5. WASTE GENERATION AND COMPOSITION

Waste quantities to be managed during the planning period are a critical component of the solid waste plan. These quantities are compared to available resources to evaluate the ability of the plan's components to successfully meet the projected needs. In addition, an accurate evaluation of the region's recycling activity is utilized to determine the Regions recycling rate and its compliance with DEQ mandates.

This chapter presents the estimates and projections of waste generation and recycling activity in the CVWMA service area. Methodologies used to make these estimates and projections are described.

5.1 WASTE GENERATION METHODOLOGY

The methodologies used to prepare estimates of the tonnages of waste generated in 2002 and projections of future waste generation in the CVWMA service area are described in this section. Specific problems with the data upon which these estimates and projections are based, are also identified.

The initial step in the process is to establish basic assumptions. It is assumed that the solid waste generation rate will remain constant during the planning period. This assumption is necessary for several reasons. It establishes a realistic beginning point for planning purposes. Furthermore, it recognizes a core need that has been documented over the past. Obviously, there may be some significant modifications to waste generation in the future. Any such modifications would probably be largely beyond any specific set of actions by CVWMA members. CVWMA and its members can continue to pursue activities to enhance public awareness and attention to issues surrounding waste management but the reality of the situation is that it will require action by those outside of the local sphere to make significant alternations to the quantities of waste generated.

5.1.1 Estimates of 2002 Waste Generation

The actual quantity of waste produced in the area is not available. This plan therefore relies on published data available from the U. S. Environmental Protection Agency (EPA). Per the EPA, the amount of municipal solid waste generated per person is 4.51 pounds per day. This amount has been determined and based on 2000 Census data. No similar data unique to the Central Virginia area is available from the Virginia Department of Environmental Quality, or from CVWMA. Absent any more precise information, the estimate prepared by EPA has been used.

An estimate of the 2002 Central Virginia solid waste generation was based on the U. S. Bureau of Census population for the Region, 994,600 persons living in the area in 2002. The estimated quantity of waste produced in 2002, is therefore in excess of 800,000 tons (4.51 times 365 days divided by 2,000 pounds/ton).

Landfilling and recycling are currently the two primary disposal methods for the waste generated in the CVWMA service area. Data currently exists for recycling tonnages within the Region. It is assumed for purposes of this Plan that the tonnage of waste landfilled and recycled tonnage account for almost all waste originating in the area. Therefore, subtracting the recycling tonnages from the estimate of total solid waste generated provides an estimate of municipal solid waste being landfilled for the Region.

The report from the U. S. EPA[1], states that for the nation as a whole, the recovery rate of waste generated is an overall 30.1%. This amount varies by type of material. Records maintained by CVWMA and reported to the Virginia DEQ indicate a recycling rate of 39% for the CVWMA service area in 2002. The area's numbers are very compatible with EPA estimates.

5.1.2 Solid Waste Quantity Estimates for the 2004-2024 Planning Period

Utilizing the population projections made by the Richmond Regional and Crater Planning District Commissions and the methodology noted above, solid waste generation projections were calculated for the region for the 20-year period through 2024. (Appendix C) For the years 2004 through 2024, each annual population projection was multiplied by the accepted EPA estimate, to create a gross amount of solid waste materials to be handled. This amount was then reduced by the accepted EPA recovery rate (30.1%), to generate a net amount of material of solid waste material to be handled. This amount was totaled for the 20-year planning period. The net amount solid waste generated is expected to be slightly less than 19 million tons. Assuming a conservative recycling rate of 30.1%, this leaves approximately 13.1 million tons of municipal solid waste to be landfilled.

Historically, Central Virginia jurisdictions have relied primarily on disposal sites within the boundaries of member jurisdictions. Changes in solid waste management external to the operations of CVWMA have resulted in the development of new, large facilities outside the CVWMA area, but still well within transportation constraints. These sites are considered to address CVWMA disposal needs. According to data provided by the Virginia DEQ, there are 5 active MSW disposal facilities physically located within the CVWMA service area. These sites have a combined Year 2002 Available Capacity of approximately 28,245,000 tons. In addition, there are three sites within reach by available transportation systems. These three sites (King and Queen Sanitary Landfill – 25,350,000; and Atlantic Waste Disposal Sanitary Landfill – 7,140,200; Maplewood Sanitary Landfill –19,763,690) have a Year 2002 Available Capacity of 52,253,890 tons. Combined, capacity within or near the CVWMA service area at the 8 sites currently available to CVWMA members is over 80 million tons.

It can be concluded from this methodology that given current practices and regulations, the existing sites are capable of handling the projected solid waste materials, with a sufficient reserve capacity. A change in regulations or a change to the economics may at some time over the life of this Plan, result in a situation where the localities would consider additional landfills or other waste disposal options.

Waste composition estimates were developed for each type of waste material generated, including newsprint, corrugated, paper, plastics, ferrous metals, non-ferrous metals, glass, yard and wood wastes, and other principal recyclable materials for the years 2005, 2010, 2015, 2020 and 2025. These estimates were generated from population projections and U.S. EPA waste type percentages, (Appendix C).

5.1.3 Special Types of Solid Waste

Special wastes are those materials that are difficult to handle or collect or which require special or unusual disposal methods. In the service area, it is estimated that special wastes make up

[1] *Municipal Solid Waste in the United States: 2000 Facts and Figures*, Office of Solid Waste and Emergency Response, Unites States Environmental Protection Agency, June 2002

roughly 15 -20 percent, by weight, of the waste generated.

