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Final Engineering Report: Tobacco Products Processing Detailed Study

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1.0 INTRODUCTION

Section 304(m) of the Clean Water Act (CWA) requires EPA to develop and publish a biennial plan that establishes a schedule for the annual review and revision of the national effluent limitations guidelines (effluent guidelines) for industrial wastewater discharges to surface waters of the United States (direct discharges). This plan must also identify directly discharging industries discharging more than trivial amounts of toxic or "nonconventional" pollutants for which the Agency has not yet promulgated effluent guidelines. Similarly, Section 307(b) of the CWA requires EPA to establish pretreatment standards for pollutants that are not susceptible to treatment by publicly owned treatment works (POTWs) or that would interfere with the operation of POTWs.

Section 304(m) also requires EPA to solicit public comment on its biennial effluent guidelines plan prior to issuing a final plan. During the comment period for the Preliminary 2004 Effluent Guidelines Plan (68 FR 75515), EPA received public comment that it should consider wastewater discharges from the tobacco products processing (tobacco products) industry for effluent guidelines rulemaking. Specifically, the commenter questioned the quantity of carcinogens in wastewater discharges associated with cigarette manufacturing.

At the time of publication of the Final 2004 Effluent Guidelines Plan, EPA was unable to determine, based on readily available information, the following: 1) whether toxic and nonconventional discharges from the tobacco products industry are trivial or nontrivial, and 2) whether the tobacco products industry discharges pollutants that are not susceptible to treatment by POTWs or that interfere with the operation of POTWs. As a result, EPA initiated a detailed study of the tobacco products industry to address these questions.

This report presents information EPA collected about the tobacco products industry during its detailed study as well as analyses of data from sampling episodes EPA conducted at tobacco products facilities.

2.0 DATA SOURCES

Data sources used for this study of the tobacco products industry include readily available information from EPA and other federal, state, and local government agencies, information EPA collected from site visits and sampling, and information provided by the industry through site visits, telephone contacts, correspondence, and comments on EPA's Preliminary 2006 Effluent Guidelines Plan.

2.1 Economic Census

The U.S. Census Bureau publishes a profile of U.S. business, the Economic Census, every five years. The Economic Census reports the number of U.S. business establishments and the size of these establishments, based on number of paid employees. EPA used the 2002 Economic Census along with other sources to develop an economic profile of the domestic tobacco products industry (Covington, 2006).

The 2002 Economic Census reports data by the North American Industry Classification System (NAICS) code, while EPA's Toxic Release Inventory (TRI) and Permit Compliance System (PCS) databases report data by the Standard Industrial Classification (SIC) code. For this reason, EPA converted the 2002 Economic Census data on the tobacco products industry into the equivalent SIC codes. Section 3.1 of this report includes descriptions of these SIC codes.

2.2 U.S. Alcohol and Tobacco Tax and Trade Bureau (TTB)

The TTB is part of the U.S. Department of Treasury. Its mission, in part, is to collect alcohol, tobacco, firearms and ammunition excise taxes and to ensure that these products are labeled, advertised, and marketed in accordance with the law. Chapter 52 of the Internal Revenue Code (IRC) of 1986 requires that everyone who intends to manufacture or import tobacco products, or warehouse tobacco products for export obtain a permit from the TTB.

EPA contacted the TTB and requested information it collects on tobacco products facilities as part of its permitting process. In particular, EPA requested information pertaining to facilities engaged in manufacturing cigarettes, cigars, snuff, chewing tobacco, pipe tobacco, or roll-your-own tobacco. The TTB provided spreadsheets containing the name, address, TTB number, and 2004 production information for all tobacco products facilities subject to its permitting process (TTB, 2006)[1]. EPA used the TTB information to supplement and confirm the industry profile.

2.3 Toxics Release Inventory (TRI)

TRI is a database that contains information on toxic chemical releases that facilities under certain SIC codes report annually to EPA. These facilities report the amount of toxic chemicals released to the environment as well as the amount of toxic chemicals transferred in wastes to off-site locations, including discharges to POTWs. EPA reports these toxic chemical releases in TRI as pounds per year.

A facility is required to report its toxic chemical releases to EPA if: (1) it is included in a covered SIC code; (2) it has 10 or more employees (or the equivalent of 20,000 hours per year); and (3) it manufactures, imports, processes, or otherwise uses chemicals in quantities exceeding the reporting thresholds. For toxic chemicals that are not PBT (persistent, bioaccumulative, and toxic), facilities must provide release information if they manufacture or process more than 25,000 pounds of the chemical in a year, or if they otherwise use more than 10,000 pounds of the chemical in a year[2]. For example, tobacco products facilities process the TRI chemical group, "nicotine and nicotine salts." To determine if a facility must report releases of nicotine and nicotine salts, it multiplies the total weight of tobacco it processes by the percent nicotine and nicotine salts to calculate the total quantity of nicotine and nicotine salts processed. If this amount is more than 25,000 pounds/year, the facility is required to report releases of nicotine and nicotine salts. The facility must make a similar analysis for every TRI chemical.

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[1] Information collected by the TTB is subject to provisions of the U.S. Tax Code. These provisions require federal agencies to ensure that any information released is not associated with, or does not otherwise identify, directly or indirectly, a particular taxpayer.

[2] Reporting thresholds are much lower for PBT chemicals. Facilities must report releases if they manufacture, process, or otherwise use the following: more than 100 lb/yr of PBT chemicals; more than 10 lb/yr of highly toxic, highly persistent PBT chemicals; and more than 0.1 gram/year of dioxin and dioxin-like compounds.

EPA used year 2002 data from TRI to create the *TRIReleases2002* database (U.S. EPA, 2005c), which EPA used in this detailed study of the tobacco products industry. For additional information on TRI reporting and *TRIReleases2002*, see the *2005 Annual Screening-Level Analysis* (U.S. EPA, 2005a). EPA used *TRIReleases2002* to estimate the number of directly and indirectly discharging facilities (direct and indirect dischargers) within the tobacco products industry. However, many facilities within the tobacco products industry (SIC code 21) are not required to report their toxic chemical releases because their size is below the cutoff or their chemical use is below the thresholds.

2.4 Permit Compliance System (PCS)

The Office of Enforcement and Compliance Assurance (OECA) manages PCS, which is a national data system that contains permit, compliance, and enforcement status information on facilities with National Pollutant Discharge Elimination System (NPDES) permits. Facilities that discharge wastewaters directly to surface waters of the United States are required to obtain NPDES permits from EPA or state permitting authorities. NPDES facilities submit Discharge Monitoring Reports (DMRs) to their state permitting authorities in accordance with their permit requirements, and the permitting authorities input these DMR data to PCS. The state permitting authorities are required to input DMR data only for facilities that they judge to be major sources of pollutants (i.e., facilities that are likely to significantly impact receiving streams if they discharge without control). Thus, PCS identifies all facilities with NPDES permits, but does not contain pollutant discharge data for all of these facilities.

EPA used PCS data to identify direct dischargers within the tobacco products industry. Of the nine direct dischargers identified, PCS contains pollutant concentration discharge data for only one facility, which is considered a major source of pollutants. EPA obtained pollutant mass loads for this facility from the *PCSLoads2002* database (U.S. EPA, 2005b). EPA created the *PCSLoads2002* database using the PCS pollutant discharge data from 2002 and various database development tools. For additional information on *PCSLoads2002*, see the *2005 Annual Screening-Level Analysis*. EPA used the *PCSLoads2002* pollutant mass loads for comparison to pollutant loads calculated from sampling data.

2.5 National Pollutant Discharge Elimination System (NPDES) and Industrial User Permits

EPA used the information in the NPDES permits of the nine direct dischargers to determine the type and amount of wastewater they generate. Similarly, EPA used the information in the Industrial User permits of several indirect dischargers to determine the type of wastewater they generate and their existing discharge requirements.

2.6 Site Visits and Sampling Episodes

EPA conducted site visits and wastewater sampling episodes at six tobacco products facilities in July 2005. EPA conducted the site visits to gain a better understanding of tobacco products processing operations, and wastewater generation, treatment, and discharge at direct and indirect dischargers. During these site visits, EPA collected grab samples to further characterize the wastewater generated and discharged at these facilities, and evaluate wastewater treatment effectiveness, as applicable.

2.7 Tobacco Products Manufacturers

In addition to providing information during the site visits, each of the facilities EPA visited provided supplemental information about its site. This information includes NPDES permits, Industrial User Pretreatment permits, wastewater treatment system documents, source water pollutant concentration data, and wastewater monitoring data, which includes concentrations and loads of certain pollutants contained in its wastewater.

EPA communicated with additional tobacco products manufacturers from various sectors of the tobacco products industry via meetings, telephone calls, letters, and emails. These manufacturers provided Industrial User Discharge permits and other information that allowed EPA to better understand their manufacturing processes, wastewater generation, wastewater controls, discharge requirements, and treatment processes.

2.8 U.S. Geological Survey (USGS) NWISWeb Database

The USGS investigates the occurrence, quantity, quality, distribution, and movement of surface and underground waters. USGS maintains a water database, the National Water Information System (NWIS), which can only be accessed by USGS. A large subset of the NWIS database, however, is available to the public via the online NWISWeb database (USGS, 2002). NWISWeb is organized primarily around water monitoring stations.

The two directly discharging tobacco products facilities that EPA sampled are both located on the James River and both obtain water from this river. EPA obtained the concentrations of certain pollutants contained in the James River from NWISWeb. USGS collected these data at monitoring sites located upstream of the two tobacco products facilities. EPA used these data, along with the facility-provided source water data, to determine the pollutants and concentrations that may originate in the tobacco products facility source water.

2.9 Virginia Department of Environmental Quality (VA DEQ)

EPA contacted VA DEQ to request information on permit violations and/or problems associated with pollutant discharges from the tobacco products facilities permitted in the Richmond, Virginia area. EPA used the information provided by VA DEQ to supplement the information obtained from the site visits and wastewater sampling.

2.10 POTW Removal Efficiencies

The CWA requires EPA to establish pretreatment standards for pollutants that are not susceptible to treatment by POTWs. EPA previously assembled a list of POTW pollutant removal efficiencies for the 612 chemicals reported to TRI in 2002 from various sources (Codding and Bartram, 2005). EPA used these POTW pollutant removal efficiencies, when applicable, in its detailed study of the tobacco products industry. EPA also assembled a list of POTW pollutant removal efficiencies for chemicals that were part of previous detailed studies, some of which are not included in the 2002 TRI chemical list. From this list, EPA used POTW pollutant removal efficiencies obtained from the Risk Reduction Engineering Laboratory

(RREL) Treatability Database (U.S. EPA, 1994) and the 50-POTW Study (U.S. EPA, 1982), when applicable, in its detailed study of the tobacco products industry.

The tobacco products industry discharges a few pollutants for which EPA had not previously evaluated POTW pollutant removals (e.g., nicotine, and propylene glycol). EPA obtained POTW removal information for nicotine from an Internet literature search (Snyder, 2002). EPA was unable to find a published source that provides a POTW percent removal (based on activated sludge or an equivalent treatment technology) for propylene glycol. In absence of a POTW removal efficiency for propylene glycol, EPA evaluated its biodegradability and, thus, its potential to pass through a POTW. This evaluation is summarized in the memorandum entitled, *Fate of Propylene Glycol in the Environment and POTWs* (Matuszko, 2006c).

2.11 50-POTW Study

EPA obtained POTW influent pollutant concentration data from the 50-POTW Study (U.S. EPA, 1982). EPA used the influent data from this study because they represent a wide range of POTWs. Using these data, EPA compared the concentrations of pollutants found in indirect discharges from tobacco products facilities to those typically found in POTW influents. EPA also used POTW pollutant removal efficiencies from the 50-POTW Study, as described in Section 2.10.

2.12 POTW Monitoring Information

EPA contacted the POTWs that receive wastewater from the largest tobacco products facilities to determine whether pollutant discharges from the tobacco products industry create problems for POTWs and whether POTWs would benefit from national pretreatment standards for the tobacco products industry.

The POTWs that EPA contacted also provided limited wastewater monitoring data from discharges that they receive from the tobacco products facilities. EPA used these data to supplement the pollutant concentration data it obtained from the sampled indirectly discharging tobacco products facilities.

2.13 Information from Comments on the Preliminary 2006 Effluent Guidelines Plan

During the comment period for the Preliminary 2006 Effluent Guidelines Plan (70 FR 51042), EPA received comments from two tobacco products manufacturers and one POTW on EPA's detailed study of the tobacco products industry. R.J. Reynolds (Reynolds American) provided information on its tobacco products processes and study reports on the biodegradability of nicotine (OW-2004-0032-1096). For an evaluation of these study reports, see *Comments on the Four Reports Submitted by R.J. Reynolds Tobacco Company in Response to Request for Data in the Notice of Availability of Preliminary 2006 Effluent Guidelines Program Plan* (Upgren, 2006). Lorillard Tobacco Company provided a Sewage Collection and Water Reclamation Plant Report for 2004 for the City of Greensboro (OW-2004-0032-1105.1). The City of Winston-Salem, North Carolina provided pollutant concentrations and other information on the wastewater that tobacco products facilities discharge to one POTW (OW-2004-0032-1061). EPA also received a comment from the National Association of Clean Water Agencies (NACWA) stating that indirect dischargers within the tobacco products industry are efficiently regulated by local pretreatment programs (OW-2004-0032-1093). Where relevant, EPA used information in these comments to supplement its analysis.

2.14 Internet Literature Search

EPA conducted an Internet literature search on the biodegradability of nicotine and propylene glycol in an effort to determine the fate of these pollutants in the environment and/or POTWs. EPA used this information to estimate a POTW percent removal for nicotine. EPA also conducted an Internet search to obtain information on tobacco products manufacturing processes.

3.0 INDUSTRY PROFILE

This section presents an overview of the tobacco products industry, including tobacco products facility counts, production, size, geographic distribution, manufacturing processes, and wastewater generation.

3.1 General Overview

The tobacco products industry comprises facilities that manufacture cigarettes, cigars, smokeless tobacco (i.e., chewing, plug/twist, and snuff tobacco), loose smoking tobacco (i.e., pipe and roll-your-own cigarette tobacco), and reconstituted (sheet) tobacco, as well as facilities engaged in stemming and redrying tobacco. For a detailed profile of the tobacco products industry, see the *Economic Profile of Domestic Tobacco Manufacturing Industry: 2006 Update* (Covington, 2006).

3.1.1 Facility Counts

Table 3-1 presents a breakdown of the number of tobacco products facilities by NAICS/SIC code, as estimated by the 2002 Economic Census and the TTB. These two sources provide different estimates of the number of facilities within each SIC code. Some variation in estimates is to be expected given that the reporting requirements and year of data collection varies with the data source. The TTB is likely to provide the most inclusive list of tobacco products facilities, with the exception of tobacco stemming and redrying. The TTB does not track the number of facilities within the tobacco stemming and redrying SIC code because products in that SIC code are not subject to taxes managed by the TTB.

Table 3-1. Tobacco Products Facility Counts

NAICS Code (2002)	Description	SIC Code (1987)	Number of Facilities (2002 Census)	Number of Facilities (2004 TTB)
312221	Cigarette manufacturing	2111	15	37
312229	Other tobacco products	2121 (cigars)	83	69
		2131 (smokeless and loose smoking tobacco)		43
		2141 (reconstituted tobacco)		Not Collected
312210	Tobacco stemming and redrying	2141	16	Not Collected
		Total	**114**	**149**

Source: *Economic Profile of Domestic Tobacco Manufacturing Industry: 2006 Update* (Covington, 2006), and U.S. Alcohol and Tobacco Tax and Trade Bureau (TTB, 2006).

3.1.2 Facility Production and Size

A small number of facilities in the tobacco products industry accounts for the majority of the total industry employment and tobacco products processing operations. Table 3-2 presents manufacturing, employment, and location information for these facilities. Five of the facilities in Table 3-2 are large (>1,000 employees) and account for greater than 60 percent of the total industry employment (Covington, 2006). Four of these five facilities manufacture cigarettes and one manufactures cigars. These large facilities are concentrated in North Carolina, Florida, and Virginia.

EPA believes that Altria, Reynolds American, and Lorillard conduct nearly all of their domestic cigarette manufacturing operations at the facilities listed in Table 3-2. Based on 2004 TTB production data, these facilities account for the vast majority of the domestic cigarette production. EPA believes that Swisher conducts nearly all of its cigar manufacturing operations at its Jacksonville, Florida facility. Based on TTB production data, Swisher is the largest manufacturer of cigars in the United States.

Table 3-2. Tobacco Products Facilities with Greatest Employment

Company	Manufacturing Sector	Employees	Location
Philip Morris (Subsidiary of Altria)	Cigarettes	3,500	Richmond, VA
	Cigarettes	2,700	Concord, NC
Reynolds American	Cigarettes	2,100	Tobaccoville, NC
	Cigarettes	Unknown	Winston-Salem, NC
Lorillard	Cigarettes	2,300	Greensboro, NC
Swisher	Cigars	1,100	Jacksonville, FL

Source: *Economic Profile of Domestic Tobacco Manufacturing Industry: 2006 Update* (Covington, 2006).

3.1.3 Direct and Indirect Dischargers

Relatively few tobacco products facilities report discharges to TRI or PCS. Table 3-3 presents the number of tobacco products facilities with information in the TRI and PCS databases.

As shown in Table 3-3, nine facilities had active NPDES permits in 2002. Thus, of the 114 tobacco products facilities reported in the 2002 Economic Census, the remaining 105 facilities either discharge no wastewater or discharge their wastewater to a POTW. Only one of the direct dischargers is classified as a major pollutant discharger in PCS.

As shown in Table 3-3, 20 facilities reported wastewater discharges to TRI in 2002. Thus, of the 114 tobacco products facilities reported in the 2002 Economic Census, the remaining 94 facilities either discharge no wastewater or discharge wastewater, but do not meet the TRI reporting requirements summarized in Section 2.3 of this report.

Most facilities that reported discharges to TRI in 2002 either manufacture cigarettes or reconstituted tobacco, or perform tobacco stemming and redrying operations. A small portion of the facilities that reported discharges to TRI in 2002 manufacture smokeless or loose tobacco. No cigar manufacturers reported discharges.

Table 3-3. Number of Tobacco Products Facilities with Information in EPA Databases

SIC Code	Description	2002 PCS		2002 TRI			
		Active Permits	Major Sources of Pollutants with DMR Data in PCS	Total	Direct	Indirect	Both
2111	Cigarette Manufacturing	2	0	7	1	5	1
2121	Cigar Manufacturing	1	0	0	0	0	0
2131	Smokeless and Loose Smoking Tobacco	1	0	4	0	4	0
2141	Tobacco Stemming and Redrying and Reconstituting Tobacco	5	1	9	1	6	2
	Total	**9**	**1**	**20**	**2**	**15**	**3**

Source: *PCSLoads2002_v02* (U.S. EPA, 2005b) and *TRIReleases2002_v02* (U.S. EPA, 2005c).

3.1.4 NPDES Facility Information

EPA gathered information on the nine tobacco products facilities with active NPDES permits by reviewing the facility permits and/or contacting the companies. Table 3-4 contains the detailed information. The following is a summary of the information:

- Four facilities no longer process tobacco or discharge process wastewater:
  - Alliance One (formerly Standard Commercial Tobacco Co), Wilson City, NC,
  - R.J. Reynolds Tobacco Co. (Reynolds American), Hanmer Plant, Chesterfield County, VA,
  - R.J. Reynolds Tobacco Co. Brk Cv (Reynolds American), Walnut Cove Town, NC, and
  - Tobacco Technology, Inc., Upperco, MD;
- One facility, GF Vaughan Tobacco Co., Inc., Fayette County, KY, discharges only boiler blowdown and steam condensate;
- One facility, R.J. Reynolds Tobacco Co. (Reynolds American), Tobaccoville Plant, Tobaccoville, NC, discharges all of its wastewater to a POTW;

Table 3-4. Tobacco Products Facilities with NPDES Permits in 2002

NPDES ID	Company Name	Facility Location	Information	Tobacco Products Process Wastewater Flow Rate
NC0081884	Alliance One (formerly Standard Commercial Tobacco Co	Wilson City MU, NC	Now closed. The facility conducted tobacco stemming while in operation (Matuszko, 2005c).	Little to no wastewater from tobacco processing operations
VA0002780	R.J. Reynolds Tobacco Company – Corp (Hanmer Facility)	Chesterfield County, VA	Now closed. The facility conducted reconstituted tobacco manufacturing while in operation.	0.72 MGD (Reynolds, 2005a)
NC0003492	R.J. Reynolds Tobacco Co. Brk Cv	Walnut Cove Town, NC	The Walnut Cove facility has a small wastewater treatment plant for domestic wastewater only. No tobacco processing occurs at this facility anymore (Curl, 2005).	NA
MD0059307	Tobacco Technology, Inc.	Upperco, MD	EPA attempted to obtain the permit for this facility, but determined that the facility no longer has an NPDES permit. The facility now has a general stormwater permit (Finseth, 2005a).	NA
KY0096008	GF Vaughan Tobacco Co., Inc.	Fayette County, KY	EPA reviewed the facility's permit and some DMR data. The wastewater discharged from the facility includes boiler blowdown and steam condensate, less than 200gpd. (Scott, 2001)	NA
PA0039861	Consolidated Cigar Corp. (Altadis)	McAdoo, Banks Township, Carbon County, PA	EPA reviewed the facility's permit. Permit describes discharges from reconstituted tobacco manufacturing process, wastewater treatment facility, and contact cooling water. (Crowley, 2000) Facility operates a biological wastewater treatment plant. Facility described cigar filler and reconstituted tobacco manufacturing processes (Finseth, 2006).	200-300 GPD equipment cleaning water from cigar filler process; 35,000 to 41,000 GPD reconstituted tobacco manufacturing process wastewater (est.) (Finseth, 2006).

