT 6 | PHILADELPHIA | MICHAEL BITTNER | M |

# Waste Paper Reported As Incinerated

| County Name | Waste Quantity | Facility Name | Location City | Conact Name | |
|---|---|---|---|---|---|
| BUCKS | 197 | PRE FINISHED METALS CO PRIOR COATED ME | MORRISVILLE | BONNIE L PRAY | E |
| BUCKS | 131 | POLYKOTE CORP | WARMINSTER | ALDO CEPRANO | P |
| BUCKS | 78 | FRES CO SYSTEM USA INC | TELFORD | FRANK LOSAGIO | E |
| BUCKS | 68 | PRE FINISHED METALS CO PRIOR COATED ME | MORRISVILLE | BONNIE L PRAY | E |
| BUCKS | 17 | LEMMON CO | SELLERSVILLE | GEORGE BROWNBACK | P |
| BUCKS | 16 | BETZ LABORATORIES INC | LANGHORNE | BINA LEAHY | P |
| BUCKS | 11 | AVERY DENNISON FASSON ROLL DIVISION | QUAKERTOWN | ROY GETZ | E |
| BUCKS | 7 | BETZ LABORATORIES INC | TREVOSE | E D HOCHBERG | M |
| BUCKS | 1 | BETZ LABORATORIES INC | TREVOSE | E D HOCHBERG | M |
| BUCKS | 1 | CHILDERS PRODUCTS CO INC | LEVITTOWN | MATTHEW HYNOSKI | A |
| CHESTER | 5401 | SARTOMER CO INC | WEST CHESTER | DAVID CAMPBELL | E |
| CHESTER | 1137 | SARTOMER CO INC | WEST CHESTER | DAVID CAMPBELL | E |
| CHESTER | 934 | SARTOMER CO INC | WEST CHESTER | DAVID CAMPBELL | E |
| CHESTER | 219 | NORWOOD COATED PRODUCTS | FRAZER | MICHAEL A ZOLOVICH | E |
| CHESTER | 101 | QUEBECOR PRINTING ATGLEN INC | ATGLEN | DIANE POTTS | E |
| CHESTER | 54 | BECKETT CORP | LIONVILLE | THOMAS KAUFMANN | V |
| CHESTER | 50 | NORWOOD COATED PRODUCTS | FRAZER | MICHAEL A ZOLOVICH | E |
| CHESTER | 22 | WORTHINGTON STEEL | MALVERN | MELANIE J YOUSEY | A |
| CHESTER | 10 | DOPACO INC | DOWNINGTOWN | JANICE SULLIVAN | E |
| CHESTER | 5 | MCCORQUODALE SECURITY CARDS INC | EXTON | JOHN KERCHER | T |
| CHESTER | 4 | WHITFORD CORP | FRAZER | ROBERT L TROUT | M |
| CHESTER | 3 | WHITFORD CORP | FRAZER | ROBERT L TROUT | M |
| CHESTER | 2 | MCCORQUODALE SECURITY CARDS INC | EXTON | JOHN KERCHER | T |
| CHESTER | 1 | MCCORQUODALE SECURITY CARDS INC | EXTON | JOHN KERCHER | T |
| CHESTER | 1 | JACKSON IMMUNORESEARCH LABS INC | WEST GROVE | WILLIAM STEGEMAN | P |