The Virginia Regulations for the Development of Solid Waste Management Plans (9 VAC 20-130-150) specify that Plans will include…

> "3. Estimates of solid waste generation from households, commercial institutions, industries and other types of sources. Estimates should identify special waste to include, at least, the following: stumps, land-clearing debris and construction wastes, motor vehicle tires, waste oil, batteries, sludges, mining wastes, ash, white goods, septage, agricultural wastes and spill residues. "

For purposes of this Plan, automobile bodies, household hazardous wastes, low-level radioactive wastes, and medical wastes are included within the category of special wastes because of their special disposal requirements.

A description of special waste handling and disposal practices are presented, including a discussion of disposal issues. In addition, estimates and projections of existing and future special waste generation by type is presented, including estimates of existing recycling rates for these special wastes.

5.1.3.1 Principal Recyclable Materials (PRM)

Paper, metal (except automobile bodies), plastic, glass, yard waste, wood (except large diameter tree stumps) and textiles are special wastes that are considered "principal recyclable materials" as defined by 9 VAR 20-130-10. The state regulations require that the weights of these materials be included in the disposal and recycling calculations in each regional solid waste management plan.

5.1.3.1.1 Appliances

In waste management terminology, used refrigerators and other common home appliances are termed "white goods." Many appliances are repaired when malfunction occurs. While major appliances generally have a long life expectancy (an average of 10 to 14 years or longer), often the high cost of repair leads to premature disposal of some appliances. For many years these items have been collected by scrap dealers for their iron and steel content.

Components of some white goods can contain compounds that if disposed of improperly, may pose a threat to natural resources. Such compounds include polychlorinated biphenols (PCBs), which may be found in the capacitors and lighting ballasts of refrigerators, freezers, fluorescent lights, air conditioners, microwaves and some other appliances manufactured prior to 1980; chlorofluorocarbons (CFC/HCFCs) found in Freon in air conditioners, refrigerators and freezers, and mercury switches.

Capacitors may be landfilled if they are not leaking. Recycled white goods are usually shredded resulting in metal and a by-product produced from shredding called "fluff". If the "fluff" contains greater than 50 parts per million of PCBs, the EPA has ruled that this material must be disposed of as a hazardous waste, adding to the expense of disposal. The Clean Air Act Amendments require that CFC/HCFC containing devices must have this material removed and recycled prior to the device being recycled or disposed of. The CVWMA has programs for the recycling of white goods and for the removal of the CFC/HCFCs.

Many retailers in the region accept a used appliance from a household when a new replacement appliance is purchased.

5.1.3.1.2 Automobile Bodies

Inoperable automobiles are composed largely of steel, iron, aluminum and plastics. Automobile manufacturers continue to reduce vehicle weight through the use of plastics, aluminum and magnesium, as a means of addressing environmental and fuel efficiency issues.

For many years, steel and iron from junk automobile bodies have been recycled. According to the Institute for Scrap Recycling Industries, nearly 98 percent (10 – 12 MM cars per year) of stripped inoperable ferrous hulks are eventually recycled. The aluminum used in cars has a high market value, and it is usually recycled when the vehicle is scrapped. In fact, approximately 95 percent of all vehicle parts, including used motor oil, batteries, and other components are recyclable.

The disposal of auto fluff created in the shredding process can sometimes pose problems. It is sometimes difficult to find a landfill facility willing to accept fluff. Depending somewhat on lack of thoroughness during the stripping and recycling processes, some fluff may be classified as a hazardous waste.

The reuse of used auto parts is a continuing tradition. The current trend is for more elements of each vehicle to be recyclable, and research is continuing in this area.

Recycling plastic automotive components is currently hindered because of several factors. The primary hindrance is that a single automobile may contain 20 different types of plastics in its various components. The effort needed to identify and separate the different types of plastics has made recycling less than cost-effective within the salvage industry. Fortunately, less than five percent of each salvaged vehicle produces plastic "fluff" material that is usually landfilled or incinerated. Furthermore, manufacturers are interested in demonstrating the recyclability of all automobile parts, largely due to public pressure. Recycling of plastic and metals from automobiles may increase throughout the planning period.

Inoperable automobiles are a substantial problem when abandoned on streets and in the rural landscape. In addition to detracting from the landscape, they can pose safety hazards to children and animals. Vector problems can develop, and environmental pollution can occur if oil, gas, lead or battery acid leak into the environment. The removal of vehicles from improper disposal areas may also be quite costly.

It is difficult to estimate the number of stripped automobile bodies generated in the CVWMA service area each year. As noted above, eventually 99 percent of the stripped hulks are recycled. For the purposes of the Regional Plan, the assumption was made that the generation rate for stripped hulks approximates the recycling rate on an annual basis.

5.1.3.1.3 Waste Motor Oil

Waste motor oil is of concern for any scheme of solid waste management, as improper dumping, or spraying for dust control, can lead to serious environmental problems. Many major collectors of waste oil collect used motor and machine oils as a mixed batch. These oils are collected and used as fuel, or they are recycled into grease and lubricants.

Used motor oil poses a threat to the environment because improper dumping is prevalent and as little as one quart of oil can contaminate up to one million gallons of drinking water. Oil can harm plant and animal life as well. It is illegal to dump oil into any waters, storm drain systems or on land within the Commonwealth.