Table 3-4 (Continued)

NPDES ID	Company Name	Facility Location	Information	Tobacco Products Process Wastewater Flow Rate
PR0001091	R.J. Reynolds Tobacco (CI) Comanufacturing American, Inc. (Reynolds American)	Yabucoa, PR	Manufactures cigarettes on a small scale (three cigarette machines vs. 65 at Tobaccoville) (Curl, 2005).	5,000 GPD process wastewater flow (est.); includes boiler, cooling tower, and scrubber blowdown, and equipment cleaning; majority is recycled (Holman, 2006b).
VA0026557	Philip Morris USA, Inc., (Park 500 Facility)	Chesterfield County, VA	This facility directly discharges a significant amount of wastewater from its reconstituted tobacco manufacturing operations (Matuszko, 2005b).	1.77 MGD average flow - 2004 DMR data (Pickelhaupt, 2005).
NC0055093	R.J. Reynolds Tobacco Co.	Tobaccoville, NC	EPA determined that this facility is an indirect discharger.	0.95 MGD permit effluent limitation, includes process, domestic, and cooling water (Bagwell, 2002)

Source: (Bagwell, 2002), (Crowley, 2000), (Curl, 2005), (Finseth, 2005a and 2006), (Holman, 2006b), (Matuszko, 2005b and 2005c), (Pickelhaupt, 2005), (Reynolds, 2005a), and (Scott, 2001).

- Two facilities produce a small amount of wastewater from their tobacco products processing operations:

  — Consolidated Cigar Corporation, Banks TWP, PA, and

  — R.J. Reynolds Tobacco (CI) Comanufacturing America, Inc., (Reynolds American), Yabucoa, PR; and

- One facility, Philip Morris USA, Inc., Park 500 Plant, Chesterfield County, VA, directly discharges a substantial amount of wastewater from its tobacco products processing operations.

EPA determined that in 2002, only three of the nine NPDES facilities - Reynolds American, Hanmer Facility, Chesterfield County, VA; Philip Morris, Park 500 Facility, Chesterfield County, VA; and Consolidated Cigar Corp. (Altadis), Banks Township, PA - directly discharged substantial amounts of wastewater from their tobacco products processing operations. Since EPA assembled this information, one of these three direct dischargers, the Reynolds American, Hanmer Facility has closed (January 2006). Therefore, there are currently only two operating facilities that directly discharge significant amounts of wastewater from their tobacco products processing operations. Of these two, the Altadis facility discharge (up to 41,000 GPD) is significantly less than the Park 500 Facility discharge (1.77 MGD).

3.2 Overview of the Industrial Sectors of the Tobacco Products Industry

This section discusses the manufacturing processes and wastewater generation of the following sectors of the tobacco products industry: cigarette, reconstituted tobacco, cigar, smokeless tobacco, and loose tobacco manufacturing; and tobacco stemming and redrying operations.

3.2.1 Cigarette Manufacturing and Reconstituted Tobacco Manufacturing

Cigarette manufacturing in the United States is dominated by a few companies. Philip Morris USA (a subsidiary of the Altria Group), Reynolds American (the result of a merger between R.J. Reynolds and Brown and Williamson, a division of British American Tobacco, in 2004), and Lorillard Tobacco Company (part of the Loews Corporation) collectively produced over 92 percent of the cigarettes manufactured in the United States in 2004 (TTB, 2006). In

2004, U.S. companies manufactured approximately 493 billion cigarettes (TTB, 2006). The three dominant cigarette manufacturers collectively operate six cigarette manufacturing facilities and one reconstituted tobacco manufacturing facility (Covington, 2006). One of the cigarette manufacturing facilities also performs reconstituted tobacco manufacturing operations.

Two main processes take place at cigarette manufacturing facilities: primary processing and cigarette manufacturing. These processes are described in Section 4.0. The vast majority of the process wastewater at cigarette manufacturing facilities is generated by primary processing. Cigarette manufacturing itself produces little to no wastewater.

Reconstituted tobacco manufacturing facilities process the waste tobacco from cigarette manufacturing facilities into paper-like sheets. These facilities ship this reconstituted product to cigarette manufacturing facilities, which blend the product with other tobacco to make cigarettes. This process is described in Section 4.4. EPA has identified three facilities in the United States that manufacture reconstituted tobacco. Similar to primary processing operations, reconstituted tobacco manufacturing operations also generate wastewater.

3.2.2 Cigar Manufacturing

There are three categories of cigars: premium, large, and small. Premium cigars are hand-made from the highest quality tobacco; the vast majority of premium cigars sold in the United States are imported. Large cigars are mass-produced by machines from lower quality tobacco. Small cigars are machine-made and weigh less than three pounds per thousand cigars. For machine-made cigars, a machine executes most or all of the processing stages, including leaf picking, tobacco grinding, and cigar rolling. In 2004, U.S. facilities manufactured approximately equal numbers of small and large cigars (TTB, 2006). Cigarette production far outweighs cigar production in the United States; in 2004, U.S. companies manufactured approximately seven billion cigars and 493 billion cigarettes.

In 2004, the top five cigar manufacturers in the United States (Swisher International Group, Inc., John Middleton, Inc., Altadis USA, Lane Limited, and Swedish Match Cigars) controlled 80 percent of the market (in terms of production). Eleven facilities reported manufacturing small cigars in the United States in 2004, while approximately 60 facilities manufactured large cigars. Most of the large cigar manufacturers are small, with 40 facilities producing less than 100,000 cigars annually. Five facilities account for 98 percent of the U.S. production of large cigars (TTB, 2006).

Cigars consist of three major components: the filler, binder, and wrapper. Long leaves are bunched together as filler for high quality, handmade cigars, whereas short, fragmented leaves are bunched together as filler for machine-made cigars. The binder holds the bunched filler tobacco together. The binder may consist of layers of coarse tobacco leaves for handmade cigars, but for the majority of cigars, the binder is a paper-like sheet of reconstituted tobacco. In most cases, cigars are wrapped with natural leaves. (USDA, 2005), (Prudent Peddler, 2006), (CigarHandbook, 2006)

EPA contacted the cigar manufacturer Altadis USA, Inc., which recently purchased Consolidated Cigar Holdings, Inc., to obtain details on the cigar manufacturing operation and the types of wastewater it generates (Finseth, 2006). The Altadis facility in McAdoo, Pennsylvania operates a cigar filler process and a reconstituted tobacco process and has an NPDES permit.

The cigar filler process generates wastewater only when equipment is cleaned after production stops. The facility uses roughly 200 to 300 gallons of cleaning water per operation day. The facility uses air pollution control devices that operate without water.

During the reconstituted tobacco manufacturing process, the facility produces a sheet of tobacco that is used as the binder for cigars. The facility produces a slurry from waste tobacco stems and leaves (cellulose pulp), and minor ingredients including gums, plasticizers, clays, and FD&C dyes. The facility pours the slurry onto stainless steel belts and sends it through a dryer, which produces a tobacco sheet. The dryer is heated with steam. Noncontact cooling water cools the tobacco sheet once it exits the dryer. This reconstituted tobacco manufacturing process generates the following wastewaters: product contact wastewater from the continuous cleaning of the dryer belt, boiler blowdown, steam condensate, wastewater from intermittent cleaning of process equipment, and noncontact cooling water blowdown. The facility estimates that it produces 35,000 to 41,000 GPD of wastewater.

The facility sends wastewaters from the cigar filler and reconstituted tobacco manufacturing processes through a wastewater treatment system, which consists of primary clarification, activated sludge aeration basin, and secondary clarification. The facility then discharges the treated wastewater to surface waters.

EPA also contacted Swisher International to obtain information on the wastewater discharges from the cigar manufacturing operations at Swisher's Jacksonville, Florida facility (Matuszko, 2006b). The cigar manufacturing process at the Swisher facility generates little to no wastewater. Most of the process wastewater is generated during the production of the tobacco binder. The Swisher facility has a wastewater permit to discharge its wastewater to the local POTW, JEA (Jacksonville Electric Authority). The majority of the wastewater discharged to the POTW is sanitary wastewater. Swisher provides no pretreatment prior to discharge to the POTW.

3.2.3 Other Tobacco Products Processing

The "other" tobacco products sector (NAICS code 312229) includes a diverse range of products. Aside from cigars, the products include smokeless tobacco (i.e., moist snuff, dry snuff, and plug, twist, and loose leaf chewing tobacco) and loose smoking tobacco (i.e., pipe tobacco and roll-your-own cigarette tobacco). These other sectors mirror cigarette and cigar production in that a few facilities dominate production. However, production of these other sectors is negligible in comparison to cigarette production.

Smokeless tobacco products consist of tobacco leaves. The manufacturing process varies slightly by product (NCI, 2002). In the moist snuff production process, tobacco leaves are air- or fire-cured and processed into fine particles or strips. Tobacco stems and seeds are not removed. The final product is packaged loose or in pouches. In the dry snuff production process, tobacco leaves are fire-cured, fermented, and processed into a dry powder. The final product is packaged in metal or glass containers. In the plug tobacco production process, enriched tobacco leaves are wrapped in fine tobacco leaves, pressed into bricks, and may be sweetened and flavored, and packaged. Twist tobacco is typically handmade. Tobacco leaves are treated with tar-like tobacco leaf extract, twisted into rope-like strands, and dried. Typically, no flavorings or sweeteners are added. In the loose leaf chewing tobacco production process, tobacco leaves are air-cured, stemmed, cut or granulated into small strips of shredded tobacco, and may be sweetened or flavored. The final product is loosely packaged.

The manufacturing process for loose smoking tobacco varies slightly depending on product. Stems are removed from tobacco leaves. Various types of tobaccos are blended together. The tobacco is moistened (sometimes with sugar water) and dried, and flavorings may be added. Flake-type pipe tobacco is often processed further with additional moistening, pressing, and cutting stages (Mac Baren Tobacco, 2002). Other types of loose smoking tobacco may be shredded or cut into ribbons (JRCigars, 2006). The finished product is packaged into tins or pouches.

3.2.4 Tobacco Stemming and Redrying

According to the 2002 Economic Census, there are 16 tobacco stemming and redrying facilities in the United States. The TTB does not track these facilities. These facilities process recently harvested tobacco, creating a product that can be stored until it is needed for the manufacture of cigarettes, cigars, and smokeless tobacco. Thus, these stemming and redrying facilities are considered the “middle man” between tobacco farmers and manufacturers. Stemming and redrying facilities are primarily located on the East Coast, near tobacco farmers.

Two companies dominate the stemming and redrying sector of the tobacco products industry: Universal Corporation and Alliance One International, Inc (Alliance One). Alliance One is a result of the merger between DIMON International and Standard Commercial Corporation on May 13, 2005. EPA contacted Alliance One to obtain information on their processes and wastewater generation (Matuszko, 2005a and 2005c). The contacts confirmed that there is little to no wastewater discharged from stemming and redrying operations. The only water used during these operations is that which is sprayed onto the tobacco during the “misting” process. All of this water is absorbed by the tobacco. The main wastewater source from stemming and redrying facilities is stormwater, which may come in contact with material from baghouses that are used for air controls. The Alliance One facilities report their stormwater discharges to TRI.

3.2.5 Summary of Tobacco Products Industry Wastewater Sources

As described above, cigarette manufacturing facilities and their related reconstituted tobacco manufacturing operations produce the vast majority of process wastewater generated from tobacco products processing.

Wastewaters from the reconstituted tobacco manufacturing operations differ from other cigarette manufacturing wastewaters in volume and content. First, the reconstituted tobacco sheet-forming process generates a much larger volume of wastewater than other cigarette manufacturing operations. Second, reconstituted tobacco wastewaters contain the soluble extracts of tobacco constituents. Thus, reconstituted tobacco wastewaters have higher pollutant concentrations and higher flows than wastewaters from other cigarette manufacturing operations.

Other than production of reconstituted tobacco, the manufacturing processes used for cigars, smokeless tobacco, and loose smoking tobacco products involve many of the same steps and raw materials (i.e., tobacco) as cigarette manufacturing. EPA concluded that the characteristics of cigarette manufacturing wastewaters, excluding reconstituted tobacco wastewaters, should be representative of other tobacco products wastewater in terms of wastewater constituents and concentrations. Therefore, EPA focused the remainder of its detailed study on characterizing and evaluating process wastewater generated at cigarette manufacturing facilities.

EPA also evaluated the wastewaters generated from reconstituted tobacco manufacturing operations and the treatment of these wastewaters.

4.0 TOBACCO PRODUCTS MANUFACTURING PROCESSES AND WASTEWATER TREATMENT

EPA obtained information on cigarette manufacturing, primary processing, reconstituted tobacco manufacturing operations, and wastewater treatment operations during site visits to tobacco products facilities and through additional communication with the visited facilities. This section describes the standard operations involved in the production of cigarettes and reconstituted tobacco, the typical wastewaters produced from these production operations, and typical wastewater treatment operations.

4.1 Primary Tobacco Processing

The tobacco processing stage that occurs prior to the manufacture of cigarettes is known in the tobacco products industry as primary processing. Figure 4-1 depicts the following steps generally involved in the primary processing operations:

- Various types of tobaccos (domestic, off-shore, and reconstituted) are sent through conditioning cylinders, in which steam is added to loosen and moisten the tobacco.
- The conditioned tobacco is sent to storage silos, where some blending occurs.
- Various blends of tobacco are flavored in cylinders, dried, and remoisturized. Any domestic, "burley" tobacco used in the blend is processed separately (flavored and dried) prior to final blending.
- The final tobacco blend is cut, dried, and remoisturized.
- The cut tobacco is sent to flavoring cylinders for final flavoring.
- Expanded tobacco, a low density tobacco, is added to the final tobacco blend during the final processing steps.
- The processed tobacco is sent to storage silos and then to the cigarette manufacturing process.

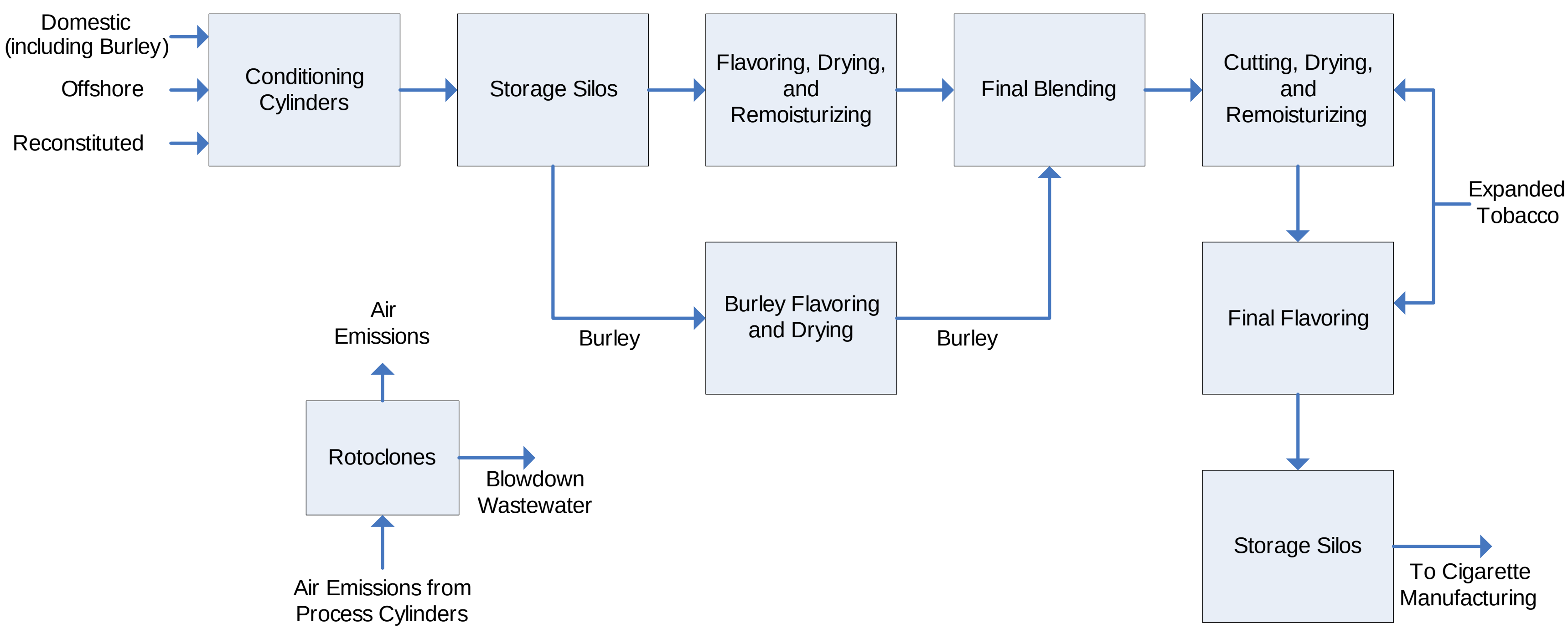

Figure 4-1. Primary Tobacco Processing

4.2 Expanded Tobacco Process

Cigarette manufacturers add a low density tobacco, known as expanded tobacco, to their tobacco blends during the final steps of the tobacco primary processing stage. Figure 4-2 depicts the following steps generally involved in the expanded tobacco process:

- Various types of tobacco (domestic, off-shore, and/or reconstituted), that have been moistened, cut, and flavored, are flooded with carbon dioxide.
- The process conditions cause the carbon dioxide to solidify within the tobacco.
- The frozen tobacco is heated rapidly, causing the carbon dioxide to vaporize. As the carbon dioxide vaporizes, the tobacco cells expand, creating a low density tobacco.

4.3 Flavor Making

Cigarette manufacturers blend the flavors they use for different brands of cigarettes. Flavorings are made in batch processes. The various ingredients for the different flavors are mixed in tanks and pumped to the flavor cylinders that are used in primary processing. Occasionally, flavor-mixing tanks are washed out, generating wastewater. These wastewaters are discharged with other primary processing wastewater and represent a relatively small portion of the wastewater generated and discharged.

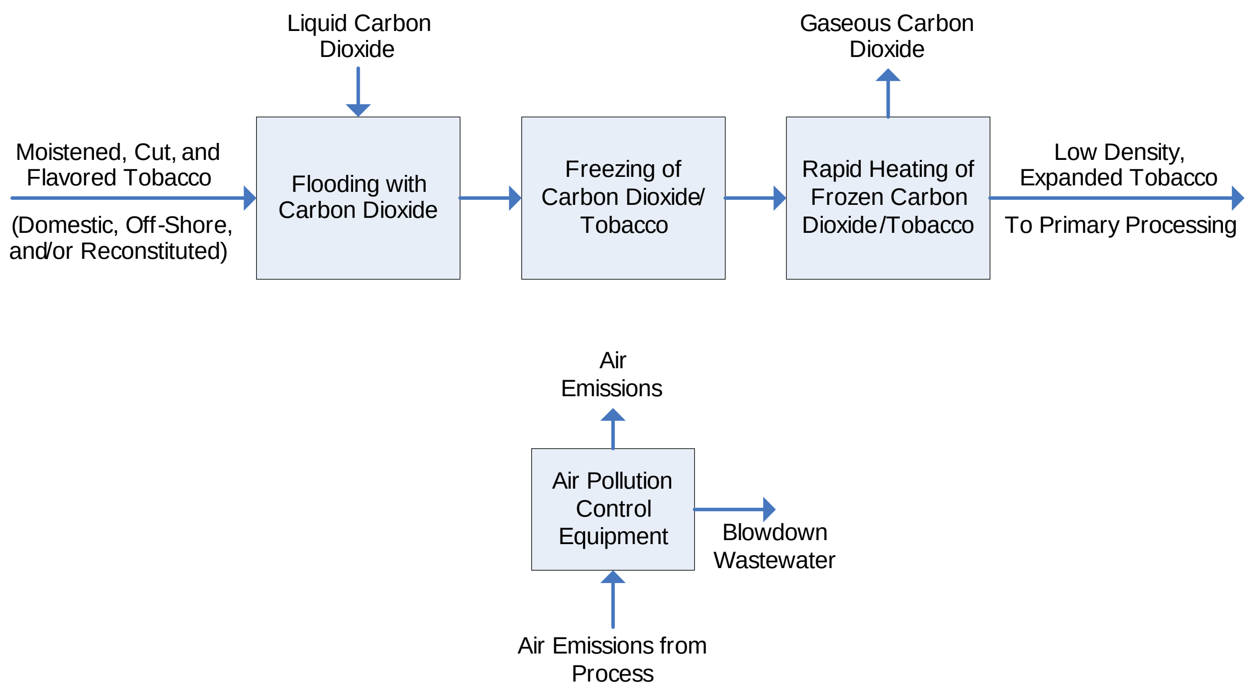

Figure 4-2. Expanded Tobacco Process

4.4 Reconstituted Tobacco Manufacturing

Tobacco products facilities produce paper-like sheets of reconstituted tobacco from tobacco stems and fines that are unusable for primary processing. The reconstituted product is cut into shreds and blended with other tobacco during primary processing. Figure 4-3 depicts the following steps generally involved in the reconstituted tobacco manufacturing process:

- Raw material storage: receipt and storage of the raw materials;
- Extraction phase: extraction of the water-soluble materials;
- Evaporation phase: removal of water from the soluble material to concentrate the tobacco extract;
- Refining stage: changing the properties of the cellulose material for optimum sheet forming;
- Sheet formation: formation of the cellulose material into a sheet;
- Reapplication of concentrated tobacco extract: application of the concentrated tobacco extract onto the sheet; and
- Final drying stage: drying and cutting of the tobacco sheet to its final product specifications.