| | | | | | |
|---|---|---|---|---|---|
| CHESTER | 1 | WORTHINGTON STEEL | MALVERN | MELANIE J YOUSEY | A |
| CHESTER | 1 | DOPACO INC | DOWNINGTOWN | JANICE SULLIVAN | E |
| CHESTER | 1 | MCCORQUODALE SECURITY CARDS INC | EXTON | JOHN KERCHER | T |
| CHESTER | 1 | DOPACO INC | DOWNINGTOWN | JANICE SULLIVAN | E |
| CHESTER | 1 | WORTHINGTON STEEL | MALVERN | MELANIE J YOUSEY | A |
| CHESTER | 1 | WHITFORD CORP | FRAZER | ROBERT L TROUT | M |
| DELAWARE | 445 | GOODMARK FOODS INC | FOLCROFT | ROBERT MIDDLETON | P |
| DELAWARE | 424 | BOEING DEFENSE & SPACE CORP HELICOPTERS | RIDLEY PARK | BRIDGET C SCIAMANNA | E |
| DELAWARE | 200 | BOEING DEFENSE & SPACE CORP HELICOPTERS | RIDLEY PARK | BRIDGET C SCIAMANNA | E |
| DELAWARE | 114 | FRANKLIN MINT | FRANKLIN CENTER | PETE MCBRIEN | F |
| DELAWARE | 96 | BOEING DEFENSE & SPACE CORP HELICOPTERS | RIDLEY PARK | BRIDGET C SCIAMANNA | E |
| DELAWARE | 72 | CUSTOM COMPOUNDING INC | ASTON | EDWARD STRUGALA | S |
| DELAWARE | 65 | FRANKLIN MINT ASTON FULFILLMENT FACILITY | ASTON | PETE MCBRIEN | F |
| DELAWARE | 53 | FIBRE METAL PRODUCTS CO | CONCORDVILLE | GARY J THURWANGER | P |
| DELAWARE | 46 | BOEING DEFENSE & SPACE CORP HELICOPTERS | RIDLEY PARK | BRIDGET C SCIAMANNA | E |
| DELAWARE | 37 | FIBRE METAL PRODUCTS CO | CONCORDVILLE | GARY J THURWANGER | P |
| DELAWARE | 30 | GOODMARK FOODS INC | FOLCROFT | ROBERT MIDDLETON | P |
| DELAWARE | 30 | BOEING DEFENSE & SPACE CORP HELICOPTERS | RIDLEY PARK | BRIDGET C SCIAMANNA | E |
| DELAWARE | 25 | BOEING DEFENSE & SPACE CORP HELICOPTERS | RIDLEY PARK | BRIDGET C SCIAMANNA | E |
| DELAWARE | 16 | FIBRE METAL PRODUCTS CO | CONCORDVILLE | GARY J THURWANGER | P |
| DELAWARE | 12 | CORK INDUSTRIES INC | FOLCROFT | MICHAEL F MCDONNELL | |
| DELAWARE | 10 | BOEING DEFENSE & SPACE CORP HELICOPTERS | RIDLEY PARK | BRIDGET C SCIAMANNA | E |
| DELAWARE | 9 | BOEING DEFENSE & SPACE CORP HELICOPTERS | RIDLEY PARK | BRIDGET C SCIAMANNA | E |
| DELAWARE | 6 | FIBRE METAL PRODUCTS CO | CONCORDVILLE | GARY J THURWANGER | P |
| DELAWARE | 4 | CORK INDUSTRIES INC | FOLCROFT | MICHAEL F MCDONNELL | |
| DELAWARE | 3 | CORK INDUSTRIES INC | FOLCROFT | MICHAEL F MCDONNELL | |
| DELAWARE | 3 | CORK INDUSTRIES INC | FOLCROFT | MICHAEL F MCDONNELL | |
| DELAWARE | 2 | BOEING DEFENSE & SPACE CORP HELICOPTERS | RIDLEY PARK | BRIDGET C SCIAMANNA | E |
| DELAWARE | 2 | DUPONT PRINTING & PUBLISHING OPERATIONS | BOOTHWYN | D GUY SCRAM | E |