A large portion of the waste motor oil generated in the CVWMA service area is recycled.

For the CVWMA service area, approximately 329 tons of waste oil was collected in 2002 through recycling programs. Some service stations pay a fee to have the waste motor oil collected. However, some stations have been able to sell the used oil to commercial collectors.

Some service stations are reluctant to accept used motor oil from the general public, citing that the operation is messy, customers sometimes drop oil off after hours, and that at times excessive quantities are dropped off. Another problem often cited by service station managers is that citizens have unwittingly contaminated the oil with kerosene and other substances, which in large quantities may ruin the batch and make the oil difficult to recycle or dispose of.

CVWMA has a program for the collection and recycling of used oil with U. S. Filter that collected over 85,000 gallons in 2003. U.S. Filter collects the used oil from a variety of sites throughout the region and after processing, resells it for boiler fuel. Some of the member jurisdictions maintain separate oil recycling programs for their fleet and drop off locations.

5.1.3.1.4 Wood, Brush, Leaves, Grass and Other Arboreal Materials

Wood, brush, leaves, grass, and other arboreal materials make up a large percentage of the waste stream, and are widely recycled on a local or regional basis. Wood and yard wastes seasonally account for between 13 and 18 percent of the weight of municipal solid waste. This type of waste is composed of materials that can frequently be recycled through natural processes.

The encouragement of source reduction is vital in any wood and yard waste recycling program. Backyard composting of leaves and grass, and similar activity in the commercial sector, can assist in diverting waste from landfills. Incentives and public education can increase these source reduction activities substantially.

The collection and composting of yard waste on a local government or regional scale is an attractive adjunct to home recycling. There are various methods of composting, some more technically sophisticated than others. Brush, leaves, grass, sludge and some larger woody items may be incorporated into compost. Usually they must be clean and preprocessed. The end products may be utilized as soil amendment, garden compost and mulch. These materials are commonly given to residents or large commercial users.

Source reduction for wood debris produced from land-clearing and trimming activities can include programs to sell wood for its timber value, some can be given away or sold to the public as firewood. It has been a common practice for private contractors and local governments to burn much of this waste. However, air pollution regulations are currently placing heavy restrictions and bans on burning activities, providing an even greater incentive to recycle and reuse these organic materials.

The private sector is accomplishing some recycling of wood wastes.

Presently the CVWMA has contracted with Simon's Hauling and Grind-All, L.L.C. for wood waste and yard waste processing. These contractors grind the wood waste and yard waste that localities have collected or have had dropped-off by residents. Most localities allow residents to avail themselves of the resultant grindings for use as mulch. Hanover County has recently opened a yard waste facility.

For planning purposes, it is assumed that approximately 143,000 tons (per year) of the waste stream in the base year of the plan is composed of wood and yard wastes.

5.1.3.2 Supplemental Recyclable Materials (SRM)

Several wastes are defined by the DEQ as "supplemental recyclable materials." 9VAC 20-130-10 defines these materials as “waste tires, used oil, used oil filters, used antifreeze, automobile bodies, construction waste, demolition waste, batteries, ash, sludge and large diameter tree stumps”. Weights of these items may be included in the regional generation and recycling totals if the materials are “productively used or sold as product substitute or other beneficial products"

5.1.3.2.1 Incinerator Ash

Ash is the solid residue remaining after combustion. It may contain organic, as well as inorganic components. Typically, there are two types of ash: bottom and fly. Bottom ash is made up of larger pieces of matter left after combustion. It comprises 75 to 90% of the total ash produced. Fly ash makes up the balance. This ash is subject to collection through air pollution control equipment on exhaust gases prior to discharge into the atmosphere.

Hazardous ash must be disposed of in a hazardous waste landfill. Currently, there are no hazardous waste landfills in Virginia. A proper landfill for non-hazardous ash disposal in Virginia is any permitted public or private sanitary or industrial landfill.

For each type of ash generated, the ash generator must file a special waste disposal application with the Department of Environmental Quality, and submit a sample of the ash for testing. A determination is then made by the Department regarding whether the material is hazardous or not.

Frequently, bottom and fly ash are mixed with water and combined for ease of handling and disposal in a landfill. Combining the two ashes dilutes the concentration of some toxic metals and organic compounds such as dioxin and furan, which are most frequently found in the fly ash portion of municipal solid waste (MSW) ash.

Ash from MSW resource recovery (waste-to-energy) facilities must be disposed of in properly designed and operated landfills to prevent possible ground or surface water contamination.

In the Central Virginia Waste Management Authority service area, there are a variety of facilities that burn material and produce ash residue. These facilities include electrical energy generators and co-generators, as well as industrial and institutional facilities. There are no “waste-to-energy” facilities in the area. A list of the facilities having permits as coal burning facilities is found in Table 6.