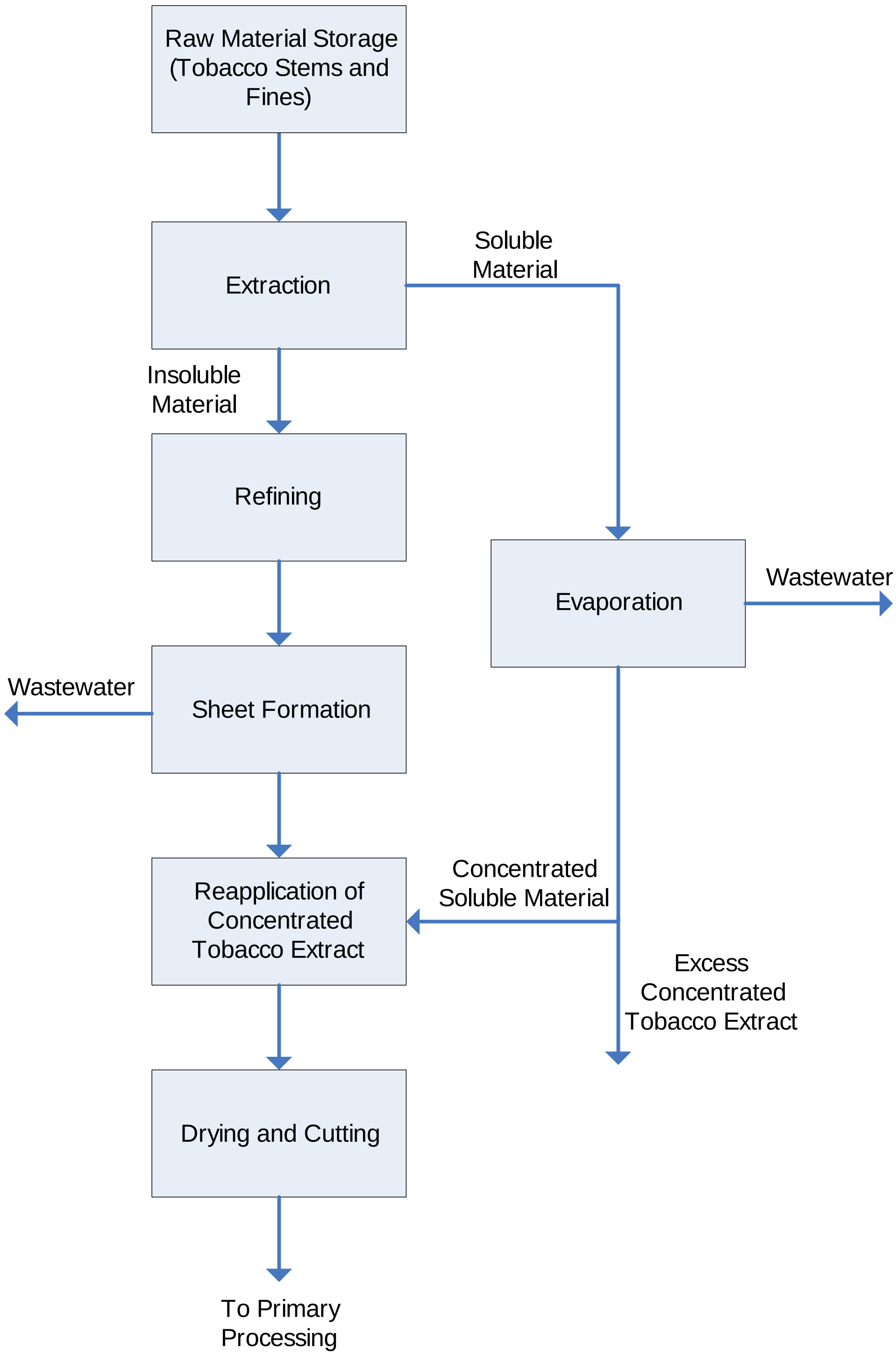

Figure 4-3. Reconstituted Tobacco Manufacturing Process

4.5 Cigarette Manufacturing

Cigarette manufacturers use tobacco from the primary processing operations to manufacture cigarettes. Figure 4-4 depicts the following steps generally involved in the cigarette manufacturing process:

- Blended tobacco, which may include reconstituted, expanded, and other varieties of tobacco, is conveyed from the primary processing storage silos to the cigarette manufacturing machines.
- The cigarette manufacturing machines place the tobacco onto cigarette paper as one rod, roll and glue the paper around the tobacco, and cut the rods to the correct length for cigarettes. Glue containers from the cigarette manufacturing machines are emptied periodically and washed with hot water.
- The machines place filters between two of the cut cigarettes, wrap the filters to the cigarettes with filter paper, and cut the filters to create two cigarettes.
- The machines pack the cigarettes and place them in cartons.
- Cigarettes that do not meet specification are cut open to reclaim the tobacco. The cigarette paper and filter are disposed of as trash. The reclaimed tobacco is returned to primary processing.

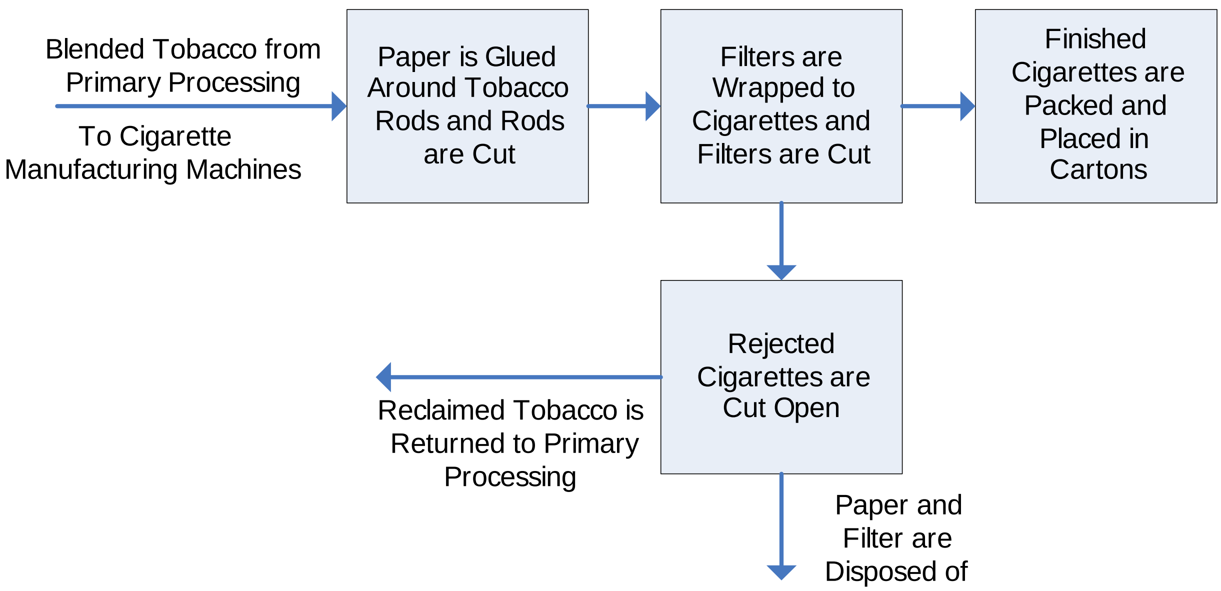

Figure 4-4. Cigarette Manufacturing

4.6 Process Wastewaters Generated

The following wastewaters, which are listed in order of decreasing volume of wastewater, are typically generated during the production of cigarettes (relative contribution of wastewater in overall cigarette production is indicated):

- Reconstituted Tobacco Manufacturing Process (largest wastewater contribution)
  - Excess dilution water from sheet forming process (majority of wastewater in reconstituted tobacco production),
  - Excess concentrated tobacco extract,
  - Steam condensate from the evaporators,
  - Possible blowdown from air pollution control equipment, and
  - Machinery, evaporators, and floor wash water.
- Primary Processing (second largest wastewater contribution)
  - Rotoclone blowdown. Some process cylinders (e.g., flavoring cylinders) are equipped with rotoclone hydrostatic precipitators for air pollution control. These rotoclones clean dust-laden air emissions by entrapping dust in water. The rotoclones discharge the water-dust slurry as a blowdown stream. Rotoclone blowdown contributes the majority of wastewater in primary processing.
  - Wash water from process cylinders.
- Expanded Tobacco Process (third largest wastewater contribution)
  - Blowdown from air pollution control equipment.
- Flavor Making (insignificant wastewater contribution)
  - Flavor tank wash water.
- Cigarette Manufacturing Process (insignificant wastewater contribution)
  - Glue container wash water.

4.7 Wastewater Treatment Operations at Direct Dischargers

This section does not discuss pretreatment at indirectly discharging tobacco products facilities because they typically do not use pretreatment steps. Wastewater treatment at directly discharging tobacco products facilities generally consists of biological treatment with nutrient removal (BNR). The general steps of the BNR treatment process at direct dischargers are as follows:

- Primary clarifiers;
- BNR wastewater treatment system that includes activated sludge, nitrification, denitrification, and phosphorus removal;
- Secondary clarifiers;
- Sludges from clarifiers are dewatered in belt presses; and
- Post clarifiers (possible chlorination).

Figure 4-5 depicts the following detailed steps of the BNR treatment process at a directly discharging tobacco products facility:

- Process wastewater passes through bar screens and grit chambers where tobacco stems and other large particles are removed.
- The wastewater is sent to primary clarifiers or a surge basin. The surge basin is used to keep a constant flow through the wastewater system.
- Overflow from the five primary clarifiers mixes with return activated sludge from the secondary clarifier and is sent to aeration basins. Sludge from the primary clarifiers is sent to belt filter presses.
- The first of five aeration basins is divided into four quadrants, and the wastewater flows sequentially through the four quadrants. Quadrant 1 has a mixer, but is not aerated (anoxic zone). The other three quadrants have aerators. The dissolved oxygen concentrations increase from about 1 ppm in Quadrant 2 to about 4 ppm in Quadrant 4.

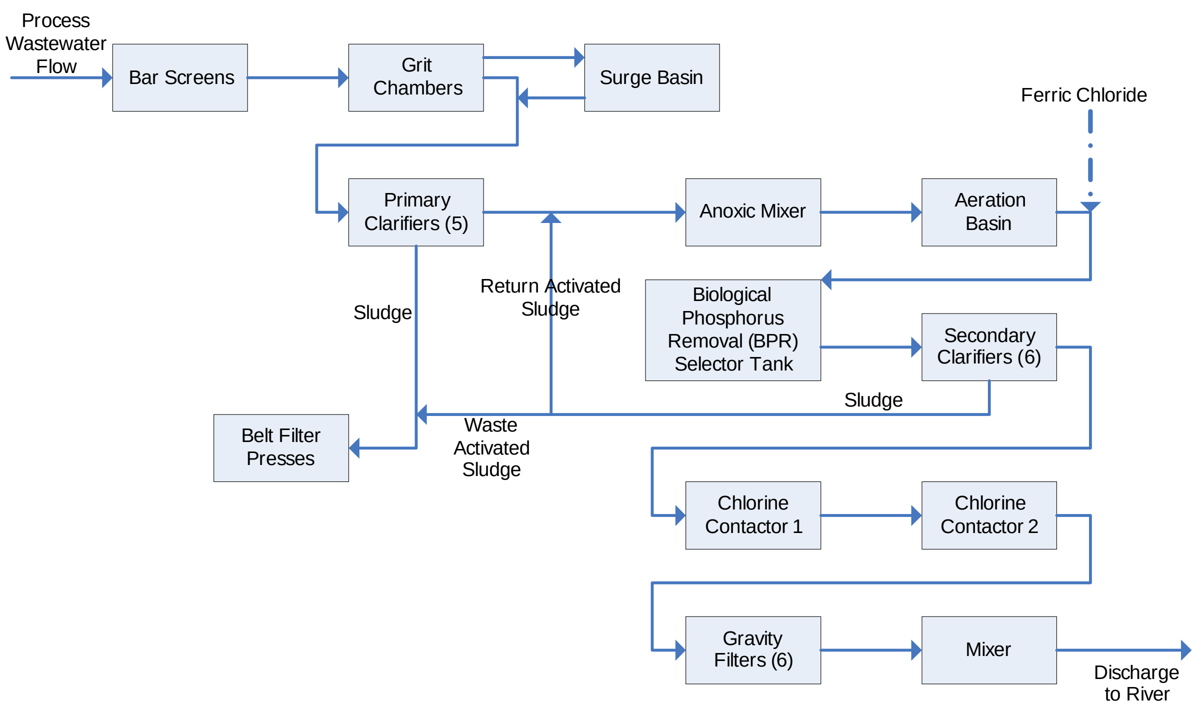

Figure 4-5. Wastewater Treatment Operations at a Directly Discharging Tobacco Products Facility

- From the first aeration basin, wastewater flows to a biological phosphorus removal (BPR) selector tank, which is equipped with a mixer. The oxygen concentration in the tank selects a bacterial population acclimated for removal of phosphorus.

- The other aeration basins (2, 3, 4, and 5) each use aerators that are turned on and off to alternate between aerobic and anoxic environments. During the aerated (aerobic) phase in this basin, carbonaceous BOD is degraded and ammonia is nitrified to nitrite, which is in turn converted to nitrate. During the unaerated (anoxic) phase, nitrate and nitrite are converted to nitrogen gas (denitrified), which is released to the atmosphere.

- Ferric chloride is added, as needed, to the aeration basins. Adding ferric chloride facilitates precipitation of phosphorus, further reducing the concentration of phosphorus in the wastewater.

- From the aeration basins, the wastewater flows to six secondary clarifiers operated in parallel. A portion of the secondary clarifier sludge is recycled to the aeration basins to optimize biological treatment. Waste-activated sludge from the secondary clarifiers mixes with sludge from the primary clarifiers and is sent to sludge dewatering belt presses.

- The overflow from the secondary clarifiers is disinfected with sodium hypochlorite. Clarified wastewater flows into two chlorine contactors, which are operated in series. Each of the contactors has a retention time of at least 30 minutes to disinfect the wastewater.

- From the chlorine contactors, the wastewater flows into six multimedia gravity filters. An in-line (nonmechanical) mixer on the final lift pump is used to mix air into the wastewater to increase the dissolved oxygen level.

- Aerated wastewater is then discharged to a river.

5.0 EPA SITE VISITS AND SAMPLING

EPA conducted site visits and wastewater sampling episodes at six tobacco products facilities during July 2005. The purpose of the visits was to: 1) gather information about the operations, wastewater sources, and wastewater management practices at the facilities; 2) collect data to determine the nature and quantity of pollutants generated and discharged by the facilities; and 3) collect data to estimate the effectiveness of any wastewater treatment systems in place at the facilities.

EPA generated reports for the six site visits, which include descriptions of sample collection activities that occurred during the site visits (see OW-2004-0032).

5.1 Criteria for Site Selection

For site visits and sampling, EPA selected a mixture of direct and indirect dischargers and facilities with and without wastewater treatment processes. Additionally, EPA selected facilities that represent a range of tobacco products manufacturing operations, but focused on those with significant production. Ultimately, EPA selected two of the three direct dischargers and 4 of the 15 indirect dischargers.

5.2 Sites Selected

Two of the six selected facilities discharge wastewater directly to surface waters and the remaining four facilities discharge wastewater to POTWs. The two direct dischargers conduct reconstituted tobacco manufacturing operations and also operate on-site wastewater treatment plants. The four indirect dischargers manufacture cigarettes, and one of these facilities also conducts reconstituted tobacco manufacturing operations. These indirect dischargers perform no wastewater treatment prior to discharging to their respective POTWs.

5.3 Wastewater Sampling Points

At the two direct dischargers, EPA sampled the influent to and the effluent from the BNR wastewater treatment systems. The influent contains tobacco process wastewater and may also contain nontobacco process wastewater (e.g., noncontact cooling water). The effluent contains treated tobacco process wastewater and treated nontobacco process wastewater.

At all four indirect dischargers, EPA sampled the final effluent discharged to the POTWs. This effluent contains tobacco process wastewater and sanitary wastewater, and may contain other nontobacco process wastewater (e.g., noncontact cooling water). At some of the indirect dischargers, EPA also collected samples at an in-process sample point. This in-process wastewater contains tobacco process wastewater and may also contain sanitary wastewater and nontobacco process wastewater.

5.4 Wastewater Sampling Data

The data tables attached to the *Tobacco Products Sampling Data* memorandum (Matuszko, 2006a) contain the analytical results from the six wastewater sampling episodes, including influent and effluent pollutant concentrations from the two direct dischargers, effluent pollutant concentrations from the four indirect dischargers, and the trip blank results. No analytes were detected in any of the trip blank samples. For detailed discussions of the analytical results, including methods used, see *Data Review Narratives for Tobacco Products Sampling* (SCC, 2005).

Appendix A of this report contains a subset of the analytical results for the direct dischargers and a subset for the indirect dischargers. For the direct dischargers' subset, EPA included pollutants with measured effluent concentrations that are greater than the baseline values (for at least one of the two direct dischargers). Likewise, for the indirect dischargers' subset, EPA included pollutants with measured effluent concentrations that are greater than the baseline values (for at least one of the four indirect dischargers). EPA develops method-specific "baseline values" for analyzing measurement data collected for effluent guidelines development. In most cases, the baseline value is the "nominal quantitation limit" stipulated for the specific method used to measure a particular pollutant. In general, the term "nominal quantitation limit" describes the smallest quantity of an analyte that can be measured reliably.

EPA organized the analytical data by the following pollutant groups: conventional pollutants, toxic and nonconventional pollutants, and nutrients. Section 5.5 of this report includes analyses of the data included in Appendix A.

5.5 Wastewater Characteristics

In this section, the sampled tobacco products facilities are referred to by their sampling episode numbers. The two sampled direct dischargers are referred to as Episode 6510 and Episode 6516. The four sampled indirect dischargers are referred to as Episodes 6511, 6512, 6513, and 6515.

5.5.1 Discharge Flow

Table 5-1 includes annual discharge flows of the final effluent from the six sampled tobacco products facilities. EPA obtained these annual discharge flows from the facilities. EPA used these annual discharge flows to calculate annual pollutant loads from the pollutant concentrations measured in the facility effluents.

Table 5-1. Annual Wastewater Discharge Flows for Sampled Tobacco Products Facilities

Sampling Episode	Annual Discharge Flow (MGY)
6510	235
6516	720
6511	90
6512	288
6513	127
6515	294

Source: (Porter, 2005a and b), and (Shore, 2006).

5.5.2 Direct Dischargers

Section 5.5.2.1 describes the pollutants discharged in the treated final effluent of the two sampled directly discharging tobacco products facilities. Section 5.5.2.2 compares the treated effluent pollutant concentrations to their concentrations in the James River. Section 5.5.2.3 compares the treated effluent pollutant concentrations and loads to facility-provided pollutant concentrations and loads and to PCS loads.

5.5.2.1 Direct Discharge Pollutant Loads

Table 5-2 contains a subset of the analytical results from effluent data at the two direct dischargers. It includes only pollutants that were measured above the pollutant-specific detection level (for at least one of the facilities). In addition, this table includes an estimate of the annual discharge loadings and toxic-weighted pound equivalents (TWPE) (based on these measured concentrations, facility-specific discharge flow, and pollutant-specific toxic-weighting factors (TWFs)).

The total facility annual TWPE for Episode 6516 (779) is roughly six times greater than the total facility annual TWPE for Episode 6510 (125). This difference is due, in part, to Episode 6516's effluent flow rate, which is roughly three times greater than Episode 6510's effluent flow rate (720 MGY vs. 235 MGY). In addition to a higher effluent flow rate, Episode 6516's treated effluent contains higher concentrations of some metals and other toxics, such as chloride, which may be due to the variable nature of the one-time grab sampling and/or variations in facility source water (refer to Sections 5.5.2.2 and 5.5.2.3 for further discussion). Episode 6516's treated effluent also includes the pollutants bromodichloromethane, chloroform, and dibromochloromethane, which were not detected in the Episode 6510 discharge. These pollutants are most likely by-products of a chlorination stage of the facility's wastewater treatment system.

