ELECTRONICS RECYCLING:

AN ECONOMIC DEVELOPMENT OPPORTUNITY

FOR THE NEW GEORGIA

Final Report

Computer Equipment Disposal and Recycling Council

June 2005

Executive Summary

Officially, **OCGA 12-8-33.1** charged the Computer Equipment Disposal and Recycling Council with the following duties:

- **To investigate problems and concerns related to the disposal and recycling of computer equipment;**

Over the past three years, the Council has heard testimony from a wide range of stakeholders on issues and concerns related to the appropriate environmental and economic management of computers and electronic scrap (e-scrap). These groups included strong representation from the electronics recycling industry, representatives of local and state government agencies, environmental organizations, nonprofit organizations, and computer manufacturers Dell and Hewlett-Packard.

- **To issue reports of its findings and recommendations as may be appropriate;**

The Council submitted a report to the Legislature titled, *The Status of Unwanted Computers and Scrap Electronics in Georgia,* in May 2004 detailing the Council's findings from its first two years. (The Executive Summary of the report is included in Appendix A.)

- **To advise the General Assembly and state agencies with respect to legislative, regulatory, or other actions within its area of expertise;**

The Council has cooperated with the Chief Information Officers Council (representing the largest state government agencies) to identify e-scrap issues and needs at the state government level. Several institutional changes have already been made as a result of these discussions. First, a policy has been developed by the Surplus Property Division of the Department of Administrative Services (DOAS) for appropriate management of e-scrap from state agencies. Second, information security, a critical issue in the disposal or recycling of old computers, has been formally addressed. New procedures were developed to ensure compliance with federal laws regulating the destruction of confidential information and data on state-owned hard drives. DOAS expects to officially announce and implement these policies on July 1, 2005.

- **To accept and expend for its purposes any funds granted to the Council by any agency of state or federal government or through private donations;**

The Council identified eight ways that computers and e-scrap could be collected and transported from homeowners and small businesses around the state. The Pollution Prevention Assistance Division (P^{2}AD) of the Georgia Department of Natural Resources funded research by engineers at the Georgia Institute of Technology to analyze these alternatives. The goal was to determine which method would produce the most net revenues. The research found that all methods could be financially viable, but those that combined public and private resources would be the most efficient and cost-effective.

- **To develop and assist in the establishment of pilot programs and ongoing programs for the recycling and proper disposal of computer equipment.**

The technical advisor to the Council was actively involved with the planning and execution of numerous computer recycling events over the last three years. He provided assistance to cities, counties, nongovernmental organizations, and commercial recycling companies that conducted collection events. The largest event, sponsored by Dell Computer, Inc., saw more than 630 vehicles bring in more than 150,000 pounds of e-scrap in eight hours.

Recommendations

Relative to economic opportunities for the state, and information security for its citizens, the Computer Equipment Disposal & Recycling Council offers the following recommendations:

The state of Georgia should facilitate e-scrap reuse, refurbishment, and recycling in order to
- increase jobs, corporate incomes, and tax revenues,
- enhance information security in both public and private sectors,
- capture the asset values of material resources that are being exported or landfilled, and
- avoid potential environmental risks.

Strategies for making this happen include
- educating the general public and small business owners,
- enhancing the development of the private sector for e-scrap collection and processing and,
- improving state government procedures for handling its own e-scrap assets.

Action items for state government may include some of the following
- stimulating the private sector, including nonprofit organizations, with allowable tax deductions for direct costs related to e-scrap collection and processing (e.g., equipment rental, mileage, labor, etc.), and implementing other tax incentives to promote recycling,
- clarifying the legal definition of " manufacturing machinery and equipment" to allow e-scrap recyclers to exempt from sales tax the purchase or maintenance of the machinery used in their operations,
- enabling counties to exempt designated e-scrap recycling companies from ad valorem taxes on inventory and motor vehicles,
- encouraging public and private funding for programs that use the recycling of electronics to train and employ persons with disabilities, and
- recommending that electronics recycling be considered a priority strategic industry with the Commission for a New Georgia.

The Council believes that these recommendations will attract new companies, promote the expansion of existing companies, promote job training for the disadvantaged, and ultimately increase local and state tax revenues.