Table 6
Coal Burning Facilities in the CVWMA Region

Name	Address of Facility
James River Cogeneration Company	912 East Randolph Road Hopewell 23860
Cogentrix of Richmond	5001 Commerce Road Richmond 23234
Dominion Hopewell Power Company	107 Terminal Street Hopewell 23860
Henrico County Government Complex	4301 East Parham Road Richmond 23228
Transmontaigne Terminating Inc	700 Goodes Street Richmond 23224
Dominion Virginia Power - Chesterfield	500 Coxendale Road Chester 23831
Honeywell International	905 East Randolph Road Hopewell 23860
Saint Laurent Paper Products - West Point	19th and Main West Point 23181
Smurfit-Stone Container Corp. - Hopewell	910 Industrial Street Hopewell 23860
Phillip Morris USA Manufacturing Center	3601 Commerce Road Richmond 23234
Bear Island Paper Company	10026 Old Ridge Road Ashland 23005
Phillip Morris USA Manufacturing Center	4100 Bermuda Hundred Road Chester 23836
University of Richmond	Three Chopt and River Road Richmond 23173
VSU 212	1 Hayden Drive Petersburg 23804
Southside Virginia Training Center	120 West Washington Street Petersburg 23803
Virginia Corrections Center for Women	2841 River Road West Goochland 23063
Stranges Greenhouses	4201 Creighton Road Richmond 23223
Stranges Florists Inc Broad Street	12111 West Broad Street Richmond 23223

Making projections about the future of coal-burning facilities and the amount of ash created is subject to a variety of external factors. Included in these factors are:

- The role of the Virginia Department of Environmental Quality and the U. S. Environmental Protection Agency as manifested through the promulgation and enforcement of environmental regulations;
- The ability of the facility to remain economically viable; and,
- The ability and economic competitiveness of the coal as a fuel.

Given these variables, for planning purposes, it is assumed that the existing facilities will remain in place and operate at their current levels.

The current facilities have in place operations to dispose of their ash. For planning purposes, it is taken that the amounts of ash will remain constant over the planning period, and that the operations in place will continue. The disposal of incineration ash resulting from the burning of coal is handled outside of the solid waste management covered by this plan.

5.1.3.2.2 Batteries

Household and automotive batteries combined make up only a very small percentage of total solid waste.

The most common kind of household battery is the alkaline battery, which no longer contains mercury. These batteries, are not currently recycled by any reputable U.S. firms, while mercury and silver oxide "button cells" and nickel-cadmium (Ni-Cad) rechargeable batteries are recycled to some extent. The CVWMA has button battery and rechargeable nickel-cadmium battery recycling programs.

Rechargeable nickel-cadmium batteries have a much longer life than alkaline batteries. They do contain another toxic heavy metal, cadmium, and therefore it is debatable whether or not these should be landfilled in sanitary landfills. As Ni-Cad household batteries are recyclable and long-lived, many recycling advocates believe their use should be encouraged.

Since 1985, automotive batteries have been classified as hazardous. In Virginia, lead-acid automotive batteries are banned from sanitary landfill disposal, and may not be disposed of in municipal solid waste landfills.

Each automobile battery contains approximately 18 pounds of lead and approximately a gallon of sulfuric acid. Used batteries returned to gas stations and other businesses are sent to recycling facilities. Unfortunately, some used batteries are improperly dumped. Once in the environment, there is the possibility that the lead and acid contents will leak into surface and groundwater, potentially poisoning wildlife and tainting public water supplies.

In recent years, several states including Virginia have banned lead acid automotive batteries from landfills. In 1990, the Virginia General Assembly prohibited the disposal of lead acid batteries with municipal solid waste. Lead acid batteries must now be disposed of by delivery to a battery retailer or wholesaler, to a secondary lead smelter, or to a collection or recycling facility authorized by the state or the EPA. Battery retailers must accept used automotive batteries of the same type and in the same quantity as sold to the customer. They must also post a sign provided by the Department of Environmental Quality that informs the public of these requirements.

Eight localities in the CVWMA service area provide drop-off sites for used automotive batteries; Chesterfield, Hanover, Henrico, New Kent, Prince George and Powhatan Counties and the Cities of Richmond and Colonial Heights.

5.1.3.2.3 Construction, Demolition and Land-Clearing Debris

Land clearing and construction debris represents a significant portion of the solid waste stream. Land clearing is generally necessary when agricultural or forested land is converted into development sites. Independent sources in Northern Virginia have estimated that such land clearing generates 150 tons of debris waste per acre.

A June 1998 report[1] prepared for the U.S. Environmental Protection Agency by Franklin Associates estimates the per capita generation rate for construction and demolition debris to be 2.8 pounds per person per day. Utilizing this figure, it is estimated that approximately 510,000 tons of construction and demolition debris was generated in the Region in 2003. This figure is anticipated to grow to approximately 640,000 tons per year by the end of the planning period. The report cited above estimates that only 35 to 45 percent of construction and demolition debris

[1] Characterization of Building-Related Construction and Demolition Debris in the United States, June 1998, Franklin Associates

is landfilled. The rest is managed on site, recycled, burned, or disposed of in unpermitted landfills.

This waste category includes construction and demolition rubble, concrete and similar inert materials (that can go into locally approved fill areas) and large diameter tree stumps. Other organic wastes, such as wood and brush, are frequently discarded commingled with construction materials. A description of the disposal practices for these additional organic materials is found above in the Wood, Brush, Leaves, Grass and Other Arboreal Materials (5.1.3.1.4) section of the plan. Construction and demolition waste may include: bricks, concrete, shingles, steel, treated and untreated wood, sheetrock (also known as drywall), windows, vinyl and plastics, and plaster.