The majority of the total facility annual TWPE in the treated effluents from both Episodes 6510 and 6516 is from metals (66.1 percent and 77 percent, respectively). Additionally, the majority of the total metals annual TWPE of both Episode 6510 and 6516 is from the combination of boron, copper, and magnesium (85.6 percent and 87.7 percent, respectively).

Table 5-2. Sampled Directly Discharging Tobacco Products Facility Effluent Pollutant Loads and TWPE

			Episode 6510			Episode 6516		
Pollutant	**Units**	**Baseline Value**	**Concentration**	**Annual Load (lbs/yr)**	**Annual TWPE**	**Concentration**	**Annual Load (lbs/yr)**	**Annual TWPE**
Conventional Pollutants								
BOD_5	mg/L	2	6	11,800	NA	5.6	33,700	NA
TSS	mg/L	1	9	17,700	NA	5	30,000	NA
Total Conventional Pollutants				**29,400**	NA	NA	**63,700**	NA
Toxic Pollutants								
Bromodichloromethane	ug/L	10	ND (<10)	0	0	315	1,890	62.3
Chloroform	ug/L	10	ND (<10)	0	0	576	3,460	7.19
Dibromochloromethane	ug/L	10	ND (<10)	0	0	86.2	518	23.0
Nicotine	ug/L	20	25.2	49.5	0.079	ND (<20)	0	0
Barium	ug/L	2	10	19.6	0.039	8.69	52.2	0.104
Boron	ug/L	100	101	198	35.1	155	931	165
Calcium	ug/L	50	60,800	119,000	3.34	75,000	451,000	12.6
Copper	ug/L	10	12.9	25.3	16.1	61.1	367	233
Iron	ug/L	100	380	746	4.18	363	2,180	12.2
Magnesium	ug/L	200	11,500	22,600	19.5	24,600	148,000	128
Manganese	ug/L	15	52.2	102	1.48	54.4	327	4.72
Molybdenum	ug/L	10	ND (<10)	0	0	27.2	163	32.9
Sodium	ug/L	500	17,300	34,000	0.186	132,000	793,000	4.35
Zinc	ug/L	10	28.2	55.4	2.60	23.4	141	6.59
Chloride	mg/L	2	109	214,000	5.21	426	2,560,000	62.3
Sulfate	mg/L	10	26	51,000	0.286	168	1,010,000	5.65
Chloropicrin	ug/L	0.5	ND (<0.5)	0	0	0.6	3.61	10.6
Unknown Dithiocarbamate Pesticide	mg/L	0.1	0.15	294	35.9	ND (<0.1)	0	0
Ammonia as Nitrogen	mg/L	0.04	0.23	452	0.680	0.9	5,410	8.14
Total Toxic Metals				**177,000**	**82.6**	NA	**1,400,000**	**600**
Total Toxic Pollutants				**443,000**	**125**	NA	**4,980,000**	**779**
Nitrogen								
TKN	mg/L	1	4.5	8,830	NA	8.3	49,900	NA
Nitrate/Nitrite	mg/L	0.05	22.9	45,000	NA	1.16	6,970	NA
Total Nitrogen				**53,800**	NA	NA	**56,800**	NA
Phosphorus								
Total Phosphorus	mg/L	0.02	2.87	5,630	NA	0.18	1,080	NA
Total Phosphorus				**5,630**	NA	NA	**1,080**	NA
Facility Total				**532,000**	**125**	NA	**5,070,000**	**779**

Source: *Tobacco Products Sampling Data* (Matuszko, 2006a).
Ammonia as nitrogen is included in the Toxic Pollutant category and not in the Nitrogen category because summing ammonia and TKN would double count the ammonia.
TWPE was calculated using TWFs, as described in *2005 Annual Screening-Level Analysis* (U.S. EPA, 2005a).
ND - Not detected; NA - Not applicable; Baseline Value - Analytical detection limit.

After the TWPE contribution of metals, nearly all of Episode 6510's remaining total facility annual TWPE is from unknown dithiocarbamate pesticide (28.7 percent of total facility annual TWPE). Its concentration, 0.15 mg/L, is only slightly higher than the minimum detection level, 0.1 mg/L. Because EPA has information in its record that tobacco growers sometimes apply mancozeb, a dithiocarbamate pesticide, EPA used the TWF for mancozeb to calculate the TWPE of this material. This may overestimate or underestimate the TWPE associated with the detected pesticide.

Unlike Episode 6510, no unknown dithiocarbamate pesticide was detected in Episode 6516's effluent. However, a small amount of the pesticide chloropicrin was detected (1.36 percent of total facility annual TWPE), at a concentration of 0.6 ug/L, which was only slightly higher than the minimum detection limit, 0.5 ug/L.

After the TWPE contribution of metals, roughly half of Episode 6516's remaining total facility annual TWPE is from bromodichloromethane, chloroform, and dibromochloromethane (11.9 percent of total facility annual TWPE). As previously mentioned, these pollutants are most likely byproducts from a chlorination stage of the facility's wastewater treatment system.

5.5.2.2 Source Water

Because the James River provides the source water for both of the direct dischargers sampled, EPA compiled data from the USGS NWISWeb database (USGS, 2002) on the concentrations of pollutants found in the James River. EPA chose three USGS monitoring sites that are located upstream and in the general vicinity of the two direct dischargers.

In addition, the facility at which EPA conducted sampling Episode 6516 provided EPA with pollutant concentrations that it measured in its source water. Table 5-3 presents these data along with the USGS data on the James River pollutant concentrations and the sampled direct discharger effluent pollutant concentrations. The sampled direct discharger effluent pollutant concentrations and the facility-provided source water pollutant concentrations were measured as total pollutants. Seven of the USGS pollutant concentrations presented in Table 5-3 were measured as total pollutants (barium, copper, iron, manganese, molybdenum, nickel, and zinc) and six of the pollutant concentrations (calcium, sodium, chloride, magnesium, sulfate, and boron) were measured as dissolved pollutants.

As previously shown in Table 5-2, metals appear to contribute the majority of TWPE detected in the effluent of the two direct dischargers. As shown in Table 5-3, the James River water appears to contribute significantly to the metals detected in the effluent of the two direct dischargers. Specifically, the USGS-reported dissolved concentration of boron, and total pollutant concentrations of barium, iron, and manganese are greater than the EPA-sampled total pollutant concentrations.

Section 5.5.2.1 highlights three pollutants, boron, copper, and magnesium, that contribute the greatest percentage of the total metals TWPE for both of the direct dischargers. The concentration data presented in Table 5-3 suggest that nearly all of the boron and a large portion of the magnesium concentration detected at both facilities originate from the James River water. Little, if any, of the copper concentration appears to originate from the James River water.

Table 5-3. Comparison of Sampled Directly Discharging Tobacco Products Facility Effluent Pollutant Concentrations to James River Pollutant Concentrations

Pollutant	Units	Baseline Value (for EPA sampling)	Effluent Concentration Episode 6510	Effluent Concentration Episode 6516	USGS James River Concentration Site 1 (203853010)	USGS James River Concentration Site 2 (203853030)	USGS James River Concentration Site 3 (203853050)	Facility Provided Source Water Concentration (Episode 6516)
Barium	ug/L	2	10	8.69	65.6	245	175	33
Boron[a]	ug/L	100	101	155	158	409	189	<500
Calcium[a]	mg/L	0.05	60.8	75	5.22	11.3	14.6	100
Copper	ug/L	10	12.9	61.1	0.8	<1	<1	<13
Iron	ug/L	100	380	363	880	78,100	4,210	<100
Magnesium[a]	mg/L	0.2	11.5	24.6	1.84	7.65	8.66	21
Manganese	ug/L	15	52.2	54.4	832	3,750	1,590	35
Molybdenum	ug/L	10	ND (<10)	27.2	<2	<2	<2	<25
Sodium[a]	mg/L	0.5	17.3	132	13.8	69.8	32.5	110
Zinc	ug/L	10	28.2	23.4	15 (est)	22 (est)	18 (est)	<100
Chloride[a]	mg/L	2	109	426	10.4	94.2	70.2	26
Sulfate[a]	mg/L	10	26	168	5.7	2	5	24

Source: (Bridges, 2006), *Tobacco Products Sampling Data* (Matuszko, 2006a), and USGS database (USGS, 2002).
[a]USGS data are dissolved concentrations.
ND – Not detected; Baseline Value – Analytical detection limit.

5.5.2.3 Facility-Provided Data and PCS Data

The direct dischargers at which EPA conducted sampling Episodes 6510 and 6516 provided EPA with monitoring data for the effluent from their wastewater treatment processes. The facility at which EPA conducted Episode 6510 provided EPA with monitoring data for the months of January through June, 2005. This facility provided pollutant concentration (ppm), which EPA converted into lbs/year based on the facility-provided effluent flow rate. The facility at which EPA conducted sampling Episode 6516 provided EPA with monitoring data for the years 2002 through 2004. EPA compared the most recent data (2004) to the sampling data. This facility provided pollutant concentration in mg/L, pollutant loads in lbs/day, and in some cases, pollutant loads in kg/month for each month of 2004. EPA converted the provided loads into lbs/month and added all months for an annual load.

Table 5-4 presents the facility-provided data along with EPA sampling data. Table 5-4 also includes *PCSLoads2002* calculated loads for Episode 6510. No 2002 PCS data are available for Episode 6516, so no *PCSLoads2002* loads are presented for Episode 6516 on Table 5-4. Table 5-4 includes only the pollutants for which the facilities provided data and/or for which 2002 PCS data is available.

Differences between the annual loads estimated with EPA's sampling data and the loads estimated with facility-provided data are most likely due to the fact that loads estimated with EPA's sampling data are based on one grab sample and a rough annual facility flow rate. The facility-provided data are more representative. Despite the difference in sample measurement, EPA's estimated loads are within an order of magnitude of the facility-provided loads. Likewise, EPA's estimated annual loads are within an order of magnitude of the *PCSLoads2002* loads.

Table 5-4. Comparison of Directly Discharging Tobacco Products Facility Sampling Data to Facility-Provided Data and PCS Data

Pollutant	Units	EPA-Measured Concentration	EPA-Estimated Annual Load (lbs/year)	Facility-Provided Concentration (mg/L)	Facility-Provided Load (lbs/year)	PCS Loads 2002 (lbs/year)
Episode 6510[a]						
Biochemical Oxygen Demand (BOD_5)	mg/L	6	11,800	—	—	17,390
Total Suspended Solids (TSS)	mg/L	9	17,700	10	19,600	39,822
Ammonia as Nitrogen	mg/L	0.23	452	1.01	1,980	2,143
Total Kjeldahl Nitrogen (TKN)	mg/L	4.5	8,830	8.15	16,000	—
Nitrate/Nitrite	mg/L	22.9	45,000	3.33	6,540	—
Total Phosphorus	mg/L	2.87	5,630	1.37	2,690	3,403
Episode 6516						
BOD_5	mg/L	5.6	33,700	—	—	—
TSS	mg/L	5	30,000	10.6	56,819	—
Ammonia as Nitrogen	mg/L	0.9	5,410	0.37	1,811	—
TKN	mg/L	8.3	49,900	12.4	71,132	—
Nitrate/Nitrite	mg/L	1.16	6,970	2	10,382	—
Total Phosphorus	mg/L	0.18	1,080	1.2	6,778	—

Source: *PCSLoads2002_v02* (U.S. EPA, 2005b), (Pickelhaupt, 2005), (Reynolds, 2005b), and *Tobacco Products Sampling Data* (Matuszko, 2006a).
[a]The facility at which EPA conducted sampling Episode 6510 provided concentrations and EPA calculated loads.
A dash (—) indicates that no facility data was provided for the pollutant.

5.5.3 Treatment Effectiveness at Direct Dischargers

Table 5-5 presents the percentage of pollutants removed by the wastewater treatment systems at the two direct dischargers. In the cases where the detected pollutant concentrations are greater in the effluent than the influent, a negative percent removal is indicated.

Overall, the data in Table 5-5 demonstrate that the treatment technology at the direct dischargers is effective. The calculated pollutant percent removals from Episodes 6510 and 6516 indicate that the direct discharger wastewater treatment technology is capable of removing the majority of conventional pollutants from the wastewater of the direct dischargers (greater than 87 percent).

Similarly, the pollutant percent removals indicate that the direct discharger wastewater treatment technology is capable of removing the majority of the nutrients from the wastewater. For both episodes, the removal of total nitrogen, ammonia, and total phosphorus is greater than 71, 93, and 79 percent, respectively. Nitrate/nitrite is higher in the effluent of the wastewater treatment process than in the influent for Episode 6510, which could be due to variability in the nitrification stage.

The pollutant percent removals indicate that the treatment technology is capable of removing nearly all of the nicotine from the direct discharger wastewater (greater than 99.9 percent removal).

In general, the pollutant percent removals indicate that the treatment technology is capable of removing the majority of the metals from the direct discharger wastewater. The majority of the metals are reduced by greater than 80 percent and/or reduced to concentrations that are near the analytical detection limits.

Table 5-5. Sampled Directly Discharging Tobacco Products Facility Wastewater Treatment Pollutant Removals

Pollutant	Units	Baseline Value	Episode	Influent Concentration	Influent MeasType[a]	Effluent Concentration	Effluent MeasType[a]	Percent Removal[b]
Conventional Pollutants								
BOD_5	mg/L	2	6510	538	NC	6	NC	98.9%
BOD_5	mg/L	2	6516	1,230	NC	5.6	NC	99.5%
TSS	mg/L	1	6510	580	NC	9	NC	98.4%
TSS	mg/L	1	6516	2,940	NC	5	ND	>99.8%
Hexane Extractable Material (HEM)	mg/L	5	6510	46.9	NC	6	ND	>87.2%
HEM	mg/L	5	6516	88.9	NC	5.6	ND	>93.7%
Toxic Pollutants								
2-Propanone	ug/L	50	6510	89.1	NC	50	ND	—
2-Propanone	ug/L	50	6516	285	NC	50	ND	>82.5%
Bromodichloromethane	ug/L	10	6510	10	ND	10	ND	—
Bromodichloromethane	ug/L	10	6516	10	ND	315	NC	—
Chloroform	ug/L	10	6510	10	ND	10	ND	—
Chloroform	ug/L	10	6516	10.8	NC	576	NC	—
Dibromochloromethane	ug/L	10	6510	10	ND	10	ND	—
Dibromochloromethane	ug/L	10	6516	10	ND	86.2	NC	—
Nicotine	ug/L	20	6510	48,700	NC	25.2	NC	99.95%
Nicotine	ug/L	20	6516	48,800	NC	20	ND	>99.96%
Propachlor	ug/L	0.1	6510	0.18	NC	0.1	ND	—
Propachlor	ug/L	0.1	6516	0.1	ND	0.1	ND	—
Acetaldehyde	mg/L	0.5	6510	0.55	NC	0.14	NC	—
Acetaldehyde	mg/L	0.5	6516	3.02	NC	0.23	NC	99.4%
Formaldehyde	mg/L	0.5	6510	0.55	NC	0.18	NC	—
Formaldehyde	mg/L	0.5	6516	0.36	NC	0.14	NC	—
Propylene Glycol	mg/L	10	6510	14.3	NC	10	ND	—
Propylene Glycol	mg/L	10	6516	10	ND	10	ND	—
Aluminum	ug/L	50	6510	917	NC	50	ND	>94.6%
Aluminum	ug/L	50	6516	3,390	NC	50	ND	>98.5%
Barium	ug/L	2	6510	158	NC	10	NC	93.7%
Barium	ug/L	2	6516	646	NC	8.69	NC	98.7%
Boron	ug/L	100	6510	122	NC	101	NC	—
Boron	ug/L	100	6516	155	NC	155	NC	—
Cadmium	ug/L	5	6510	5	ND	5	ND	—
Cadmium	ug/L	5	6516	5.16	NC	5	ND	—
Calcium	ug/L	50	6510	84,000	NC	60,800	NC	27.6%
Calcium	ug/L	50	6516	172,000	NC	75,000	NC	56.4%
Chromium	ug/L	10	6510	10	ND	10	ND	—
Chromium	ug/L	10	6516	25.3	NC	10	ND	—
Copper	ug/L	10	6510	48.5	NC	12.9	NC	—
Copper	ug/L	10	6516	90.5	NC	61.1	NC	32.5%
Iron	ug/L	100	6510	1,250	NC	380	NC	69.6%
Iron	ug/L	100	6516	26,600	NC	363	NC	98.6%
Magnesium	ug/L	200	6510	20,900	NC	11,500	NC	45.0%
Magnesium	ug/L	200	6516	27,200	NC	24,600	NC	9.6%

Table 5-5 (Continued)

Pollutant	Units	Baseline Value	Episode	Influent Concentration	Influent MeasType[a]	Effluent Concentration	Effluent MeasType[a]	Percent Removal[b]
Manganese	ug/L	15	6510	435	NC	52.2	NC	88.0%
Manganese	ug/L	15	6516	1,050	NC	54.4	NC	94.8%
Molybdenum	ug/L	10	6510	12.1	NC	10	ND	—
Molybdenum	ug/L	10	6516	10	ND	27.2	NC	—
Sodium	ug/L	500	6510	8,540	NC	17,300	NC	-103%
Sodium	ug/L	500	6516	50,800	NC	132,000	NC	-160%
Titanium	ug/L	10	6510	21.4	NC	10	ND	—
Titanium	ug/L	10	6516	10	ND	10	ND	—
Zinc	ug/L	10	6510	153	NC	28.2	NC	81.6%
Zinc	ug/L	10	6516	635	NC	23.4	NC	96.3%
Chloride	mg/L	2	6510	93	NC	109	NC	-17.2%
Chloride	mg/L	2	6516	218	NC	426	NC	-95.4%
Sulfate	mg/L	10	6510	88	NC	26	NC	70.5%
Sulfate	mg/L	10	6516	89	NC	168	NC	-88.8%
Chloropicrin	ug/L	0.5	6510	0.5	ND	0.5	ND	—
Chloropicrin	ug/L	0.5	6516	0.5	ND	0.6	NC	—
Unknown Dithiocarbamate Pesticide	mg/L	0.1	6510	0.1	ND	0.15	NC	—
Unknown Dithiocarbamate Pesticide	mg/L	0.1	6516	0.1	ND	0.1	ND	—
Ammonia as Nitrogen	mg/L	0.04	6510	21.1	NC	0.23	NC	98.9%
Ammonia as Nitrogen	mg/L	0.04	6516	13.1	NC	0.9	NC	93.1%
Nitrogen								
TKN	mg/L	1	6510	80.4	NC	4.5	NC	94.4%
TKN	mg/L	1	6516	163	NC	8.3	NC	94.9%
Nitrate/Nitrite	mg/L	0.05	6510	14.4	NC	22.9	NC	-59.0%
Nitrate/Nitrite	mg/L	0.05	6516	36.8	NC	1.16	NC	96.8%
Phosphorus								
Total Phosphorus	mg/L	0.02	6510	13.8	NC	2.87	NC	79.2%
Total Phosphorus	mg/L	0.02	6516	45.6	NC	0.18	NC	99.6%
Other Pollutants								
Total Dissolved Solids	mg/L	10	6510	930	NC	721	NC	22.5%
Total Dissolved Solids	mg/L	10	6516	2,350	NC	1,830	NC	22.1%
Silica Gel Treated Hexane Extractable Material (SGT-HEM)	mg/L	5	6510	5.9	ND	6	ND	—
SGT-HEM	mg/L	5	6516	11.9	NC	5.6	ND	—
Alkalinity	mg/L	10	6510	475	NC	270	NC	43.2%
Alkalinity	mg/L	10	6516	620	NC	534	NC	13.9%
Total Organic Carbon (TOC)	mg/L	1	6510	412	NC	27.8	NC	93.3%
TOC	mg/L	1	6516	1,090	NC	50.7	NC	95.3%
Chemical Oxygen Demand (COD)	mg/L	50	6510	1,410	NC	82	NC	94.2%
COD	mg/L	50	6516	4,000	NC	135	NC	96.6%

Source: *Tobacco Products Sampling Data* (Matuszko, 2006a).
[a] MeasType – type of measurement.
[b]Percent removals were only calculated when the influent concentration was greater than five times the baseline value.
ND - Not detected; NC - Not censored; Baseline Value - Analytical detection limit; a dash (—) indicates that a percent removal was not calculated.

As reported in Section 5.5.2.1, three pollutants, boron, copper, and magnesium, contribute the greatest percentage of the total metals annual TWPE for both of the direct dischargers. The concentration data presented in Table 5-3 suggest that a large portion of the boron and magnesium detected at both direct dischargers originate from the James River water. Little, if any, of the copper concentration appears to originate from the James River water. The wastewater treatment system pollutant removal calculated for copper is only 32.5 percent, as shown in Table 5-5. Although the percent removed is fairly low (due to low influent concentration), the copper concentration discharged is relatively close to the minimum detection limit of the analytical test method.