| DELAWARE | 1 | DUPONT PRINTING & PUBLISHING OPERATIONS | BOOTHWYN | D GUY SCRAM | E |
| MONTGOMERY | 5443 | LEHIGH VALLEY DAIRIES INC | LANSDALE | AUSTIN W RACE | T |
| MONTGOMERY | 2057 | LEHIGH VALLEY DAIRIES INC | FORT | CHRISTOPHER J GALL | E |
| MONTGOMERY | 1236 | PHILADELPHIA NEWSPAPERS INC | CONSHOHOCKEN | ANTHONY MONTALBANO | M |
| MONTGOMERY | 240 | PHILADELPHIA NEWSPAPERS INC | CONSHOHOCKEN | ANTHONY MONTALBANO | M |
| MONTGOMERY | 190 | RORER PHARMACEUTICAL CORP | FORT | DAVID W BUTLER | M |
| MONTGOMERY | 184 | SPS TECHNOLOGIES INC | JENKINTOWN | STEPHEN PIERCE | E |
| MONTGOMERY | 160 | RAHNS SPECIALTY METALS | RAHNS | LANE KREIDER | P |
| MONTGOMERY | 140 | SAFEGUARD BUSINESS SYSTEMS INC | LANSDALE | HERB BERKLEBACK | P |
| MONTGOMERY | 122 | CHEMALLOY CO INC | CONSHOHOCKEN | A C DEMOS | P |
| MONTGOMERY | 122 | STROEHMANN BAKERIES NORRISTOWN | NORRISTOWN | DANIEL W BARONE | E |
| MONTGOMERY | 54 | ORTHO MCNEIL PHARMACEUTICAL | SPRING HOUSE | MICHAEL ESPOSITO | E |
| MONTGOMERY | 15 | SPS TECHNOLOGIES INC | JENKINTOWN | STEPHEN PIERCE | E |
| MONTGOMERY | 10 | SPS TECHNOLOGIES INC | JENKINTOWN | STEPHEN PIERCE | E |
| MONTGOMERY | 7 | FORMS INC SPECTRA GRAPHICS | WILLOW GROVE | KIMBERLY SLATER | E |
| MONTGOMERY | 5 | TRANSICOIL INC | TROOPER | MARK M JOHNSON | V |
| MONTGOMERY | 4 | TRANSICOIL INC | TROOPER | MARK M JOHNSON | V |
| MONTGOMERY | 2 | PHILADELPHIA NEWSPAPERS INC | CONSHOHOCKEN | ANTHONY MONTALBANO | M |
| MONTGOMERY | 1 | TRANSICOIL INC | TROOPER | MARK M JOHNSON | V |
| MONTGOMERY | 1 | TRANSICOIL INC | TROOPER | MARK M JOHNSON | V |
| MONTGOMERY | 1 | TRANSICOIL INC | TROOPER | MARK M JOHNSON | V |
| MONTGOMERY | 1 | TRANSICOIL INC | TROOPER | MARK M JOHNSON | V |
| MONTGOMERY | 1 | TRANSICOIL INC | TROOPER | MARK M JOHNSON | V |
| MONTGOMERY | 1 | ORTHO MCNEIL PHARMACEUTICAL | SPRING HOUSE | MICHAEL ESPOSITO | E |
| MONTGOMERY | 1 | ORTHO MCNEIL PHARMACEUTICAL | SPRING HOUSE | MICHAEL ESPOSITO | E |
| MONTGOMERY | 1 | ORTHO MCNEIL PHARMACEUTICAL | SPRING HOUSE | MICHAEL ESPOSITO | E |
| MONTGOMERY | 1 | SGS THOMSON MICROELECTRONICS INC | MONTGOMERYVILL | JAMES BISCARDI | H |
| MONTGOMERY | 1 | HULL CORP | HATBORO | ERIC KRATSCHMER | S |
| MONTGOMERY | 1 | SPS TECHNOLOGIES INC | JENKINTOWN | STEPHEN PIERCE | E |
| MONTGOMERY | 1 | SPS TECHNOLOGIES INC | JENKINTOWN | STEPHEN PIERCE | E |
| MONTGOMERY | 1 | ORTHO MCNEIL PHARMACEUTICAL | SPRING HOUSE | MICHAEL ESPOSITO | E |
| MONTGOMERY | 1 | TRANSICOIL INC | TROOPER | MARK M JOHNSON | V |