Construction and demolition debris may contain some contaminants, including asbestos, lead-based paint, fiberglass and old fuel tanks, may be present which can cause problems. Usually, debris landfills are less heavily regulated than sanitary landfills, and there are fewer restrictions on construction and operation. Disposal of contaminants may occasionally occur at some of these locations.

There are six private debris landfills in the CVWMA service area but only 5 were considered for planning purposes. The Qualla Road landfill in Chesterfield County is no longer accepting C/D/D and may be closing. In addition, there is one other C/D/D landfill in Chesterfield County, two in Henrico County, one located in Goochland County, and one in Hanover County.

A limited number of public and private landfills in the area accept the medium to larger items from contractors. Little data is available within the service area concerning weight and quantity of these materials.

Frequently, no specific tracking system exists at debris landfills to quantify tonnage or truckloads of construction and land-clearing wastes received.

Public sanitary landfills are frequently concerned with saving landfill space for municipal wastes, and therefore encourage contractors and haulers to deposit debris in private landfills.

The majority of builders pay excavating and land-clearing companies or private haulers to dispose of the debris. Some contractors bury or burn these wastes on site.

Once wood wastes are commingled with construction and demolition debris, separating components for recycling is difficult and costly.

5.1.3.2.4 Stumps

Within the CVWMA service areas, most stumps are generated during land clearing for construction of buildings, support areas for buildings, roads, or recreation facilities. On rare occasions, stumps are generated during natural disasters. Because of increasing EPA regulations for air quality, the traditional method of burning stumps is less available for the Region. Therefore, the disposal process tends to be the transfer of stumps to a C/D/D landfill.

5.1.4.2.5 Scrap Tires

Scrap tires are associated with a host of disposal problems and thus merit special consideration. Automobile tires make up approximately 85% of all scrap tires. Estimates of total used automobile and truck tire generation in the U.S. range from 190 to 240 million tires annually,

which is approximately equal to one percent of municipal solid waste by weight.

Within the CVWMA service area, most landfills charge for the disposal of scrap tires, with the exception that some residents may dispose of a minimal number at no charge. Whole tires are not allowed in landfills by DEQ regulations.

The Virginia Department of Environmental Quality has put forth the estimate that waste tires are produced at the rate of 1 tire per person per year. Using population projections provided by the PDC's, over the 20 year planning period, the CVWMA service area is estimated to produce approximately 23,000,000 tires. Except in rare cases, tire vendors handle disposal of tires through private reprocessing and disposal facilities. CVWMA has established contracts with tire recyclers in the area.

5.1.3.2.6 Sludge and Septage

Sludge is the liquid residual resulting from wastewater treatment processes (public municipal, private subdivision), or public water treatment systems. Septage is the liquid residual collected from private on-site sewage disposal systems (septic systems). Biosolids are residual sludge from public-owned wastewater treatment works (POTW's) that have been further processed at the POTW to meet the pathogen reduction and stabilization methods regulated by the Virginia Biosolids Use Regulations (12 VAC 5-585) (BUR). Sludge from public water treatment works is a precipitate composed of aluminum sulfate, $Al_2(SO_4)_3$. Alum sludge from public water treatment works is either disposed in a Municipal Solid Waste (MSW) landfill with liner, and leachate collection and treatment; or is blended with stabilized biosolids and land applied. Alum sludge provides no nutrient value to soils, but is considered inert and the cake consistency is considered a soil amendment to some farmers.

No POTW's in the CVWMA suburbanized areas have the level of stabilization and pathogen reduction to produce "Class A" biosolids. Class A biosolids are completely stabilized and can be marketed in bags to homeowners. CVWMA's POTW's all produce Class B biosolids. These are partially stabilized and safe land application includes quick turn-around between biosolids production at the POTW and spreading on the farm fields with a manure spreader or tanker truck (with liquid jet spreaders). Exposure to sunshine and air-drying further stabilizes biosolids. Thus the requirement in the BUR that public exposure is restricted for a minimum of 30-days after complete land application of biosolids, to reduce the risk to public health of air-borne pathogens and respiratory irritation particulates from lime stabilized biosolids.

Sludges and septage are normally collected in tanker trucks from POTW's, private waste water treatment works and private septic tanks and run through a POTW with size, capacity and biosolids management end process drying beds or centrifuges to produce stabilized cake biosolids, suitable for land application. The Virginia regulations for POTW's and for private waste water treatment works require no permanent, covered storage for cake biosolids, as is found in most other state regulations. Permanent holding facilities are difficult for biosolids haulers to construct, due to local zoning restrictions for nuisances. Odor accompanies the manipulation of biosolids, and interim permanent storage facilities are normally not covered, to save costs. Concrete lined lagoons protect groundwater from uncovered biosolids storage exposed to rainwater, and a second lagoon is required for these facilities for the liquid residual to be transferred via pump. This liquid residual from stormwater infiltration through stored cake biosolids is called supernatant. Supernatant may be land applied for disposal, but it contains

very little nutrient value and is subject to turning "septic" and not meeting the proper pH required by the BUR for land application of cake biosolids.