The wastewater treatment process reduced the propylene glycol concentration to the analytical detection limit in Episode 6510. Propylene glycol was not detected in the influent in Episode 6516. Propylene glycol is readily biodegradable, as discussed in the memorandum entitled, *Fate of Propylene Glycol in the Environment and POTWs* (Matuszko, 2006c).

The wastewater treatment process appears to add bromodichloromethane, chloroform, and dibromochloromethane to the wastewater of Episode 6516. This could be due to a chlorination stage of the wastewater treatment process.

Two pesticides were detected in the effluent samples, but not in the influent. Chloropicrin was detected in the treated effluent of Episode 6516 and unknown dithiocarbamate pesticide was detected in the treated effluent of Episode 6510. However, both pesticide concentrations are just slightly above the detection limit of the test methods.

5.5.4 State Regulator Information about Direct Discharges

EPA received information from the VA DEQ about two tobacco products facilities in the Richmond, Virginia area with NPDES permits (Winter, 2006). One of these facilities recently ceased its operations. While in operation, both facilities operated strong internal environmental programs. Both facilities discharged wastewaters to a water-quality-limited segment of the James River. VA DEQ reported that there have been few problems with the tobacco products facility wastewater over the years. There have been periodic complaints from the public about the brown color of the wastewater.

5.5.5 Summary of Direct Discharge Wastewater Characteristics and Analyses

As explained in Section 3.1.4, EPA has identified only two tobacco products facilities that currently discharge significant quantities of process wastewater directly to waters of the United States. EPA collected samples and evaluated discharge data from one of these facilities and from another that has since closed. EPA's review of data from these two directly discharging tobacco products facilities demonstrates that such discharges are characterized by low concentrations of toxic and nonconventional pollutants – primarily metals. EPA found existing on-site wastewater treatment systems to be highly efficient, with BOD_5 and nicotine removals in excess of 99 percent. Remaining metals discharges largely result from source water contributions. Finally, permitting authorities report few problems with tobacco products processing discharges.

5.5.6 Indirect Dischargers

Section 5.5.6.1 describes the pollutants discharged in the untreated final effluent of the four indirectly discharging tobacco products facilities sampled by EPA. Section 5.5.6.2 compares the untreated effluent pollutant concentrations to their concentrations in facility source water. Section 5.5.6.3 compares the untreated effluent pollutant concentrations and loads to facility-provided pollutant concentrations and loads and to POTW-provided influent pollutant concentrations.

5.5.6.1 Indirect Discharge Pollutant Loads and TWPE

Tables 5-6 through 5-9 contain subsets of the analytical results from the four indirect dischargers sampled by EPA. The tables include only pollutants that were measured above the pollutant specific detection level (for at least one of the facilities). In addition, these tables include an estimate of the annual discharge loadings and TWPE (based on these measured concentrations and facility-specific discharge flow). These loadings are discharged to POTWs and, as presented, do not account for POTW removals.

Table 5-6. Sampled Indirectly Discharging Tobacco Products Facility Effluent Pollutant Loads and TWPE, Episode 6511, Sample Number 66161

Pollutant	Units	Baseline Value	Concentration	Annual Load (lbs/year)	Annual TWPE
Conventional Pollutants					
BOD_5	mg/L	2	1210	909,000	NA
TSS	mg/L	1	341	256,000	NA
HEM	mg/L	5	16.3	12,200	NA
			Total Conventional Pollutants	**1,180,000**	NA
Toxic Pollutants					
2-Propanone	ug/L	50	2620	1,970	0.0167
Benzoic Acid	ug/L	50	ND (<50)	0	0
Benzyl Alcohol	ug/L	10	ND (<10)	0	0
Nicotine	ug/L	20	30,800	23,100	37.0
Acetaldehyde	mg/L	0.5	0.49	368	0.811
Formaldehyde	mg/L	0.5	0.2	150	0.350
Propylene Glycol	mg/L	10	29.2	21,900	1.25
Aluminum	ug/L	50	145	109	7.05
Arsenic	ug/L	10	ND (<10)	0	0
Barium	ug/L	2	43.7	32.8	0.0653
Boron	ug/L	100	ND (<100)	0	0
Calcium	ug/L	50	27,700	20,800	0.583
Chromium	ug/L	10	ND (<10)	0	0
Copper	ug/L	10	224	168	107
Iron	ug/L	100	1,710	1,280	7.19
Magnesium	ug/L	200	4,480	3,370	2.91
Manganese	ug/L	15	58.9	44.2	0.639
Molybdenum	ug/L	10	69.3	52.1	10.5
Sodium	ug/L	500	20,900	15,700	0.0862
Zinc	ug/L	10	185	139	6.52
Chloride	mg/L	2	57	42,800	1.04
Sulfate	mg/L	10	58	43,600	0.244
Ammonia as	mg/L	0.04	9.06	6,810	10.2
			Total Toxic Metals	**41,700**	**142**
			Total Toxic Pollutants	**182,000**	**193**
Nitrogen					
TKN	mg/L	1	38.7	29,100	NA
Nitrate/Nitrite	mg/L	0.05	0.35	263	NA
			Total Nitrogen	**29,300**	NA
Phosphorus					
Total Phosphorus	mg/L	0.02	3.4	2,550	NA
			Total Phosphorus	**2,550**	NA
			Facility Total	**1,390,000**	**193**

Source: *Tobacco Products Sampling Data* (Matuszko, 2006a).
ND - Not detected; NA - Not applicable; Baseline Value - Analytical detection limit.

Table 5-7. Sampled Indirectly Discharging Tobacco Products Facility Effluent Pollutant Loads and TWPE, Episode 6512, Sample Number 66167

Pollutant	Units	Baseline Value	Concentration	Annual Load (lbs/year)	Annual TWPE
Conventional Pollutants					
BOD	mg/L	2	1,740	4,180,000	NA
TSS	mg/L	1	236	567,000	NA
HEM	mg/L	5	12.1	29,100	NA
			Total Conventional Pollutants	**4,780,000**	NA
Toxic Pollutants					
2-Propanone	ug/L	50	2,560	6,150	0.0521
Benzoic Acid	ug/L	50	6,470	15,600	5.15
Benzyl Alcohol	ug/L	10	1290	3,100	17.4
Nicotine	ug/L	20	16,800	40,400	64.6
Acetaldehyde	mg/L	0.5	0.3	721	1.59
Formaldehyde	mg/L	0.5	0.41	985	2.30
Propylene Glycol	mg/L	10	131	315,000	18.0
Aluminum	ug/L	50	177	425	27.5
Arsenic	ug/L	10	ND (<10)	0	0
Barium	ug/L	2	66.8	161	0.320
Boron	ug/L	100	135	324	57.5
Calcium	ug/L	50	28,100	67,500	1.89
Chromium	ug/L	10	ND (<10)	0	0
Copper	ug/L	10	41.6	100	63.5
Iron	ug/L	100	2,020	4,860	27.2
Magnesium	ug/L	200	7,310	17,600	15.2
Manganese	ug/L	15	55.9	134	1.94
Molybdenum	ug/L	10	16.7	40.1	8.09
Sodium	ug/L	500	57,300	138,000	0.756
Zinc	ug/L	10	104	250	11.7
Chloride	mg/L	2	122	293,000	7.14
Sulfate	mg/L	10	47	113,000	0.633
Ammonia as	mg/L	0.04	5.48	13,200	19.8
			Total Toxic Metals	**229,000**	**216**
			Total Toxic Pollutants	**1,030,000**	**352**
Nitrogen					
TKN	mg/L	1	22.6	54,300	NA
Nitrate/Nitrite	mg/L	0.05	ND (<0.05)	0	NA
			Total Nitrogen	**54,300**	NA
Phosphorus					
Total Phosphorus	mg/L	0.02	1.86	4,470	NA
			Total Phosphorus	**4,470**	NA
			Facility Total	**5,870,000**	**352**

Source: *Tobacco Products Sampling Data* (Matuszko, 2006a).
ND - Not detected; NA - Not applicable; Baseline Value - Analytical detection limit.

Table 5-8. Sampled Indirectly Discharging Tobacco Products Facility Effluent Pollutant Loads and TWPE, Episode 6513, Sample Number 66171

Pollutant	Units	Baseline Value	Concentration	Annual Load (lbs/year)	Annual TWPE
Conventional Pollutants					
BOD	mg/L	2	208	221,000	NA
TSS	mg/L	1	287	305,000	NA
HEM	mg/L	5	9.5	10,100	NA
			Total Conventional Pollutants	**535,000**	NA
Toxic Pollutants					
2-Propanone	ug/L	50	142	151	0.00128
Benzoic Acid	ug/L	50	222	236	0.078
Benzyl Alcohol	ug/L	10	ND (<10)	0	0
Nicotine	ug/L	20	7,490	7,950	12.7
Acetaldehyde	mg/L	0.5	0.42	446	0.983
Formaldehyde	mg/L	0.5	0.44	467	1.09
Propylene Glycol	mg/L	10	ND (<10)	0	0
Aluminum	ug/L	50	979	1,040	67.2
Arsenic	ug/L	10	ND (<10)	0	0
Barium	ug/L	2	71.7	76.1	0.151
Boron	ug/L	100	ND (<100)	0	0
Calcium	ug/L	50	17,700	18,800	0.526
Chromium	ug/L	10	26.3	27.9	2.11
Copper	ug/L	10	135	143	90.9
Iron	ug/L	100	4,400	4,670	26.1
Magnesium	ug/L	200	4,390	4,660	4.03
Manganese	ug/L	15	146	155	2.24
Molybdenum	ug/L	10	ND (<10)	0	0
Sodium	ug/L	500	15,700	16,700	0.0915
Zinc	ug/L	10	879	933	43.7
Chloride	mg/L	2	22	23,300	0.568
Sulfate	mg/L	10	19	20,200	0.113
Ammonia as	mg/L	0.04	3.8	4,030	6.07
			Total Toxic Metals	**47,100**	**237**
			Total Toxic Pollutants	**104,000**	**259**
Nitrogen					
TKN	mg/L	1	31.6	33,500	NA
Nitrate/Nitrite	mg/L	0.05	0.59	626	NA
			Total Nitrogen	**34,200**	NA
Phosphorus					
Total Phosphorus	mg/L	0.02	2.99	3,170	NA
			Total Phosphorus	**3,170**	NA
			Facility Total	**677,000**	**259**

Source: *Tobacco Products Sampling Data* (Matuszko, 2006a).
ND - Not detected; NA - Not applicable; Baseline Value - Analytical detection limit.

Table 5-9. Sampled Indirectly Discharging Tobacco Products Facility Effluent Pollutant Loads and TWPE, Episode 6515, Sample Number 66176

Pollutant	Units	Baseline Value	Concentration	Annual Load (lbs/year)	Annual TWPE
Conventional Pollutants					
BOD	mg/L	2	223	548,000	NA
TSS	mg/L	1	182	447,000	NA
HEM	mg/L	5	33.9	83,300	NA
			Total Conventional Pollutants	**1,080,000**	NA
Toxic Pollutants					
2-Propanone	ug/L	50	51.1	126	0.00106
Benzoic Acid	ug/L	50	8,690	21,400	7.07
Benzyl Alcohol	ug/L	10	ND (<10)	0	0
Nicotine	ug/L	20	12,700	31,200	49.9
Acetaldehyde	mg/L	0.5	1.83	4,500	9.91
Formaldehyde	mg/L	0.5	0.14	344	0.802
Propylene Glycol	mg/L	10	ND (<10)	0	0
Aluminum	ug/L	50	136	334	21.6
Arsenic	ug/L	10	14.5	35.6	144
Barium	ug/L	2	41.1	101	0.201
Boron	ug/L	100	ND (<100)	0	0
Calcium	ug/L	50	18,200	44,700	1.25
Chromium	ug/L	10	18.3	45	3.40
Copper	ug/L	10	138	339	215
Iron	ug/L	100	860	2,110	11.8
Magnesium	ug/L	200	4,130	10,100	8.78
Manganese	ug/L	15	84	206	2.98
Molybdenum	ug/L	10	ND (<10)	0	0
Sodium	ug/L	500	18,200	44,700	0.246
Zinc	ug/L	10	395	971	45.5
Chloride	mg/L	2	90	221,000	5.39
Sulfate	mg/L	10	37	90,900	0.509
Ammonia as	mg/L	0.04	3.36	8,260	12.4
			Total Toxic Metals	**104,000**	**455**
			Total Toxic Pollutants	**482,000**	**541**
Nitrogen					
TKN	mg/L	1	26.1	64,100	NA
Nitrate/Nitrite	mg/L	0.05	6.39	15,700	NA
			Total Nitrogen	**79,800**	NA
Phosphorus					
Total Phosphorus	mg/L	0.02	7.41	18,200	NA
			Total Phosphorus	**18,200**	**NA**
			Facility Total	**1,660,000**	**541**

Source: *Tobacco Products Sampling Data* (Matuszko, 2006a).
ND - Not detected; NA - Not applicable; Baseline Value - Analytical detection limit.

Conventional pollutants contribute the majority of the total facility annual pollutant load for each of the four indirect dischargers. The total conventional pollutants contributions are greater than 65 percent of the total facility pollutant load for each sampling episode. BOD_5 and TSS are the greatest contributors to the total conventional pollutants load for each of the four facilities.

Of the pollutant groupings analyzed, nutrients contribute the least amount to the total facility annual pollutant load. The nutrients in the effluent of the four indirect dischargers contribute 5.9 percent or less to the total facility annual pollutant load.

Similar to the effluent of the two direct dischargers, the metals in the effluent of the four indirect dischargers are the greatest contributors to the total facility annual TWPE (greater than 61 percent for each facility). As shown in Table 5-10, copper is the greatest contributor to the total metals TWPE for each indirect discharger. The contributions from other significant metals (aluminum, arsenic, boron, iron, and zinc) vary for the four facilities.

Table 5-10. Metal Contributions to Total Facility Annual TWPE

Metal Pollutant	Episode 6511		Episode 6512		Episode 6513		Episode 6515	
	TWPE	% of Total	TWPE	% of Total	TWPE	% of Total	TWPE	% of Total
Aluminum	7.05	4.96%	27.5	**12.7%**	67.2	**28.4%**	21.6	**4.75%**
Arsenic	0	0%	0	0%	0	0%	144	**31.6%**
Barium	0.0653	0.046%	0.32	0.148%	0.151	0.064%	0.201	0.044%
Boron	0	0%	57.5	**26.6%**	0	0%	0	0%
Calcium	0.583	0.411%	1.89	0.875%	0.526	0.222%	1.25	0.275%
Chromium	0	0%	0	0%	2.11	0.89%	3.4	0.747%
Copper	107	**75.4%**	63.5	**29.4%**	90.9	**38.4%**	215	**47.3%**
Iron	7.19	5.06%	27.2	**12.6%**	26.1	**11%**	11.8	2.59%
Magnesium	2.91	2.05%	15.2	7.04%	4.03	1.7%	8.78	1.93%
Manganese	0.639	0.45%	1.94	.898%	2.24	0.945%	2.98	0.655%
Molybdenum	10.5	7.39%	8.09	3.75%	0	0%	0	0%
Sodium	0.0862	0.0607%	0.756	0.35%	0.0915	0.039%	0.246	0.054%
Zinc	6.52	4.59%	11.7	5.42%	43.7	**18.4%**	45.5	**10%**
Total	**142**		**216**		**237**		**455**	

Source: *Tobacco Products Sampling Data* (Matuszko, 2006a).

As shown in Table 5-11, after metals, nicotine contributes the next highest amount of TWPE to the facility totals, followed by ammonia (as nitrogen). The most significant contributions to the remaining total facility TWPEs are from propylene glycol, benzoic acid, benzyl alcohol, and acetaldehyde.

Table 5-11. Contributions of All Pollutants to Total Facility Annual TWPE

Pollutant	Episode 6511		Episode 6512		Episode 6513		Episode 6515	
	TWPE	% of Total	TWPE	% of Total	TWPE	% of Total	TWPE	% of Total
2-Propanone	0.0167	0.00865%	0.0521	0.0148%	0.00128	0.000494%	0.00106	0.000196%
Benzoic Acid	0	0%	5.15	1.46%	0.078	0.0301%	7.07	1.31%
Benzyl Alcohol	0	0%	17.4	4.94%	0	0%	0	0%
Nicotine	37.0	19.2%	64.6	18.4%	12.7	4.903%	49.9	9.22%
Acetaldehyde	0.811	0.420%	1.59	0.452%	0.983	0.380%	9.91	1.83%
Formaldehyde	0.350	0.181%	2.3	0.653%	1.09	0.421%	0.802	0.148%
Propylene Glycol	1.25	0.648%	18	5.11%	0	0%	0	0%
Total Metals[a]	142	73.6%	216	61.4%	237	91.5%	455	84.1%
Chloride	1.04	0.539%	7.14	2.03%	0.568	0.219%	5.39	0.996%
Sulfate	0.244	0.126%	0.633	0.180%	0.113	0.0436%	0.509	0.0941%
Ammonia as Nitrogen	10.2	5.29%	19.8	5.625%	6.07	2.34%	12.4	2.29%
Facility Total	**193**		**352**		**259**		**541**	

Source: *Tobacco Products Sampling Data* (Matuszko, 2006a).
[a]For a breakout of individual metal TWPEs, see Table 5-10.

5.5.6.2 Facility-Provided Source Water Data

The facilities at which EPA conducted sampling Episodes 6511 and 6512 provided EPA with pollutant concentrations measured in their source water. Table 5-12 presents these data along with effluent concentration data from EPA's sampling episodes.

As shown in Tables 5-6 through 5-9, metals appear to contribute the majority of TWPE detected in the effluent of the four indirect dischargers. As shown in Table 5-12, for the facilities that provided source water data, the source water appears to contribute significantly to the metals detected in the effluent.

Table 5-12. Comparison of Indirectly Discharging Tobacco Products Facility Sampling Data to Facility-Provided Source Water Data

Pollutant	Units	Baseline Value (for EPA sampling)	Effluent Concentration Episode 6511	Effluent Concentration Episode 6512	Facility-Provided Source Water Concentration (Episode 6511)	Facility-Provided Source Water Concentration (Episode 6512)
BOD_5	mg/L	2	1,210	1,740	5.5	2.9
TSS	mg/L	1	341	236	22	6.0
HEM	mg/L	5	16.3	12.1	<5.0	<5.0
2-Propanone	ug/L	50	2,620	2,560	<25	<25
Benzoic Acid	ug/L	50	ND (<50)	6,470	<50	<50
Benzyl Alcohol	ug/L	10	ND (<10)	1,290	<10	<10
Nicotine	ug/L	20	30,800	16,800	ND	ND
Acetaldehyde	mg/L	0.5	0.49[a]	0.3[a]	<0.1	<0.1
Formaldehyde	mg/L	0.5	0.2[a]	0.41[a]	<0.05	350 B
Propylene Glycol	mg/L	10	29.2	131	<5.0	<5.0
Aluminum	ug/L	50	145	177	66	<50
Arsenic	ug/L	10	ND (<10)	ND (10)	<2.5	<2.5
Barium	ug/L	2	43.7	66.8	35	30
Boron	ug/L	100	ND (<100)	135	<100	<100
Calcium	ug/L	50	27,700	28,100	25,000	9,600
Chromium	ug/L	10	ND (<10)	ND (<10)	<5.0	<5.0
Copper	ug/L	10	224	41.6	15	72
Iron	ug/L	100	1,710	2,020	<100	<100
Magnesium	ug/L	200	4,480	7,310	4,300	2,800
Manganese	ug/L	15	58.9	55.9	<5.0	<5.0
Molybdenum	ug/L	10	69.3	16.7	<5.0	<5.0
Sodium	ug/L	500	20,900	57,300	14,000	17,000
Zinc	ug/L	10	185	104	87	<20
Chloride	mg/L	2	57	122	18	10
Sulfate	mg/L	10	58	47	48	24
Ammonia (as nitrogen)	mg/L	0.04	9.06	5.48	0.85	<0.03
TKN	mg/L	1	38.7	22.6	1.1	<0.2
Nitrate/Nitrite	mg/L	0.05	0.35	ND (<0.05)	0.33	0.06
Total Phosphorus	mg/L	0.02	3.4	1.86	0.39	0.24

Source: (Bridges, 2006) and *Tobacco Products Sampling Data* (Matuszko, 2006a).
[a]These concentrations are lower than baseline due to sample specific issues.
B - Facility-provided source water data were labeled "B." However, B was not defined.
ND - Not detected.

As discussed in Section 5.5.6.1, EPA identified copper as the pollutant that contributes the greatest percentage of the total metals TWPE for all four indirect dischargers. The facility source water contains a greater concentration of copper than the effluent of Episode 6512, suggesting that the copper in the effluent of this facility may not originate from the process wastewater.

As also discussed in Section 5.5.6.1, EPA identified aluminum and zinc as significant contributors to the total metals TWPE for the indirect dischargers. The source water concentrations of aluminum and zinc (Episode 6511) indicate that the source water contributes significantly to the aluminum and zinc concentrations detected in the facility effluent.