The Council's report to the Legislature, *The Status of Unwanted Computers and Scrap Electronics in Georgia* (May 2004), is appended to this report as Supplement 1. It describes issues identified during the Council's first two years and provides an overview of environmental and other recycling issues, both locally and nationally. The Executive Summary is given in Appendix A.

Introduction

Over its three-year existence, the Council has heard wide-ranging testimony from various state agencies, environmental NGOs, nonprofit and for-profit electronics recyclers, and original equipment manufacturers. The Council has reviewed reverse production systems modeling of cost effective electronics recycling infrastructure solutions. P^{2}AD, Georgia Tech, and the National Science Foundation (NSF) supported the latter research. Based upon this information, the Council finds that surplus computers and electronics provide opportunities for revenue enhancement for the state of Georgia and Georgia businesses, job development for its citizens, and environmental risk reduction through improved recycling.

The Council believes that enhancing the electronics-recycling infrastructure in Georgia, eventually in partnership with neighboring states, should be a goal of the state. As obsolete electronic equipment comes out of storage, and both computer monitors and television sets are replaced by HDTV and LCD screens, private market forces are adequate to support cost-effective solutions to this potential environmental problem.

Electronic equipment used for computing, communication, information transfer, manufacturing, and commerce can be found everywhere in our state. It's in our three million homes, in the 85 state agencies, in the 4,000 buildings of our 34 state colleges and universities, and in every office and commercial establishment. Often purchased at great cost, virtually every piece of equipment one day will have outlived its usefulness. When electronic equipment is no longer needed because it's old, slow, or not working, it becomes e-scrap, and must be either disposed of, reused, or recycled in economically and environmentally appropriate ways. However, **electronic equipment is not subject to regulation as waste, regardless of its origin, as long as the equipment is in commerce**. Some types of e-scrap are listed in Appendix B.

E-scrap should be considered an asset. Most of this material has residual financial value that can be recovered through a variety of methods. If fairly new and wholly functional, it can be sold as is. If somewhat dated, it can be refurbished with new components (e.g., increased memory for computers) and then sold. In the case of "old" computers, many individual components (e.g., mother boards, audio/visual cards, various drives, power supplies, fans, etc.) can be removed and sold. After everything of value has been removed from a unit of e-scrap, it can be shredded into very small pieces. The pieces consist of precious metals (gold and silver), base metals (steel, copper, and aluminum), plastics (at least a dozen types), and glass. Definitions and specifications of e-scrap materials can be found at http://www.isri.org/Content/NavigationMenu/IndustryInformation/ CommoditySpecifications/Specs_Document/specifications.pdf. Recent advances in sorting technology allow a recycler to cleanly separate these material streams so they can be sold to processors who smelt the metals, re-pelletize the plastics, or melt the glass for use as raw materials in manufacturing new products.

The Council finds that because of the enormous amount of electronic equipment owned by the state and its citizens, there are three broad areas of concern that should be addressed by the governor and the General Assembly: economic development opportunities, consumer education about recycling opportunities, and information security. These will be addressed below.

Economic Development Opportunities for the State

Using cutting edge, reverse production systems engineering technology, Ammons and Realff (Georgia Institute of Technology) evaluated the costs and net profits of eight methods of collecting and processing personal computers, monitors, and television sets from throughout the state. This research describes the economic variables and outcomes of each scenario and is contained in *Evaluation of the State of Georgia's E-Scrap Handling Alternatives, 2005*, (See Appendix C for the Executive Summary). The scenarios were developed by the Council and are grouped in the following eight general alternatives:

1. Retailer alternative
2. One-day event alternative
3. Permanent collection center alternative
4. Combined alternative
5. Combined alternative with adjusted distance
6. Hub and spoke alternative
7. Product stewardship alternative
8. Advanced recycling fee (ARF) alternative

Ammons and Realff (2005) concluded that there is a significant economic development opportunity in the state for e-scrap recycling when managed by the private sector. Some of the most promising alternatives have net potential annual revenues in the range of $6 million, while most are closer to break even.