As of this writing, five POTW's serve the CVWMA suburban areas. Three of these facilities – Richmond, Henrico/New Kent, and South Central (Petersburg and Colonial Heights) dispose of all of their biosolids primarily by land application. These facilities contract for biosolids disposal, and the biosolids contractors are haulers of the material, and also are the permit holder for the farm fields for land application. The BUR does not allow land application of biosolids when fields are too wet or frozen to support land application vehicles and haul trucks. Therefore, the shortage of biosolids storage at the POTW's has placed a demand in the region for consideration of a regional storage facility. This facility should be covered and designed to be able to restabilize biosolids, since microbial decomposition continues to degrade the pH and nutrient value of the material, causing strong odors and if land applied, contributing to stream pollution and soil degradation.

One POTW facility – Hopewell (Hopewell/Prince George) disposes of its biosolids materials by incineration followed by landfill of remaining ash. The amount of ash produced for FY 2002-03 was 4,801 tons. The disposal of this material is handled outside of the CVWMA umbrella.

Industrial wastewater accounts for 85% of the wastewater handled by Hopewell. The residential flow is a minor component of the flow and consequently, of the ash production. Over the next 20 years, the population projections for the residential areas served by the Hopewell facility show limited growth. For the purpose of this plan, it is assumed that the ash produced by the Hopewell facility will remain constant. The amount of ash produced by this facility is a minor amount and is not expected to show much, if any, growth in the future.

As of this writing (February 2004) Hanover County and the Town of Ashland are served by two small POTW's – located west of the Ashland Town limits at the South Anna River and located in Doswell to serve Paramount's Kings Dominion on the North Anna River. The quantity of biosolids from these two small facilities does not make land application cost effective, and the method of disposal is landfilling, hauled by private contractor. A larger POTW is programmed to be on-line by mid-2004 in the Mechanicville area, located on Pole Green Road, with effluent discharge pumped to the Pamunkey River, east of the river crossing of US Route 360. This POTW includes a biosolids management building and the combined quantity of biosolids from Hanover County's three POTW's will make land application a more cost effective means of disposal.

Municipal landfills are considering ways to safely combine biosolids with wood chips to produce a stable end product that can be marketed as compost or potting soil. Landfills are also continuing to investigate irrigation of leachate and supernatant to improve landfill ground cover. Since these facilities are lined and have leachate collection systems, they provide groundwater protection and runoff controls that make their location excellent for on-going research and refinement of alternatives for biosolids disposal, in addition to land application.

It has been proposed that the BUR be amended to allow field storage of biosolids during frozen or wet conditions. Monitoring and testing of the field-stored biosolids is being required by the proposed regulations, as well as covering and lining of stockpiles. If the stored biosolids do not

meet the pathogen reduction, pH and stabilization required by the BUR, the proposed regulation requires that the stockpiled material be removed and re-treated at a POTW.

5.1.3.2.7 Other Special Wastes

For the purposes of the Regional Solid Waste Management Plan, "other special wastes" includes waste materials listed in the regulations that are neither classified Principal nor Supplemental Recyclable Materials. These materials include agricultural wastes, mining wastes and spill residues. In addition, the Plan includes descriptions of household hazardous wastes, low-level radioactive wastes and medical wastes, as the general public and local governments are particularly concerned about the proper handling and disposal of these materials. 9VAC 20-130-10 defines special wastes to mean “solid wastes that are difficult to handle, require special precautions because of hazardous properties or the nature of the waste creates waste management problems in normal operations”.

5.1.3.2.7.1 Agricultural Wastes

The farms in the rural parts of the CVWMA Region generate agricultural wastes, including animal manure and bedding, pesticides and herbicides, and animal carcasses. Much of this waste is removed and disposed by private waste collectors under contract to individual farm owners. Animal manure is generally disposed of in the area by land application.

5.1.3.2.7.2 Household Hazardous Wastes

Hazardous waste is defined by the EPA to have properties that render it of particular concern to human health or the environment. These wastes are either listed in the EPA regulations as hazardous or exhibit the characteristics of a hazardous waste. 9 VAC 20-80-10 defines household hazardous waste as: “ any waste material derived from households (including single and multiple residences, hotels, motels, bunkhouses, ranger stations, crew quarters, campgrounds, picnic grounds and day-use recreation areas) which, except for the fact that it is derived from a household, would otherwise be classified as a hazardous waste in accordance with 9 VAC 20-60.”

Household hazardous wastes are typically found in such products as pesticides, furniture polish, paints, solvents, and cleaning solutions. It is estimated that these substances comprise one percent or less of municipal solid waste.

The EPA regulates commercial and industrial hazardous waste. Household hazardous wastes (HHW) are conditionally exempt from regulation by the EPA, although they may pose serious risks to residents, collection personnel, wildlife, and the environment. Special HHW collection events are expensive because the transportation and hazardous waste disposal costs are very high. In addition, the actual amount of waste diverted by a single community event is only a small fraction of the household hazardous wastes generated annually.

There is a need to educate the public regarding the hazards of disposing of potentially dangerous wastes. The general public is often unaware of the hazardous properties of items used in the household on a regular basis, such as cleaners, paints, and solvents. Information is widely available regarding more benign, environmentally desirable substitutes for the more toxic substances, identification of potentially hazardous components of various products, and identification of safer disposal methods for residues and containers.

Although several localities in the CVWMA service area currently provide information to the public regarding the proper disposal of these wastes, Chesterfield County is the one locality in the service area that has a special program for the collection of household hazardous wastes. Several household hazardous waste collection days have been conducted in the CVWMA Region.

Few reliable statistics are available to estimate a per capita generation rate of household hazardous wastes. As noted above, a rough estimate is that these materials make up one percent or less by weight of the municipal solid waste stream.