5.5.6.3 Facility-Provided Data and POTW-Provided Data

The indirect dischargers at which EPA conducted sampling Episodes 6511 and 6512 provided EPA with monitoring data for their effluent wastewater for the years 2002 through 2004. EPA compared the most recent data (2004) to the sampling data. The facility at which EPA conducted sampling Episode 6511 provided pollutant concentration (mg/L), which EPA converted into lbs/year based on the facility-provided effluent flow rate. The facility at which EPA conducted sampling Episode 6512 provided pollutant concentration in ppm, and pollutant loads in lbs/day, averaged for each month. EPA converted the pollutant loads into lbs/year based on the facility-provided annual production days.

The POTWs that receive wastewater from the sampled indirect dischargers also provided EPA with monitoring data for these wastewaters. The POTWs monitor these wastewaters as they are discharged from the tobacco products facility. The POTWs provided pollutant monitoring data as concentrations (mg/L) for years 2004 and 2005. EPA compared the most recent data (2005) to sampling data.

Table 5-13 presents the facility-provided and POTW-provided data along with EPA sampling data. Table 5-13 includes only the pollutants for which EPA has POTW monitoring data although additional pollutants were detected in EPA's sampling program (see Tables 5-6 through 5-9).

Table 5-13. Comparison of Indirectly Discharging Tobacco Products Facility Sampling Data to Facility-Provided and POTW-Provided Data

Pollutant	Units	EPA-Measured Effluent Concentration	EPA-Estimated Annual Load (lbs/year)	Facility-Provided Effluent Concentration	Facility-Provided Effluent Annual Load (lbs/year)	POTW-Provided Influent Concentration
Episode 6511[a]						
BOD_5	mg/L	1210	909,000	597	448,000	416
TSS	mg/L	341	256,000	420	315,000	402
HEM	mg/L	16.3	12,200	14.5	10,900	3.19
Chromium	ug/L	ND (<10)	0	30	22.5	10
Copper	ug/L	224	168	160	120	140
Zinc	ug/L	185	139	450	338	300
Episode 6512						
BOD_5	mg/L	1740	4,180,000	723	1,066,320	954
TSS	mg/L	236	567,000	337	495,720	325
Arsenic	ug/L	ND (<10)	0	—	—	2
Chromium	ug/L	ND (<10)	0	—	—	6
Copper	ug/L	41.6	100	70	102.6	78
Zinc	ug/L	104	250	180	208	135
Ammonia as Nitrogen	mg/L	5.48	13,200	3.07	4,428	3
Episode 6513						
BOD_5	mg/L	208	221,000	—	—	340
TSS	mg/L	287	305,000	—	—	528
Arsenic	ug/L	ND (<10)	0	—	—	<5
Chromium	ug/L	26.3	27.9	—	—	15
Copper	ug/L	135	143	—	—	100
Manganese	ug/L	146	155	—	—	100
Molybdenum	ug/L	ND (<10)	0	—	—	<10
Zinc	ug/L	879	933	—	—	800
Ammonia as Nitrogen	mg/L	3.8	4,030	—	—	4.5
TKN	mg/L	31.6	33,500	—	—	20.1
Total Phosphorus	mg/L	2.99	3,170	—	—	2.88
Episode 6515						
BOD_5	mg/L	223	548,000	—	—	1,009
TSS	mg/L	182	447,000	—	—	977
Arsenic	ug/L	14.5	35.6	—	—	<5
Chromium	ug/L	18.3	45	—	—	20
Copper	ug/L	138	339	—	—	670
Manganese	ug/L	84	206	—	—	440
Molybdenum	ug/L	ND (<10)	0	—	—	<10
Zinc	ug/L	395	971	—	—	474
Ammonia as Nitrogen	mg/L	3.36	8,260	—	—	3.65
TKN	mg/L	26.1	64,100	—	—	43
Total Phosphorus	mg/L	7.41	18,200	—	—	9.525

Source: (Pickelhaupt, 2005), POTW-provided data (see OW-2004-0032), and *Tobacco Products Sampling Data* (Matuszko, 2006a).
[a]The facility at which EPA conducted sampling Episode 6511 provided concentrations, from which EPA calculated loads.
A dash (—) indicates that no facility data were provided for the pollutant.
ND – Not detected.

Differences between the annual loads estimated with EPA's sampling data and the loads estimated with facility-provided data are most likely due to the fact that loads estimated with EPA's sampling data are based on one grab sample and a rough annual facility flow rate. The facility-provided data are more representative. Despite the difference in sample measurement, EPA's estimated loads are within an order of magnitude of the facility-provided loads. Likewise, EPA's measured concentrations are within an order of magnitude of the POTW-provided concentrations.

5.5.7 Pass Through and Pollutant Loadings Analysis for Indirect Dischargers

Pretreatment standards are designed to prevent the discharge of pollutants that "interfere with, pass through, or otherwise [are] incompatible with" the operation of POTWs. See 33 U.S.C.§ 1371(b)(1). In establishing pretreatment standards, Congress had two objectives: (1) that standards for indirect dischargers be equivalent to standards for direct dischargers, and (2) that the treatment capability and performance of POTWs be recognized and taken into account in regulating the discharge of pollutants from indirect dischargers. EPA's approach is consistent with both objectives. Generally, EPA determines whether pollutants "pass through" by comparing the percentage of the pollutant removed by well operated POTWs achieving secondary (biological) treatment with the percentage of the pollutant removed by facilities meeting the best available treatment technology (BAT) effluent limitations. If the median percentage removed by well operated POTWs is less than the median percentage removed by BAT facilities, then the pollutant "passes through," and EPA develops pretreatment standards for facilities that indirectly discharge the pollutant.

EPA performs pass through analyses for industries that are under consideration for the development of pretreatment standards. As part of a typical pass through analysis, EPA compares the pollutant loadings in an industry's wastewater that are currently being discharged to POTWs and surface waters (current loadings) to the pollutant loadings in the industry's wastewater that would be discharged to POTWs and surface waters upon compliance with a rule (post-compliance loadings). To reach the goal that standards for indirect dischargers be equivalent to standards for direct dischargers, EPA generally calculates post-compliance loadings assuming facilities would achieve treatment at least equivalent to treatment that may be achieved by using the directly discharging technology (i.e., the BAT). EPA uses pass through analyses to select pollutants for regulation, to evaluate the effectiveness of treatment technologies in addition to POTW removals, and to evaluate the cost of these technologies in comparison to pollutant removals.

EPA analyzed current loadings from the four indirect dischargers sampled and the pollutant loadings that would be discharged if these facilities used pretreatment. EPA calculated current loadings for the sampled facilities as described in Section 5.5.6.1. However, for the loadings analysis, EPA is interested in the current loadings as discharged to surface waters. Therefore, EPA reduced the pollutant loadings calculated in Section 5.5.6.1 to account for removals achieved by the POTW. See Table 5-11 for EPA's estimated POTW removals and current loadings accounting for POTW reductions.

EPA also needed an estimate of post-compliance pollutant loadings. EPA estimated post-compliance pollutant loadings assuming pretreatment with BNR wastewater treatment technology. Both of the direct dischargers sampled by EPA used this technology and EPA collected effluent data from these treatment systems for an extensive list of pollutants. Furthermore, as detailed in Section 5.5.3, these systems are generally effective at reducing pollutants in tobacco products processing wastewaters. Therefore, for this analysis, EPA considers BNR treatment technology to be the BAT.

To calculate post-compliance pollutant loadings, EPA needed an estimate of the pollutant concentrations that would be achieved by the four indirect dischargers if they used BNR. EPA determined the average performance level that a well designed and operated BNR system is capable of achieving using the effluent pollutant concentrations from the two sampled direct dischargers. Typically, EPA applies data-editing criteria to the data sets prior to its performance level calculations. EPA calculates a performance level for a specific pollutant if it is present in the influent at sufficient concentrations that treatment effectiveness can be evaluated[3]. For this analysis, when a pollutant was detected in the facility's influent to treatment

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[3] EPA typically defines a pollutant to be at treatable levels if it is detected at a concentration in the influent equal to or greater than 10 times the baseline value. To be conservative with this analysis and to estimate treatment effectiveness for a wider range of pollutants, EPA selected a concentration equal to or greater than five times the baseline value.

in a concentration equal to or greater than five times the baseline value, the corresponding effluent data were included in the performance level calculations. When the data set for a pollutant at a facility did not meet this criteria, EPA excluded the data. For example, at Episode 6510, the influent copper concentration is 48.5 ug/L and the baseline value for copper is 10 ug/L. Because this pollutant failed the data-editing criteria, the corresponding effluent data were not included in the performance level calculation for copper. After applying the data-editing criteria, EPA then calculates a performance level for a pollutant by averaging the treated effluent concentrations, as applicable for that pollutant[4]. In this report, EPA refers to these averages as "BNR treatment averages."

Before applying the BNR treatment averages, EPA looked at the data sets to determine if the pollutant removals for any of the pollutants were negative (i.e., where an average effluent concentration was greater than an average influent concentration). In these cases, the treatment was ineffective and did not remove any of the pollutants. EPA removed such data sets from its BNR treatment averages. If the BNR treatment average for a pollutant was larger than the indirect discharge effluent concentration for that pollutant at a facility, then EPA set the BNR treatment average equal to the indirect discharge effluent concentration for that facility.

To estimate theoretical post-compliance loadings for each of the indirect dischargers sampled, EPA multiplied the BNR treatment averages for each pollutant by each indirect discharger's annual discharge flow. Similar to current loadings, EPA then adjusted these values to account for POTW treatment. Finally, EPA estimated post-compliance pollutant reductions by subtracting the post-compliance loadings from the current loadings. The resulting pollutant reductions reflect the pollutant loadings that the BNR treatment is capable of removing above the POTW reductions.

[4] If the effluent was measured as nondetect, EPA used the detection limit value as reported in these calculations.

Table 5-14 presents the results of the pollutant loadings analysis for the four indirectly discharging tobacco products facilities, including the current pollutant loadings, post-compliance pollutant loadings, and post-compliance pollutant reductions. All pollutant loadings and reductions presented in Table 5-14 take into account the POTW removals. Table 5-14 also presents the annual TWPE associated with the loadings and reductions. Table 5-14 does not contain information on conventional pollutants. Because POTWs are designed to effectively remove conventional pollutants, EPA does not generally regulate conventional pollutants for indirect dischargers, nor does EPA include conventional pollutants in its pollutant loadings analyses for indirect dischargers.

As shown in Table 5-14, the post-compliance pollutant reductions indicate that the BNR treatment is capable of removing a significant amount of the annual TWPE (greater than 41 percent for each sampling episode) that remains after the wastewater passes through the POTWs. EPA estimates that the pollutant loadings and annual TWPE that pass through the POTWs are relatively insignificant, as shown in Table 5-15. Table 5-15 compares the total pollutant loadings and TWPE that are discharged in the effluent of the four indirect dischargers, the total pollutant loadings and TWPE that EPA estimates pass through the POTWs, and the post-compliance annual pollutant TWPE reductions.

Table 5-15 demonstrates that if each of the indirectly discharging tobacco products facilities used BNR treatment, the average annual facility reduction that would be achieved is 28.6 TWPE/year. In a previous consideration of pretreatment standards for the Industrial Laundries category (see 64 FR 45071), EPA determined that pretreatment standards were not warranted because of the small amount of pollutants removed by the pretreatment option. For Industrial Laundries, EPA estimated an average annual facility reduction of 32 TWPE/year. EPA also found that POTWs were not generally experiencing problems with discharges from industrial laundries.

Table 5-14. Pollutant Loadings Analysis for Sampled Indirectly Discharging Tobacco Products Facilities

Pollutant	BNR Treatment		POTW Removals	Current Pollutant Loading[a] (lbs/yr)	Current Pollutant Annual TWPE[a]	Post-Compliance Pollutant Loading[a] (lbs/yr)	Post-Compliance Pollutant Annual TWPE[a]	Post-Compliance Pollutant Reductions[a] (lbs/yr)	Post-Compliance Pollutant Annual TWPE Reductions[a]
	Units	Averages							
Episode 6511, 90 MGY									
Toxic Pollutants									
2-Propanone	ug/L	50	0.8375	320	0.00271	6.11	0.0000517	314	0.00265
Nicotine	ug/L	22.6	0.964	833	1.33	0.611	0.000978	832	1.33
Acetaldehyde	mg/L	0.23	0.921	29	0.0639	13.6	0.0300	15.4	0.0339
Aluminum	ug/L	50	0.91	9.80	0.634	3.38	0.219	6.42	0.415
Barium	ug/L	9.35	0.5515	14.7	0.0293	3.15	0.00627	11.6	0.0230
Calcium	ug/L	27,700	0.0850	19,000	0.533	19,000	0.533	0	0
Copper	ug/L	61.1	0.842	26.6	16.9	7.25	4.60	19.3	12.3
Iron	ug/L	371.5	0.82	231	1.29	50.3	0.281	181	1.01
Magnesium	ug/L	4480	0.14	2,890	2.51	2,890	2.51	0	0
Manganese	ug/L	53.3	0.406	26.3	0.379	23.8	0.343	2.48	0.0359
Zinc	ug/L	25.8	0.7914	29.0	1.36	4.04	0.190	24.9	1.17
Ammonia as Nitrogen	mg/L	0.57	0.39	4,150	6.25	261	0.393	3,890	5.86
Total Toxic Metals				22,300	23.6	22,000	8.68	246	14.9
Total Toxic Pollutants				27,600	31.3	22,300	9.10	5,300	**22.2**
Nitrogen									
TKN	mg/L	6.4	0.57	12,500	NA	2,070	NA	10,400	NA
Nitrate/Nitrite	mg/L	0.35	0.9	26.3	NA	26.3	NA	0	NA
Total Nitrogen				12,500	NA	2,090	NA	10,400	NA
Phosphorus									
Total Phosphorus	mg/L	1.53	0.57	1,100	NA	494	NA	604	NA

Table 5-14 (Continued)

Pollutant	BNR Treatment		POTW Removals	Current Pollutant Loading[a] (lbs/yr)	Current Pollutant Annual TWPE[a]	Post-Compliance Pollutant Loading[a] (lbs/yr)	Post-Compliance Pollutant Annual TWPE[a]	Post-Compliance Pollutant Reductions[a] (lbs/yr)	Post-Compliance Pollutant Annual TWPE Reductions[a]
	Units	Averages							
Episode 6512, 288 MGY									
Toxic Pollutants									
2-Propanone	ug/L	50	0.8375	1,000	0.00846	19.5	0.000165	980	0.00829
Nicotine	ug/L	22.6	0.964	1,450	2.33	1.96	0.00313	1,450	2.32
Acetaldehyde	mg/L	0.23	0.921	56.7	0.125	43.5	0.0959	13.2	0.029
Aluminum	ug/L	50	0.91	38.3	2.48	10.8	0.700	27.5	1.78
Barium	ug/L	9.35	0.5515	72.0	0.143	10.1	0.0201	61.9	0.123
Calcium	ug/L	28,100	0.0850	61,800	1.73	61,800	1.73	0	0
Copper	ug/L	41.6	0.842	15.8	10.0	15.8	10.0	0	0
Iron	ug/L	371.5	0.82	874	4.89	161	0.900	713	3.99
Magnesium	ug/L	7,310	0.14	15,100	13.1	15,100	13.1	0	0
Manganese	ug/L	53.3	0.406	79.8	1.15	76.1	1.10	3.67	0.0536
Zinc	ug/L	25.8	0.7914	52.1	2.44	12.9	0.607	39.2	1.84
Ammonia as Nitrogen	mg/L	0.57	0.39	8,030	12.1	836	1.26	7,200	10.8
Total Toxic Metals				78,000	35.9	77,200	28.2	846	7.79
Total Toxic Pollutants				88,600	50.5	78,100	29.5	10,500	**21.0**
Nitrogen									
TKN	mg/L	6.4	0.57	23,400	NA	6,620	NA	16,700	NA
Nitrate/Nitrite	mg/L	0.05	0.9	12.0	NA	12.0	NA	0	NA
Total Nitrogen				23,400	NA	6,630	NA	16,700	NA
Phosphorus									
Total Phosphorus	mg/L	1.53	0.57	1,920	NA	1,580	NA	341	NA

Table 5-14 (Continued)

Pollutant	BNR Treatment		POTW Removals	Current Pollutant Loading[a] (lbs/yr)	Current Pollutant Annual TWPE[a]	Post-Compliance Pollutant Loading[a] (lbs/yr)	Post-Compliance Pollutant Annual TWPE[a]	Post-Compliance Pollutant Reductions[a] (lbs/yr)	Post-Compliance Pollutant Annual TWPE Reductions[a]
	Units	Averages							
Episode 6513, 127 MGY									
Toxic Pollutants									
2-Propanone	ug/L	50	0.8375	24.5	0.000207	8.63	0.0000730	15.9	0.000134
Nicotine	ug/L	22.6	0.964	286	0.458	0.864	0.00138	285	0.456
Acetaldehyde	mg/L	0.23	0.921	35.1	0.0773	19.2	0.0423	15.9	0.0350
Aluminum	ug/L	50	0.91	93.5	6.05	4.78	0.309	88.7	5.74
Barium	ug/L	9.35	0.5515	34.1	0.0679	4.45	0.00886	29.7	0.0591
Calcium	ug/L	17,700	0.0850	17,200	0.481	17,200	0.481	0	0
Copper	ug/L	61.1	0.842	22.6	14.4	10.2	6.50	12.4	7.87
Iron	ug/L	371.5	0.82	840	4.71	71.0	0.397	770	4.31
Magnesium	ug/L	4,390	0.14	4,010	3.47	4,010	3.47	0	0
Manganese	ug/L	53.3	0.406	92.0	1.33	33.6	0.485	58.4	0.843
Zinc	ug/L	25.8	0.7914	195	9.12	5.71	0.268	189	8.86
Ammonia as Nitrogen	mg/L	0.57	0.39	2,460	3.70	369	0.555	2,090	3.15
Total Toxic Metals				22,500	39.6	21,300	11.9	1,150	27.7
Total Toxic Pollutants				25,300	43.8	21,700	12.5	3,560	**31.3**
Nitrogen									
TKN	mg/L	6.4	0.57	14,400	NA	2,920	NA	11,500	NA
Nitrate/Nitrite	mg/L	0.59	0.9	62.6	NA	62.6	NA	0	NA
Total Nitrogen				14,500	NA	2,980	NA	11,500	NA
Phosphorus									
Total Phosphorus	mg/L	1.53	0.57	1,360	NA	698	NA	666	NA

Table 5-14 (Continued)

Pollutant	BNR Treatment		POTW Removals	Current Pollutant Loading[a] (lbs/yr)	Current Pollutant Annual TWPE[a]	Post-Compliance Pollutant Loading[a] (lbs/yr)	Post-Compliance Pollutant Annual TWPE[a]	Post-Compliance Pollutant Reductions[a] (lbs/yr)	Post-Compliance Pollutant Annual TWPE Reductions[a]
	Units	Averages							
Episode 6515, 294 MGY									
Toxic Pollutants									
2-Propanone	ug/L	50	0.8375	20.4	0.000173	20.0	0.000169	0.428	0.00000362
Nicotine	ug/L	22.6	0.964	1,120	1.80	2.00	0.00320	1,120	1.79
Acetaldehyde	mg/L	0.23	0.921	354	0.780	44.5	0.0981	309	0.682
Aluminum	ug/L	50	0.91	30.1	1.95	11.1	0.715	19.0	1.23
Barium	ug/L	9.35	0.5515	45.3	0.0902	10.3	0.0205	35.0	0.0697
Calcium	ug/L	18,200	0.0850	40,900	1.15	40,900	1.15	0	0
Copper	ug/L	61.1	0.842	53.6	34.0	23.7	15.1	29.9	19.0
Iron	ug/L	371.5	0.82	380	2.13	164	0.920	216	1.21
Magnesium	ug/L	4,130	0.14	8,730	7.56	8,730	7.56	0	0
Manganese	ug/L	53.3	0.406	123	1.77	77.8	1.12	44.8	0.647
Zinc	ug/L	25.8	0.7914	202	9.49	13.2	0.620	189	8.87
Ammonia as Nitrogen	mg/L	0.57	0.39	5,040	7.58	855	1.29	4,180	6.30
Total Toxic Metals				50,500	58.1	50,000	27.2	534	31.0
Total Toxic Pollutants				57,000	68.3	50,900	28.5	6,150	**39.8**
Nitrogen									
TKN	mg/L	6.4	0.57	27,600	NA	6,760	NA	20,800	NA
Nitrate/Nitrite	mg/L	6.39	0.9	1,570	NA	1,570	NA	0	NA
Total Nitrogen				29,200	NA	8,330	NA	20,800	NA
Phosphorus									
Total Phosphorus	mg/L	1.53	0.57	7,830	NA	1,620	NA	6,210	NA

Source: (Codding and Bartram, 2005), *Tobacco Products Sampling Data* (Matuszko, 2006a), (U.S. EPA, 1982), and (U.S. EPA, 1994).
[a]All pollutant loadings and reductions take into account POTW removals. TWPE was calculated using TWFs, as described in *2005 Annual Screening-Level Analysis* (U.S. EPA, 2005a).
NA - Not applicable.