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|---|---|---|---|---|---|
| PHILADELPHIA | 8 | BAUM PRINTING INC | PHILADELPHIA | LINDA BABISH | C |
| PHILADELPHIA | 6 | NABISCO BISCUIT CO | PHILADELPHIA | WALTER G GOGOLA | E |
| PHILADELPHIA | 5 | BAUM PRINTING INC | PHILADELPHIA | LINDA BABISH | C |
| PHILADELPHIA | 4 | NABISCO BISCUIT CO | PHILADELPHIA | WALTER G GOGOLA | E |
| PHILADELPHIA | 1 | ACTION MANUFACTURING CO PLANT 6 | PHILADELPHIA | MICHAEL BITTNER | M |
| PHILADELPHIA | 1 | ACTION MANUFACTURING CO PLANT 6 | PHILADELPHIA | MICHAEL BITTNER | M |
| PHILADELPHIA | 1 | HYGRADE FOOD PRODUCTS ASSOCIATES | PHILADELPHIA | BEVERLY A HARRIS | E |
| PHILADELPHIA | 1 | MCCLEAN PACKAGING CORP | PHILADELPHIA | ELISE SHORT | C |

# Waste Paper Reported As Land Applied

| County Name | Waste Quantity | Facility Name | Location City | Conact Name | Con |
|---|---|---|---|---|---|
| CHESTER | 6982 | HERR FOODS INC | NOTTINGHAM | STEVE MORAN | PLANT EN |
| CHESTER | 1268 | JACKSON IMMUNORESEARCH LABS INC | WEST GROVE | WILLIAM STEGEMAN | PRESIDEI |
| CHESTER | 70 | JACKSON IMMUNORESEARCH LABS INC | WEST GROVE | WILLIAM STEGEMAN | PRESIDEI |
| CHESTER | 5 | HERR FOODS INC | NOTTINGHAM | STEVE MORAN | PLANT EN |

# APPENIDIX E:

# COMPANIES WITH SAWDUST POTENTIALLY AVAILABLE

## Sawdust Reported as Landfilled

| County Name | Waste Quantity | Facility Name | Location City | Conact Na |
|---|---|---|---|---|
| DELAWARE | 200 | BOEING DEFENSE & SPACE CORP HELICOPTERS DIVISION | RIDLEY PARK | BRIDGET C SCIAM |
| DELAWARE | 143 | BOEING DEFENSE & SPACE CORP HELICOPTERS DIVISION | RIDLEY PARK | BRIDGET C SCIAM |
| DELAWARE | 20 | BOEING DEFENSE & SPACE CORP HELICOPTERS DIVISION | RIDLEY PARK | BRIDGET C SCIAM |
| DELAWARE | 15 | BOEING DEFENSE & SPACE CORP HELICOPTERS DIVISION | RIDLEY PARK | BRIDGET C SCIAM |
| DELAWARE | 14 | BOEING DEFENSE & SPACE CORP HELICOPTERS DIVISION | RIDLEY PARK | BRIDGET C SCIAM |
| DELAWARE | 8 | BOEING DEFENSE & SPACE CORP HELICOPTERS DIVISION | RIDLEY PARK | BRIDGET C SCIAM |
| DELAWARE | 7 | BOEING DEFENSE & SPACE CORP HELICOPTERS DIVISION | RIDLEY PARK | BRIDGET C SCIAM |
| DELAWARE | 6 | BOEING DEFENSE & SPACE CORP HELICOPTERS DIVISION | RIDLEY PARK | BRIDGET C SCIAM |
| DELAWARE | 4 | BOEING DEFENSE & SPACE CORP HELICOPTERS DIVISION | RIDLEY PARK | BRIDGET C SCIAM |

## Sawdust Reported as Incinerated

| County Name | Waste Quantity | Facility Name | Location City | Conact Na |
|---|---|---|---|---|
| DELAWARE | 424 | BOEING DEFENSE & SPACE CORP HELICOPTERS DIVISION | RIDLEY PARK | BRIDGET C SCIAM |
| DELAWARE | 200 | BOEING DEFENSE & SPACE CORP HELICOPTERS DIVISION | RIDLEY PARK | BRIDGET C SCIAM |
| DELAWARE | 96 | BOEING DEFENSE & SPACE CORP HELICOPTERS DIVISION | RIDLEY PARK | BRIDGET C SCIAM |
| DELAWARE | 46 | BOEING DEFENSE & SPACE CORP HELICOPTERS DIVISION | RIDLEY PARK | BRIDGET C SCIAM |
| DELAWARE | 30 | BOEING DEFENSE & SPACE CORP HELICOPTERS DIVISION | RIDLEY PARK | BRIDGET C SCIAM |
| DELAWARE | 25 | BOEING DEFENSE & SPACE CORP HELICOPTERS DIVISION | RIDLEY PARK | BRIDGET C SCIAM |
| DELAWARE | 10 | BOEING DEFENSE & SPACE CORP HELICOPTERS DIVISION | RIDLEY PARK | BRIDGET C SCIAM |
| DELAWARE | 9 | BOEING DEFENSE & SPACE CORP HELICOPTERS DIVISION | RIDLEY PARK | BRIDGET C SCIAM |
| DELAWARE | 2 | BOEING DEFENSE & SPACE CORP HELICOPTERS DIVISION | RIDLEY PARK | BRIDGET C SCIAM |

# APPENDIX F:

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