5.1.3.2.7.3 Low-Level Radioactive Wastes

Low-level radioactive wastes are special wastes generated, for the most part, by nuclear power plants, universities, laboratories and hospitals, industrial sources and some governmental facilities. The U.S. Department of Energy is responsible for the disposal of defense waste. This disposal is carried out at government-owned facilities.

Several federal agencies are involved in regulation of commercial low-level waste disposal, including the Department of Energy, the Nuclear Regulatory Commission, and the Department of Transportation.

CVWMA member jurisdictions are not involved in low-level radioactive waste and those few entities involved in its use manage this material. Radioactive waste is not further considered in this plan.

5.1.3.2.7.4 Medical Wastes

Medical wastes are generated by numerous community facilities including hospitals, physician's offices, dentist's offices, nursing homes, clinics, laboratories, veterinary facilities, and blood banks. "Sharps" (e.g., scalpels, needles, and surgical instruments), bandages and medical gloves, and other materials contaminated with body fluids or body parts are considered by the DEQ to be medical wastes.

The Virginia Regulated Medical Waste Management Regulations originally went into effect in 1990 (recently updated). They require regulated medical wastes to be specially packaged, labeled, and inventoried. These wastes must then be incinerated within a specified temperature range and time period, or steam sterilized. Ash and sterilized trash are sent to landfills for disposal. Since the regulations have gone into effect, many Virginia hospitals have stopped incinerating on site and have contracted for waste disposal services. Others are planning new on-site incinerators. The listing of active solid waste facilities in Appendix D includes facilities with permitted regulated medical waste (RMW) incineration operations.

5.1.3.2.7.5 Mining Wastes

According to the Mineral Resources Division of the Virginia Department of Mines, Minerals and Energy, very little mining waste is generated in the CVWMA service area, and virtually none of it is classified as hazardous.

The few sand and gravel companies contacted in the region report that the materials they mine are sold or are stored on site. Stone quarry waste is also minimal. Luck Stone Corporation reports

that almost all material mined is converted to a product. The small quantities of waste generated are inert and are stored or disposed of on site.

5.1.3.2.7.6 Spill Residues

The potential exists that when a hazardous substance is spilled in the environment a portion of the material may pollute the soil and ground and surface water resources. Therefore, careful cleanup of all such spills is required.

The Virginia Hazardous Materials Emergency Response Program was approved and funded by the 1987 Session of the General Assembly. It is coordinated by the Department of Emergency Services (VDES), which works with appropriate state and local agencies.

When a spill occurs the state is contacted. The material is tested to determine the presence of heavy metals, and organic compounds. A determination is then made regarding whether or not the material must be treated as a hazardous waste and disposed of at a facility licensed to handle hazardous materials. If the material is determined to be non-hazardous, it may be disposed of in a landfill permitted by the state to accept this type of special waste.

In the CVWMA service area, several private landfills accept spill residue including petroleum-contaminated substances (in accordance with specific guidelines) and friable (easily crumbled) asbestos. Sanitary landfills may, after approval by the DEQ, accept non-hazardous special wastes.

As potentially hazardous materials are transported through the region, on occasion minor spillage occurs. The Virginia Department of Emergency Services maintains a log of incidents reported by locality. Of reported incidents, approximately one quarter involved petroleum products.

5.1.4 Qualifications About Projection Methodology

The available landfill capacity figures and annual tonnages entering landfills in the region are extracted from the Virginia Department of Environmental Quality report, Solid Waste Managed in Virginia During Calendar Year 2002[1]. Only total tonnages are published by DEQ. The jurisdiction that is the source of the waste going to these landfills cannot be determined making it difficult to correlate these numbers with the waste generation totals.

It should be recognized that no direct data is available concerning specific composition of the wastes at area landfills.

5.2 RECYCLING RATE METHODOLOGY

The methodology employed to determine the recycling rate for 2002 used the following tonnage-based formula:

Calculated Recycling Rate: Using the formula below.
[P + S] / [P + S + M] X 100 = Recycling Rate
[_____ + _____**]** / **[**_____ + _____ + _____**]** X 100
[Total PRM (P) + Total SRM (S)**]** / **[**Total PRM (P) + Total SRM (S) + Total MSW (M)**]** X 100
= _____% Recycling Rate

[1] *Solid Waste Managed in Virginia During Calendar Year 2002*, June 2003, Department of Environmental Quality

Where:

- PRM is tons of Principal Recyclable Materials. (Paper, Metal, Plastic, Glass, Comingled, Yard Waste (composted or mulched), Waste Wood (chipped or mulched) and Textiles).

- SRM is tons of Supplemental Recyclable Materials. (Waste Tires, Used Oil, Used Oil Filters, Used Antifreeze, Abandoned Automobiles Removed, Batteries, Sludge (composted), Electronics and Tree Stumps (> 6" Diameter)).

- MSW is tons of Municipal Solid Waste Disposed.

5.3 SOLID WASTE GENERATION AND RECYCLING RATE

Estimates and projections of solid waste generation for the CVWMA service area are presented in the following sections.