Table 5-15. Comparison of Pollutant Loadings Discharged To and From POTWs

Episode	Pollutant Load Discharged To POTWs		EPA's Estimated Pollutant Load Discharged From POTWs		Post-Compliance Pollutant Annual TWPE Reductions Accounting for POTW Removal[a]
	Facility Total Current Pollutant Loading (lbs/yr)	Facility Total Current Pollutant Annual TWPE[a]	Facility Total Current Pollutant Loading Accounting for POTW Removal (lbs/yr)	Facility Total Current Pollutant Annual TWPE Accounting for POTW Removal[a]	
6511	1,390,000	193	168,000	31.3	22.2
6512	5,870,000	352	634,000	50.5	21.0
6513	677,000	259	97,200	43.8	31.3
6515	1,660,000	541	210,000	68.3	39.8

Source: *Tobacco Products Sampling Data* (Matuszko, 2006a).
[a]TWPE was calculated using TWFs, as described in *2005 Annual Screening-Level Analysis* (U.S. EPA, 2005a).

5.5.7.1 Cost of BNR Treatment Technology Relative to Pollutant Removals

EPA calculated the cost of BNR treatment using facility-provided information that is claimed as confidential business information (CBI). The cost of BNR treatment greatly exceeds the pollutant loadings removed; the cost effectiveness is well in excess of $10,000/TWPE of pollutant removed (Holman, 2006a).

EPA examined the tobacco products industry as part of the 304(m) process and found that the removals associated with pretreatment would be small. Because the screening process identified that relatively trivial amounts of pollutants would be removed by pretreatment, EPA did not perform the analyses associated with an effluent limitations guidelines rulemaking such as an economic impact or affordability analysis.

5.5.7.2 Possible Impact on POTWs

EPA considered the impact of the tobacco products industry on POTWs under current conditions. EPA conducted four telephone conversations with POTWs about the wastewater discharges that they receive from tobacco products facilities (Finseth, 2005b - 2005e). The information obtained from the telephone conversations was fairly consistent (Table 5-16). The POTWs reported that the tobacco products facilities only occasionally exceed their discharge limits. On the occasions when the tobacco products facilities have exceeded their limits (e.g. zinc, oil and grease, pH, and BOD), the POTWs have not exceeded their own NPDES permit limits. POTW operators reported no issues from the nutrient content of the tobacco products wastewater. None of the POTWs monitors either the facility discharges or their own discharge for nicotine.

The POTWs reported no significant issues handling the wastewater discharges from the tobacco products facilities. For this reason, the POTWs reported that they would not benefit from a national pretreatment standards rulemaking for the tobacco products industry. One POTW indicated that such standards would be burdensome.

Table 5-16. POTW Contact Summary

	City of Richmond, VA POTW	City of Winston-Salem, NC POTW[a]	Water and Sewer Authority of Cabarrus County, Concord, NC	City of Greensboro, NC POTW
Date of Contact	12/7/2005	11/17/2005	11/18/2005	11/21/2005
Any instances in which the tobacco products facilities exceeded their permit limits?	The facility exceeded its zinc limit four times since 2003. The facility occasionally exceeds its oil and grease and pH limits.	The facility occasionally discharges high levels of BOD.	No	The facility exceeded its BOD limit once, three years prior to call.
Any instances in which POTW exceeded NPDES permit limits due to tobacco products facility discharge?	No	No	No	No
Nicotine monitoring and/or information on removal efficiency?	No	No	No	No
Any issues related to nutrient discharges from tobacco products facilities?	No	No	No	No
Would POTWs benefit from Federal categorical pretreatment standards for the tobacco products industry?	No	No. Such a standard would be a burden.	No	No

Source: (Finseth, 2005b – 2005e).
[a]City of Winston-Salem also submitted comments on the Preliminary 2006 Effluent Guidelines Plan (OW-2004-0032-1061).

Table 5-17 compares metals concentrations detected in the effluent of the four sampled indirectly discharging tobacco products facilities to typical POTW influent. Median metals concentrations from EPA's 50-POTW Study were used to represent typical POTW influent. Table 5-17 includes the metals that are the greatest contributors to the total pollutant TWPE in the effluent of the sampled indirect dischargers, as discussed in Section 5.5.6.1.

Table 5-17. Comparison of Metals Concentrations in Sampled Tobacco Products Facility Discharges to POTWs to Typical POTW Influent

Metal Pollutant	Units	Average Effluent Concentrations for Four Indirect Dischargers[a]	50-POTW Study Influent Concentrations[b]
Aluminum	ug/L	359	2,650
Arsenic	ug/L	11.1	29
Boron	ug/L	109	337
Copper	ug/L	135	229
Iron	ug/L	2,250	6,306
Zinc	ug/L	391	885

Source: *Tobacco Products Sampling Data* (Matuszko, 2006a), (U.S. EPA, 1982).
[a] Facility effluent discharged to POTW.
[b] These data reflect the median influent concentrations of POTWs in the study using secondary treatment, where the influent concentration is equal to or greater that 20 ppb.
See W-00-25, DCN IS04612.

The data presented in Table 5-17 indicate that the metals concentrations discharged from tobacco products facilities are similar to, though somewhat lower than, the typical metals concentrations entering POTWs.

5.5.8 Summary of Indirect Discharge Wastewater Characteristics and Analyses

As explained in Section 3.1.3, the majority of discharging tobacco products facilities discharge indirectly to POTWs. EPA's review of data from indirectly discharging tobacco products facilities demonstrates that such discharges are generally characterized by low concentrations of toxic and nonconventional pollutants – primarily metals. One exception is nicotine, with discharge concentrations ranging from 7,500 ug/L to 31,000 ug/L. Nicotine and metal discharges account for approximately 91 percent of the total annual TWPE associated with indirect tobacco products processing discharges. As was the case with direct dischargers, source water appears to be the biggest contributor to metal discharges at indirect dischargers.

EPA evaluated possible pretreatment standards for these tobacco products processing discharges assuming a technology basis equivalent to that found at direct dischargers, biological treatment with nutrient removal. EPA compared the pollutant loadings currently discharged to POTWs and surface waters to the pollutant loadings that would be discharged to POTWs and surface waters upon compliance with pretreatment standards based on biological treatment with nutrient removal. EPA found that the annual incremental removal per facility would generally be small, approximately 28.6 TWPE. Furthermore, the costs of such incremental removals would be in excess of $10,000/TWPE.

Finally, EPA evaluated possible negative effects of discharges from tobacco products facilities to POTWs. As explained above, nicotine and metals account for approximately 91 percent of the total annual TWPE associated with indirect discharges from this category. Based on information obtained in this study, POTWs achieve nicotine removals in excess of 96 percent. EPA compared the concentrations of metals found in indirect tobacco products processing discharges to those typically found in POTW influent. This comparison demonstrated that metals concentrations discharged by tobacco products facilities are lower than those found in typical POTW influent. As a result of these findings, tobacco products processing discharges should not have negative impacts on the receiving POTWs. To verify this finding, EPA contacted POTWs receiving significant tobacco products processing discharges. All POTWs contacted indicated they had experienced little to no problems with such discharges and that they had no problem handling and treating tobacco products processing discharges.

6.0 REFERENCES

Bagwell, Sherry. 2002. City of Winston-Salem. Industrial User Permit: R.J. Reynolds Tobacco Company, Tobaccoville. (June 26). DCN 01833.

Bridges, Charles T. 2006. Tobacco Products Facility Source Water Concentration Data. (January). DCN 03647.

CigarHandbook. 2006. CigarHandbook.com. Manufacturing Process of the Cigar. Available online at: http://www.cigarhandbook.com/Manufacturing.asp. Accessed: August. DCN 03519.

Codding, Ellie and Bartram, Deb. 2005. Eastern Research Group (ERG). Memorandum to Effluent Guidelines Program Plan Docket. "Publicly Owned Treatment Works (POTW) Percent Removals Used for the TRIReleases2002 Database." (August 12). DCN 02180.

Covington, James III. 2006. U.S. EPA. Memorandum to Public Record for the 2006 Effluent Guidelines Program Plan. "Economic Profile of Domestic Tobacco Manufacturing Industry: 2006 Update." (April 19). DCN 02948.

Crowley, Kate. 2000. Pennsylvania Department of Environmental Protection. Industrial Waste NPDES Permit for Consolidated Cigar Corporation, McAdoo, Pennsylvania. (June 25). DCN 03510A2.

Curl, Steve. 2005. Email from Steve Curl of R.J. Reynolds (Reynolds American) to Jan Matuszko of U.S. EPA. (September 27). DCN 03498.

Finseth, TJ. 2005a. Telephone conversation with Michael Richardson of Maryland Department of the Environment and TJ Finseth of ERG. "Tobacco Technology Incorporated." (November 09). DCN 03497.

Finseth, TJ. 2005b. Telephone conversation with Sherry Bagwell of City of Winston-Salem, Industrial Waste Control Section, and TJ Finseth of ERG. "R.J. Reynolds Whitaker Park and Tobaccoville Discharges to the Winston-Salem POTW." (November 17). DCN 03501.

Finseth, TJ. 2005c. Telephone conversation with Beverly Metcalf of Water & Sewer Authority of Cabarrus County and TJ Finseth of ERG. "Philip Morris Cabarrus Operations Discharges to the Cabarrus County POTW." (November 18). DCN 03499.

Finseth, TJ. 2005d. Telephone conversation with Sharon Miller and Martie Groome of City of Greensboro, Industrial Pretreatment, and TJ Finseth of ERG. "Lorillard Discharges to the Greensboro POTW." (November 21). DCN 03502.

Finseth, TJ. 2005e. Telephone conversation with Sherry Crewe of City of Richmond and TJ Finseth of ERG. "Philip Morris Commerce Road Discharges to the Richmond POTW." (December 07). DCN 03500.

Finseth, TJ. 2006. Telephone conversation with Atul Govil of Altadis USA and TJ Finseth of ERG. "Wastewater Discharges from the Altadis Cigar Manufacturing Facility." (February 28). DCN 03510A1.

Holman, Sarah. 2006a. ERG. Cost of BNR Wastewater Treatment. (June 27). DCN 02989.

Holman, Sarah. 2006b. Telephone conversation with Richard Vazquez of R.J. Reynolds Tobacco (CI) Comanufacturing America, Inc., and Sarah Holman, ERG. "Wastewater Discharges from Tobacco Processsing/Manufacturing – NPDES ID PR0001091." (August 29). DCN 03531.

JRCigars. 2006. JR Cigars. Lesson 13: Pipe Tobacco "101". Available online at: http://www.jrcigars.com/index.cfm?page=jrcu_pipe-tobacco. Copyright 2006. Accessed: August. DCN 03522.

Mac Baren Tobacco. 2002. Mac Baren Tobacco. The Production of Flake Tobacco. Available online at: http://www.mac-baren.com/TopMenu/Expert-Knowledge/Flake-Tobacco/The-Production-of-Flake-Tobacco.aspx. Copyright 2002. Accessed: August. DCN 03521.

Matuszko, Jan. 2005a. Meeting with Dimon International (Alliance One International) and Jan Matuszko, et al. of U.S. EPA. "Meeting Notes – Dimon International." (May 31). DCN 01805.

Matuszko, Jan. 2005b. Meeting with Philip Morris, Inc. and Jan Matuszko, et al. of U.S. EPA. "Meeting Notes – Philip Morris USA." (May 31). DCN 01922.

Matuszko, Jan. 2005c. Telephone conversation with Gary Foote of Alliance One International, Environmental Health and Safety, and Jan Matuszko of U.S. EPA. "Telephone Call Notes – Alliance One International." (July 12). DCN 01804.

Matuszko, Jan. 2006a. U.S. EPA. Memorandum to Public Record for the 2006 Effluent Guidelines Program Plan. "Tobacco Products Sampling Data." (March 21). DCN 02626.

Matuszko, Jan. 2006b. U.S. EPA. Memorandum to Public Record for the 2006 Effluent Guidelines Program Plan. "Swisher International Cigar Manufacturing." (May 8). DCN 02719.

Matuszko, Jan. 2006c. U.S. EPA. Memorandum to Effluent Guidelines Program Plan Docket. "Fate of Propylene Glycol in the Environment and POTWs." (June 29). DCN 03530.

NCI. 2002. National Cancer Institute (NCI) and Centers for Disease Control and Prevention (CDC). Smokeless Tobacco Fact Sheets. 3rd International Conference on Smokeless Tobacco. Stockholm, Sweden. Available online at: http://cancercontrol.cancer.gov/tcrb/stfact_sheet_combined10-23-02.pdf. Accessed: August 2006. DCN 03520.

Pickelhaupt, John. Jr., P.E. 2005. Philip Morris, USA. Philip Morris Wastewater Discharge Summaries. (May 16). DCN 01834.

Porter, Kim. 2005a. Pre-sampling telephone interview with Philip Morris, Inc. and Kim Porter of ERG. "Tobacco Products Processing Wastewater Characterization." (June 29). DCN 01914.

Porter, Kim. 2005b. ERG. Site Visit Notes. (July 19). DCN 03075.

Prudent Peddler. 2006. The Prudent Peddler. Cigar Basics. Available online at: http://mywebpages.comcast.net/bcabana2/prudentpeddler/cigars/basics.htm. Accessed: August. DCN 03518.

Reynolds. 2005a. R.J. Reynolds Tobacco Company. Hanmer Division. Chester, VA. Permit Renewal Application for a Virginia Pollutant Discharge Elimination System (VPDES) Permit. (April). DCN 01829.

Reynolds. 2005b. R.J. Reynolds Tobacco Company. R.J. Reynolds Effluent Monitoring Data. (June 1). DCN 01828.

SCC. 2005. Sample Control Center (SCC). Memoranda to Jan Matuszko of U.S. EPA. "Data Review Narratives for Tobacco Products Sampling." (October 24). DCN 03695.

Scott, Bruce R. 2001. Kentucky Department for Environmental Protection. Kentucky Pollutant Discharge Elimination System (KPDES) Permit for G.F. Vaughan Tobacco Company, Inc., Fayette County, Kentucky. (July 10). DCN 03506A1.

Shore, Myron. 2006. Email from Myron Shore of R.J. Reynolds (Reynolds American) to Jan Matuszko of U.S. EPA. "RJ Reynolds Tobacco POTW Flows." (February 23). DCN 02961.

Snyder, S.A. 2002. "Endocrine Disruptors and Pharmaceutically Active Compounds: U.S. Regulations and Research." In: Proceedings of the International Water Association (IWA) 3rd World Water Congress. Melbourne, Australia. DCN 03494.

TTB. 2006. TTB. 2004 TTB information provided to U.S. EPA. (April).

Upgren, Amy. 2006. U.S. EPA. Memorandum to Jan Matuszko of U.S. EPA. "Comments on the Four Reports Submitted by R.J. Reynolds Tobacco Company in Response to Request for Data in the Notice of Availability of Preliminary 2006 Effluent Guidelines Program Plan." (May 18). DCN 02798.

USDA. 2005. United States Department of Agriculture (USDA). Economics Research Service. Tobacco: Background. Available online at: http://www.ers.usda.gov/Briefing/Tobacco/Background.htm. Updated: October 3, 2005. Accessed: August 2006. DCN 03517.

U.S. EPA. 1982. Effluent Guidelines Division. *Fate of Priority Pollutants in Publicly Owned Treatment Works*. EPA 440/1-82/303. Washington, DC. (September).

U.S. EPA. 1994. Office of Research and Development. *RREL Treatability Database*. Cincinnati.

U.S. EPA. 2005a. *2005 Annual Screening-Level Analysis: Supporting the Annual Review of Existing Effluent Limitations Guidelines and Standards and Identification of New Point Source Categories for Effluent Limitations and Standards*. EPA 821-B-05-003. Washington, DC. (August). DCN 02173.

U.S. EPA. 2005b. Office of Water. Engineering and Analysis Division. *PCSLoads2002_v02*. DCN 02299.

U.S. EPA. 2005c. Office of Water. Engineering and Analysis Division. *TRIReleases2002_v02*. DCN 02289.

USGS. 2002. U.S. Geological Survey (USGS) National Water Information System, NWISWeb Database. Available online at: http://waterdata.usgs.gov/nwis/. Updated: November 2002. Virginia water quality data is available online via NWISWeb at: http://waterdata.usgs.gov/va/nwis/. Accessed: February 2006.

Winter, Kyle I., P.E. 2006. Email from Kyle I. Winter, P.E. of VA DEQ, Office of Water Permit Programs, Division of Water Quality Programs, to Jan Matuszko of U.S. EPA. "Request for Information for Tobacco Products Permitted Facilities in Richmond VA Area." (March 22). DCN 02688.

Appendix A

WASTEWATER SAMPLING DATA

Table A-1. Sampled Directly Discharging Tobacco Products Facility Data

Pollutant	CAS Number	Method	Units	Baseline Value	Concentration	Meas Type[a]	Annual Load (lbs/yr)	12/04 TWF	Annual TWPE	Facility-Provided Data (mg/L)	Facility-Provided Data (lbs/yr)	PCS Loads 2002 (lbs/yr)
Episode 6510, Sample Number 66157, Treated Effluent												
Conventional Pollutants												
BOD_5	C003	5210B	mg/L	2	6	NC	11,800	NA	NA	-	-	17,390
TSS	C009	160.2	mg/L	1	9	NC	17,700	NA	NA	10	19,200	39,822
Total Conventional Pollutants							**29,400**	NA	NA	NA	NA	NA
Toxic Pollutants												
Bromodichloro-methane	75274	1624C	ug/L	10	10	ND	0	0.032918	0	-	-	-
Chloroform	67663	1624C	ug/L	10	10	ND	0	0.002078	0	-	-	-
Dibromochloro-methane	124481	1624C	ug/L	10	10	ND	0	0.044483	0	-	-	-
Nicotine	54115	1625C	ug/L	20	25.2	NC	49.5	0.0016	0.079	-	-	-
Barium	7440393	200.7	ug/L	2	10	NC	19.6	0.001991	0.039	-	-	-
Boron	7440428	200.7	ug/L	100	101	NC	198	0.177215	35.1	-	-	-
Calcium	7440702	200.7	ug/L	50	60,800	NC	119,000	0.000028	3.34	-	-	-
Copper	7440508	200.7	ug/L	10	12.9	NC	25.3	0.634822	16.1	-	-	-
Iron	7439896	200.7	ug/L	100	380	NC	746	0.0056	4.18	-	-	-
Magnesium	7439954	200.7	ug/L	200	11,500	NC	22,600	0.000866	19.5	-	-	-
Manganese	7439965	200.7	ug/L	15	52.2	NC	102	0.014433	1.48	-	-	-
Molybdenum	7439987	200.7	ug/L	10	10	ND	0	0.201439	0	-	-	-
Sodium	7440235	200.7	ug/L	500	17,300	NC	34,000	5.49E-06	0.186	-	-	-
Zinc	7440666	200.7	ug/L	10	28.2	NC	55.4	0.046886	2.60	-	-	-
Chloride	16887006	325.3	mg/L	2	109	NC	214,000	2.43E-05	5.21	-	-	-
Sulfate	14808798	375.4	mg/L	10	26	NC	51,000	5.6E-06	0.286	-	-	-
Chloropicrin	76062	618	ug/L	0.5	0.5	ND	0	2.947368	0	-	-	-
Unknown Dithiocarbamate Pesticide	8018017	630	mg/L	0.1	0.15	NC	294	0.121907	35.9	-	-	-
Ammonia as Nitrogen[b]	7664417	350.1	mg/L	0.04	0.23	NC	452	0.001505	0.680	1.01	1,940	2,143
Total Toxic Metals							**177,000**	NA	**82.6**	NA	NA	NA
Total Toxic Pollutants							**443,000**	NA	**125**	NA	NA	NA
Nitrogen												
TKN	C021	351.3	mg/L	1	4.5	NC	8,830	NA	NA	8.15	15,700	-
Nitrate/Nitrite	C005	353.2	mg/L	0.05	22.9	NC	45,000	NA	NA	3.33	6,400	-
Total Nitrogen							**53,800**	NA	NA	NA	NA	NA
Phosphorus												
Total Phosphorus	14265442	365.1	mg/L	0.02	2.87	NC	5,630	NA	NA	1.37	2,630	3,403
Total Phosphorus							**5,630**	NA	NA	NA	NA	NA
Facility Total							**532,000**	NA	**125**	NA	NA	NA

Table A-1. Direct Discharge Loads and TWPE (Continued)