5.3.1 Waste Estimates and Recycling Rate

It is estimated, based on the waste generation projection methodology described in the previous section, that the CVWMA service area produced slightly over 800 thousand tons of municipal solid waste in 2002. Approximately 490 thousand tons, or 60 percent of the waste stream generated by the CVWMA service area, entered the region's landfills. Nearly 330,000 tons (or approximately 40 percent of the total waste stream) was recycled. Using the state recycling formula, the 2002 recycling rate was 39 percent.

It should be noted that the landfill estimates are based on projection methodology.

5.3.2 Waste Estimates and Projections

Table 7 provides a breakdown of the estimated tonnage of projected municipal solid waste by material for the Region in 2002. As indicated in the tables in Appendix C, it is anticipated that the amount of waste generated in the CVWMA service area will increase from an estimated 0.8 million tons in 2000, to 1.037 million tons by 2025.

5.4 SOLID WASTE AND RECYCLABLE MATERIAL COMPOSITION

The estimated composition by weight of the CVWMA service area's solid waste is presented in this section. This information, which is summarized in Table 7, is useful in the analysis of waste management and recycling needs. A brief description of the estimated rate of recycling for various components follows.

5.4.1 Composition of Wastes

The estimates and projections of waste stream composition based on EPA data are presented in Table 7. Construction and demolition wastes are not included in this table, but in addition to the waste summarized, an estimated 510,000 tons of construction and demolition debris was generated. Since the C/D/D landfills in the region are privately owned and operated and the material is collected and hauled by private contractors, very little data is available on this waste segment. The construction and demolition total tonnage, however, is consistent with the total

tonnage reported[1] disposed of in the six C/D/D landfills located within the Region.

It should be recognized that these composition numbers are not based on direct sampling within the service area.

An analysis of this data reveals that paper products comprise a major portion of the regional waste stream.

Ferrous and non-ferrous metals (excluding automobile bodies) together accounted for 7.8 percent of the waste stream. Of the remaining components, only plastics (10.7%) and food scraps (11.2%) account for more than ten percent each.

5.4.2 Recycling of Waste By Component

Some of the basic 2002 recycling and waste generation data indicate the following recycling rates:

Paper Products: All paper waste combined accounted for an estimated 306,168 tons of waste in 2002, of which 130,158 tons or 42.5 percent was recycled. The recycled paper tonnage is also equal to 39.5 percent of the total tonnage of recycled materials in 2002.

Newspaper wastes accounted for an estimated 53,052 tons per year. Newspaper accounted for about 17 percent of the paper waste stream, and about 6.5 percent of the total waste stream. 106,633 tons of corrugated waste was produced.

Nearly 146,000 tons of other types of paper waste were produced.

Yard/Wood Waste: An estimated 143,000 tons of yard and wood wastes were generated in the CVWMA service area, which was equal to 17.5 percent of the total waste stream. Of this total, 104,000 tons were recycled, which was equal to about 73 percent of the total yard wastes generated.

Plastics: Approximately 87,593 tons of plastic wastes were generated in the CVWMA service area, equaling nearly 10.7 percent of the total waste stream. Less than 1.3 percent of this waste was recycled.

Glass: Glass accounted for 5.5 percent (45,025 tons) of the waste stream. Of this total, 3,807 tons or 8.4 percent was recycled.

Ferrous and Nonferrous Metals: Excluding automobiles, ferrous metals accounted for over 47,481 tons of waste generated. The total tonnage of ferrous waste is equal to about 5.8 percent of the total waste stream. Nonferrous wastes accounted for 16,373 tons in 2002. The total non-ferrous waste tonnage is equal to about two percent of the waste stream. Total metals (ferrous and non-ferrous) recycled in 2002 were 18,556 tons or nearly 30 percent of the amount in the waste stream.

[1] *Solid Waste Managed in Virginia During Calendar Year 2002,* Department of Environmental Quality, June 2003

Table 7
2002 CVWMA Region Solid Waste Estimated Tonnages by Material

Material	Percent Generated	Est. Regional Tons Generated	CVWMA Programs - FY2003 Recycled Tonnages	Total 2002 Regional Recycled Tonnages
Paper & Paperboard	37.40	306,168	28,679	130,158
- Newspaper	6.48	53,052		
- Office Paper	3.25	26,579		
- Corrugated Boxes	13.03	106,633		
- Other	14.65	119,905		
Glass	5.50	45,025	4,512	3,807
Metals:			5,273	18,556
Ferrous	5.80	47,481		
Aluminum	1.40	11,461		
Other Non-Ferrous	0.60	4,912		
Abandoned Autos				566
Plastics	10.70	87,593	1,399	1,080
- PET	1.08	8,827		
- HDPE	2.09	17,122		
- Other	7.53	61,645		
Rubber & Leather	2.70	22,103		
- Tires	1.27	10,375	547	17,523
- Other	1.43	11,706		
Electronics				79
Textiles	4.00	32,745		8,892
Batteries				3,595
Wood	5.50	45,025		4,700
Other	1.70	13,917	338	23
Used Oil				32,889
Used Antifreeze				2,780
Used Oil Filters				445
Sub-total	75.30	616,429	40,748	225,093
Other Wastes:				
Food Scraps	11.20	91,687		4,921
Yard Trimmings	12.00	98,236	74,000	99,284
Misc Inorganic	1.50	12,279		
Sub-total	24.70	202,202	74,000	104,205
Total	**100.00**	**818,630**	114,748	**329,298**

Note: Data based on Central Virginia Planning Area 2002 population of 994,600 and EPA percentages