Pollutant	CAS Number	Method	Units	Baseline Value	Concentration	Meas Type[a]	Annual Load (lbs/yr)	12/04 TWF	Annual TWPE	Facility-Provided Data (mg/L)	Facility-Provided Data (lbs/yr)	PCS Loads 2002 (lbs/yr)
Episode 6516, Sample Number 66182, Treated Effluent												
Conventional Pollutants												
BOD_5	C003	5210B	mg/L	2	5.6	NC	33,700	NA	NA	-	-	-
TSS	C009	160.2	mg/L	1	5	ND	30,000	NA	NA	10.6	56,819	-
						Total Conventional Pollutants	**63,700**	NA	NA	NA	NA	NA
Toxic Pollutants												
Bromodichloro methane	75274	1624C	ug/L	10	315	NC	1,890	0.032918	62.3	-	-	-
Chloroform	67663	1624C	ug/L	10	576	NC	3,460	0.002078	7.19	-	-	-
Dibromochloro methane	124481	1624C	ug/L	10	86.2	NC	518	0.044483	23.0	-	-	-
Nicotine	54115	1625C	ug/L		20	ND	0	0.0016	0	-	-	-
Barium	7440393	200.7	ug/L	2	8.69	NC	52.2	0.001991	0.104	-	-	-
Boron	7440428	200.7	ug/L	100	155	NC	931	0.177215	165	-	-	-
Calcium	7440702	200.7	ug/L	50	75,000	NC	451,000	0.000028	12.6	-	-	-
Copper	7440508	200.7	ug/L	10	61.1	NC	367	0.634822	233	-	-	-
Iron	7439896	200.7	ug/L	100	363	NC	2,180	0.0056	12.2	-	-	-
Magnesium	7439954	200.7	ug/L	200	24,600	NC	148,000	0.000866	128	-	-	-
Manganese	7439965	200.7	ug/L	15	54.4	NC	327	0.014433	4.72	-	-	-
Molybdenum	7439987	200.7	ug/L	10	27.2	NC	163	0.201439	32.9	-	-	-
Sodium	7440235	200.7	ug/L	500	132,000	NC	793,000	5.49E-06	4.35	-	-	-
Zinc	7440666	200.7	ug/L	10	23.4	NC	141	0.046886	6.59	-	-	-
Chloride	16887006	325.3	mg/L	2	426	NC	2,560,000	2.43E-05	62.3	-	-	-
Sulfate	14808798	375.4	mg/L	10	168	NC	1,010,000	5.6E-06	5.65	-	-	-
Chloropicrin	76062	618	ug/L	0.5	0.6	NC	3.61	2.947368	10.6	-	-	-
Unknown Dithiocarbamate Pesticide	8018017	630	mg/L	0.1	0.1	ND	0	0.121907	0	-	-	-
Ammonia as Nitrogen[b]	7664417	350.1	mg/L	0.04	0.9	NC	5,410	0.001505	8.14	0.37	1,811	-
						Total Toxic Metals	**1,400,000**	NA	**600**	NA	NA	NA
						Total Toxic Pollutants	**4,980,000**	NA	**779**	NA	NA	NA
Nitrogen												
TKN	C021	351.3	mg/L	1	8.3	NC	49,900	NA	NA	12.4	35,566	-
Nitrate/Nitrite	C005	353.2	mg/L	0.05	1.16	NC	6,970	NA	NA	2	5,191	-
						Total Nitrogen	**56,800**	NA	NA	NA	NA	NA
Phosphorus												
Total Phosphorus	14265442	365.1	mg/L	0.02	0.18	NC	1,080	NA	NA	1.2	6,778	-
						Total Phosphorus	**1,080**	NA	NA	NA	NA	NA
						Facility Total	**5,070,000**	NA	**779**	NA	NA	NA

Source: *PCSLoads2002_v02* (U.S. EPA, 2005b), (Pickelhaupt, 2005), (Reynolds, 2005b), and *Tobacco Products Sampling Data* (Matuszko, 2006a).
[a]MeasType – type of measurement.
[b]Ammonia as nitrogen is included in the Toxic Pollutant category and not in the Nitrogen category because summing ammonia and TKN would double count the ammonia.
ND - Not detected; NC - Not censored; NA - Not applicable; Dash (-) - Not provided; Baseline Value - Analytical detection limit.

Table A-2. Sampled Indirectly Discharging Tobacco Products Facility Data

Pollutant	CAS Number	Method	Units	Baseline Value	Concentration	Meas Type[a]	Annual Load (lbs/year)	12/04 TWF	Annual TWPE	Facility-Provided Data (mg/L)	Facility-Provided Data (lbs/year)	POTW-Provided Data (mg/L)
Episode 6511, Sample Number 66161, Discharge to POTW												
Conventional Pollutants												
BOD_5	C003	5210B	mg/L	2	1210	NC	909,000	NA	NA	597	448,000	416
TSS	C009	160.2	mg/L	1	341	NC	256,000	NA	NA	420	315,000	402
HEM	C036	1664	mg/L	5	16.3	NC	12,200	NA	NA	14.5	10,900	3.19
						Total Conventional Pollutants	**1,180,000**	NA	NA	NA	NA	NA
Toxic Pollutants												
2-Propanone	67641	1624C	ug/L	50	2620	NC	1,970	8.46E-06	0.0167	-	-	-
Benzoic Acid	65850	1625C	ug/L	50	50	ND	0	0.000331	0	-	-	-
Benzyl Alcohol	100516	1625C	ug/L	10	10	ND	0	0.005619	0	-	-	-
Nicotine	54115	1625C	ug/L	20	30,800	NC	23,100	0.0016	37.0	-	-	-
Acetaldehyde	75070	1671	mg/L	0.5	0.49	NC	368	0.002205	0.811	-	-	-
Formaldehyde	50000	1671	mg/L	0.5	0.2	NC	150	0.002331	0.35	-	-	-
Propylene Glycol	57556	1671	mg/L	10	29.2	NC	21,900	5.72E-05	1.25	-	-	-
Aluminum	7429905	200.7	ug/L	50	145	NC	109	0.064691	7.05	-	-	-
Arsenic	7440382	200.7	ug/L	10	10	ND	0	4.041333	0	-	-	-
Barium	7440393	200.7	ug/L	2	43.7	NC	32.8	0.001991	0.0653	-	-	-
Boron	7440428	200.7	ug/L	100	100	ND	0	0.177215	0	-	-	-
Calcium	7440702	200.7	ug/L	50	27,700	NC	20,800	0.000028	0.583	-	-	-
Chromium	7440473	200.7	ug/L	10	10	ND	0	0.075697	0	0.03	22.5	0.01
Copper	7440508	200.7	ug/L	10	224	NC	168	0.634822	107	0.16	120	0.14
Iron	7439896	200.7	ug/L	100	1,710	NC	1,280	0.0056	7.19	-	-	-
Magnesium	7439954	200.7	ug/L	200	4,480	NC	3,370	0.000866	2.91	-	-	-
Manganese	7439965	200.7	ug/L	15	58.9	NC	44.2	0.014433	0.639	-	-	-
Molybdenum	7439987	200.7	ug/L	10	69.3	NC	52.1	0.201439	10.5	-	-	-
Sodium	7440235	200.7	ug/L	500	20,900	NC	15,700	5.49E-06	0.0862	-	-	-
Zinc	7440666	200.7	ug/L	10	185	NC	139	0.046886	6.52	0.45	338	0.3
Chloride	16887006	325.3	mg/L	2	57	NC	42,800	2.43E-05	1.04	-	-	-
Sulfate	14808798	375.4	mg/L	10	58	NC	43,600	5.6E-06	0.244	-	-	-
Ammonia as Nitrogen	7664417	350.1	mg/L	0.04	9.06	NC	6,810	0.001505	10.2	-	-	-
						Total Toxic Metals	**41,700**	NA	**142**	NA	NA	NA
						Total Toxic Pollutants	**182,000**	NA	**193**	NA	NA	NA
Nitrogen												
TKN	C021	351.3	mg/L	1	38.7	NC	29,100	NA	NA	-	-	-
Nitrate/Nitrite	C005	353.2	mg/L	0.05	0.35	NC	263	NA	NA	-	-	-
						Total Nitrogen	**29,300**	NA	NA	NA	NA	NA
Phosphorus												
Total Phosphorus	14265442	365.1	mg/L	0.02	3.4	NC	2,550	NA	NA	-	-	-
						Total Phosphorus	**2,550**	NA	NA	NA	NA	NA
						Facility Total	**1,390,000**	NA	**193**	NA	NA	NA

Table A-2. Sampled Indirectly Discharging Tobacco Products Facility Data (Continued)

Pollutant	CAS Number	Method	Units	Baseline Value	Concentration	Meas Type[a]	Annual Load (lbs/year)	12/04 TWF	Annual TWPE	Facility-Provided Data (mg/L)	Facility-Provided Data (lbs/year)	POTW-Provided Data (mg/L)
Episode 6512, Sample Number 66167, Discharge to POTW												
Conventional Pollutants												
BOD_5	C003	5210B	mg/L	2	1,740	NC	4,180,000	NA	NA	723	1,066,320	954
TSS	C009	160.2	mg/L	1	236	NC	567,000	NA	NA	337	495,720	325
HEM	C036	1664	mg/L	5	12.1	NC	29,100	NA	NA	-	-	-
Total Conventional Pollutants							**4,780,000**	NA	NA	NA	NA	NA
Toxic Pollutants												
2-Propanone	67641	1624C	ug/L	50	2,560	NC	6,150	8.46E-06	0.0521	-	-	-
Benzoic Acid	65850	1625C	ug/L	50	6,470	NC	15,600	0.000331	5.15	-	-	-
Benzyl Alcohol	100516	1625C	ug/L	10	1290	NC	3,100	0.005619	17.4	-	-	-
Nicotine	54115	1625C	ug/L	20	16,800	NC	40,400	0.0016	64.6	-	-	-
Acetaldehyde	75070	1671	mg/L	0.5	0.3	NC	721	0.002205	1.59	-	-	-
Formaldehyde	50000	1671	mg/L	0.5	0.41	NC	985	0.002331	2.30	-	-	-
Propylene Glycol	57556	1671	mg/L	10	131	NC	315,000	5.72E-05	18.0	-	-	-
Aluminum	7429905	200.7	ug/L	50	177	NC	425	0.064691	27.5	-	-	-
Arsenic	7440382	200.7	ug/L	10	10	ND	0	4.041333	0	-	-	0.002
Barium	7440393	200.7	ug/L	2	66.8	NC	161	0.001991	0.320	-	-	-
Boron	7440428	200.7	ug/L	100	135	NC	324	0.177215	57.5	-	-	-
Calcium	7440702	200.7	ug/L	50	28,100	NC	67,500	0.000028	1.89	-	-	-
Chromium	7440473	200.7	ug/L	10	10	ND	0	0.075697	0	-	-	0.006
Copper	7440508	200.7	ug/L	10	41.6	NC	100	0.634822	63.5	0.07	102.6	0.078
Iron	7439896	200.7	ug/L	100	2,020	NC	4,860	0.0056	27.2	-	-	-
Magnesium	7439954	200.7	ug/L	200	7,310	NC	17,600	0.000866	15.2	-	-	-
Manganese	7439965	200.7	ug/L	15	55.9	NC	134	0.014433	1.94	-	-	-
Molybdenum	7439987	200.7	ug/L	10	16.7	NC	40.1	0.201439	8.09	-	-	-
Sodium	7440235	200.7	ug/L	500	57,300	NC	138,000	5.49E-06	0.756	-	-	-
Zinc	7440666	200.7	ug/L	10	104	NC	250	0.046886	11.7	0.18	208	0.135
Chloride	16887006	325.3	mg/L	2	122	NC	293,000	2.43E-05	7.14	-	-	-
Sulfate	14808798	375.4	mg/L	10	47	NC	113,000	5.6E-06	0.633	-	-	-
Ammonia as Nitrogen	7664417	350.1	mg/L	0.04	5.48	NC	13,200	0.001505	19.8	3.07	4,428	3
Total Toxic Metals							**229,000**	NA	**216**	NA	NA	NA
Total Toxic Pollutants							**1,030,000**	NA	**352**	NA	NA	NA
Nitrogen												
TKN	C021	351.3	mg/L	1	22.6	NC	54,300	NA	NA	-	-	-
Nitrate/Nitrite	C005	353.2	mg/L	0.05	0.05	ND	0	NA	NA	-	-	-
Total Nitrogen							**54,300**	NA	NA	NA	NA	NA
Phosphorus												
Total Phosphorus	14265442	365.1	mg/L	0.02	1.86	NC	4,470	NA	NA	-	-	-
Total Phosphorus							**4,470**	NA	NA	NA	NA	NA
Facility Total							**5,870,000**	NA	**352**	NA	NA	NA

Table A-2. Sampled Indirectly Discharging Tobacco Products Facility Data (Continued)

Pollutant	CAS Number	Method	Units	Baseline Value	Concentration	Meas Type[a]	Annual Load (lbs/year)	12/04 TWF	Annual TWPE	Facility-Provided Data (mg/L)	Facility-Provided Data (lbs/year)	POTW-Provided Data (mg/L)
Episode 6513, Sample Number 66171, Discharge to POTW												
Conventional Pollutants												
BOD_5	C003	5210B	mg/L	2	208	NC	221,000	NA	NA	-	-	340
TSS	C009	160.2	mg/L	1	287	NC	305,000	NA	NA	-	-	528
HEM	C036	1664	mg/L	5	9.5	NC	10,100	NA	NA	-	-	-
Total Conventional Pollutants							**535,000**	NA	NA	NA	NA	NA
Toxic Pollutants												
2-Propanone	67641	1624C	ug/L	50	142	NC	151	8.46E-06	0.00128	-	-	-
Benzoic Acid	65850	1625C	ug/L	50	222	NC	236	0.000331	0.078	-	-	-
Benzyl Alcohol	100516	1625C	ug/L	10	10	ND	0	0.005619	0	-	-	-
Nicotine	54115	1625C	ug/L	20	7,490	NC	7,950	0.0016	12.7	-	-	-
Acetaldehyde	75070	1671	mg/L	0.5	0.42	NC	446	0.002205	0.983	-	-	-
Formaldehyde	50000	1671	mg/L	0.5	0.44	NC	467	0.002331	1.09	-	-	-
Propylene Glycol	57556	1671	mg/L	10	10	ND	0	5.72E-05	0	-	-	-
Aluminum	7429905	200.7	ug/L	50	979	NC	1,040	0.064691	67.2	-	-	
Arsenic	7440382	200.7	ug/L	10	10	ND	0	4.041333	0	-	-	<0.005
Barium	7440393	200.7	ug/L	2	71.7	NC	76.1	0.001991	0.151	-	-	-
Boron	7440428	200.7	ug/L	100	100	ND	0	0.177215	0	-	-	-
Calcium	7440702	200.7	ug/L	50	17,700	NC	18,800	0.000028	0.526	-	-	-
Chromium	7440473	200.7	ug/L	10	26.3	NC	27.9	0.075697	2.11	-	-	0.015
Copper	7440508	200.7	ug/L	10	135	NC	143	0.634822	90.9	-	-	0.1
Iron	7439896	200.7	ug/L	100	4,400	NC	4,670	0.0056	26.1	-	-	-
Magnesium	7439954	200.7	ug/L	200	4,390	NC	4,660	0.000866	4.03	-	-	-
Manganese	7439965	200.7	ug/L	15	146	NC	155	0.014433	2.24	-	-	0.1
Molybdenum	7439987	200.7	ug/L	10	10	ND	0	0.201439	0	-	-	<0.01
Sodium	7440235	200.7	ug/L	500	15,700	NC	16,700	5.49E-06	0.0915	-	-	-
Zinc	7440666	200.7	ug/L	10	879	NC	933	0.046886	43.7	-	-	0.8
Chloride	16887006	325.3	mg/L	2	22	NC	23,300	2.43E-05	0.568	-	-	-
Sulfate	14808798	375.4	mg/L	10	19	NC	20,200	5.6E-06	0.113	-	-	-
Ammonia as Nitrogen	7664417	350.1	mg/L	0.04	3.8	NC	4,030	0.001505	6.07	-	-	4.5
Total Toxic Metals							**47,000**	NA	**237**	NA	NA	NA
Total Toxic Pollutants							**104,000**	NA	**259**	NA	NA	NA
TKN	C021	351.3	mg/L	1	31.6	NC	33,500	NA	NA	-	-	20.1
Nitrate/Nitrite	C005	353.2	mg/L	0.05	0.59	NC	626	NA	NA	-	-	-
Total Nitrogen							**34,200**	NA	NA	NA	NA	NA
Phosphorus												
Total Phosphorus	14265442	365.1	mg/L	0.02	2.99	NC	3,170	NA	NA	-	-	2.88
Total Phosphorus							**3,170**	NA	NA	NA	NA	NA
Facility Total							**677,000**	NA	**259**	NA	NA	NA

Table A-2. Sampled Indirectly Discharging Tobacco Products Facility Data (Continued)

Pollutant	CAS Number	Method	Units	Baseline Value	Concentration	Meas Type[a]	Annual Load (lbs/year)	12/04 TWF	Annual TWPE	Facility-Provided Data (mg/L)	Facility-Provided Data (lbs/year)	POTW-Provided Data (mg/L)
Episode 6515, Sample Number 66176, Discharge to POTW												
Conventional Pollutants												
BOD_5	C003	5210B	mg/L	2	223	NC	548,000	NA	NA	-	-	1,009
TSS	C009	160.2	mg/L	1	182	NC	447,000	NA	NA	-	-	977
HEM	C036	1664	mg/L	5	33.9	NC	83,300	NA	NA	-	-	-
Total Conventional Pollutants							**1,080,000**	NA	NA	NA	NA	NA
Toxic Pollutants												
2-Propanone	67641	1624C	ug/L	50	51.1	NC	126	8.46E-06	0.00106	-	-	-
Benzoic Acid	65850	1625C	ug/L	50	8,690	NC	21,400	0.000331	7.07	-	-	-
Benzyl Alcohol	100516	1625C	ug/L	10	10	ND	0	0.005619	0	-	-	-
Nicotine	54115	1625C	ug/L	20	12,700	NC	31,200	0.0016	49.9	-	-	-
Acetaldehyde	75070	1671	mg/L	0.5	1.83	NC	4,500	0.002205	9.91	-	-	-
Formaldehyde	50000	1671	mg/L	0.5	0.14	NC	344	0.002331	0.802	-	-	-
Propylene Glycol	57556	1671	mg/L	10	10	ND	0	5.72E-05	0	-	-	-
Aluminum	7429905	200.7	ug/L	50	136	NC	334	0.064691	21.6	-	-	-
Arsenic	7440382	200.7	ug/L	10	14.5	NC	35.6	4.041333	144	-	-	<0.005
Barium	7440393	200.7	ug/L	2	41.1	NC	101	0.001991	0.201	-	-	-
Boron	7440428	200.7	ug/L	100	100	ND	0	0.177215	0	-	-	-
Calcium	7440702	200.7	ug/L	50	18,200	NC	44,700	0.000028	1.25	-	-	-
Chromium	7440473	200.7	ug/L	10	18.3	NC	45	0.075697	3.40	-	-	0.02
Copper	7440508	200.7	ug/L	10	138	NC	339	0.634822	215	-	-	0.67
Iron	7439896	200.7	ug/L	100	860	NC	2,110	0.0056	11.8	-	-	-
Magnesium	7439954	200.7	ug/L	200	4,130	NC	10,100	0.000866	8.78	-	-	-
Manganese	7439965	200.7	ug/L	15	84	NC	206	0.014433	2.98	-	-	0.44
Molybdenum	7439987	200.7	ug/L	10	10	ND	0	0.201439	0	-	-	<0.01
Sodium	7440235	200.7	ug/L	500	18,200	NC	44,700	5.49E-06	0.246	-	-	-
Zinc	7440666	200.7	ug/L	10	395	NC	971	0.046886	45.5	-	-	0.474
Chloride	16887006	325.3	mg/L	2	90	NC	221,000	2.43E-05	5.39	-	-	-
Sulfate	14808798	375.4	mg/L	10	37	NC	90,900	5.6E-06	0.509	-	-	-
Ammonia as Nitrogen	7664417	350.1	mg/L	0.04	3.36	NC	8,260	0.001505	12.4	-	-	3.65
Total Toxic Metals							**104,000**	NA	**455**	NA	NA	NA
Total Toxic Pollutants							**482,000**	NA	**541**	NA	NA	NA
Nitrogen												
TKN	C021	351.3	mg/L	1	26.1	NC	64,100	NA	NA	-	-	43
Nitrate/Nitrite	C005	353.2	mg/L	0.05	6.39	NC	15,700	NA	NA	-	-	-
Total Nitrogen							**79,800**	NA	NA	NA	NA	NA
Phosphorus												
Total Phosphorus	14265442	365.1	mg/L	0.02	7.41	NC	18,200	NA	NA	-	-	9.525
Total Phosphorus							**18,200**	NA	**NA**	NA	NA	NA
Facility Total							**1,660,000**	NA	**541**	NA	NA	NA

Source: (Matuszko, 2006a) , (Pickelhaupt, 2005), and POTW-provided data (see OW-2004-0032); [a]MeasType – type of measurement; [b]Ammonia as nitrogen is included in the Toxic Pollutant category and not in the Nitrogen category because summing ammonia and TKN would double count the ammonia; ND - Not detected; NC - Not censored; NA - Not applicable; Dash (-) - Not provided; Baseline Value - Analytical detection limit.