These projections are likely low because they did not include computer peripherals, cellular phones, or other information technology and communications equipment as revenue generators. Ammons and Realff conclude that the state has the opportunity to increase jobs, increase tax revenues, and capture the asset value of resources that are now often exported or landfilled.

An important result from the Ammons and Realff report is that several alternatives for collecting and processing e-scrap can be economically viable, and all are based on private enterprise. They include electronics retail stores serving as collection points for e-scrap and developing drop-off collection centers in rural counties lacking electronics retail stores.

The Georgia e-scrap recycling industry is young and growing. A key factor has been that a very strong international market for used electronic equipment, refurbished computers, and component parts has developed within just the last five years and is vital to growing Georgia's e-scrap recycling infrastructure.

Most of the demand has come from Asian countries where low labor costs make it feasible to disassemble e-scrap to recover basic parts for re-manufacturing. Most of the supply has come from North American and European countries where there is rapid turnover (especially in computers, IT, and communication equipment) as new technologies are adopted. An exceptionally strong market for re-programmed, used cellular phones has developed in Latin America because it is cheaper to build cell towers than string hard wire over thousands of miles.

Georgia, and especially metropolitan Atlanta, is home to a variety of for-profit companies that buy, resell, or recycle e-scrap of all kinds. Some provide an essential service to businesses by offering certified hard drive or data destruction. Some offer asset value

recovery to computer-owning companies by reselling functional equipment and returning a share of the revenue to the owners. Some offer their recycling services to homeowners for a fee. Collectively, computer recyclers and resellers are becoming an economic engine for the state of Georgia: they rent warehouse and office space, buy equipment and supplies, provide jobs, and pay state income taxes.
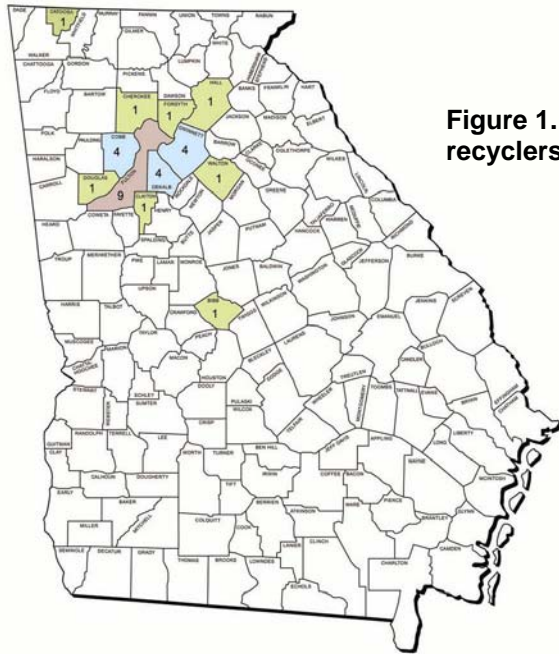

Figure 1. Location of e-scrap recyclers by county.

Of the 29 commercial e-scrap recyclers in Georgia, 26 are within 30 miles of the state Capitol and serve a population base of about 4.5 million residents (See Figure 1). (A list of these businesses is provided in Appendix D.) None are located within 30 miles of Augusta, Columbus, Brunswick, Savannah, or Valdosta. The metro areas of these five cities are home to 785,000 residents and there is a great need for e-scrap recyclers to locate near them. The northwest corner of the state is served by a recycler in Fort Oglethorpe, and a company in Bolingbroke (north of Macon) serves central Georgia.

In addition to the commercial sector, there are a variety of nonprofit organizations in Georgia that recycle computers (see Appendix E). Typically, they accept donations of used or surplus equipment that can be upgraded with more memory, newer drives, or new operating systems. The work is usually performed by persons with disabilities who are paid for their labor. The nonprofit sector is well known for creating jobs for the disabled, and this is particularly the case in electronics recycling. These organizations also provide training in new job skills for unemployed, but able-bodied people. The refurbished computers and necessary peripherals are donated (or sold at very low cost) to other nonprofit agencies, private schools, churches, and economically disadvantaged families.

Goodwill Industries International is one of the world's largest nonprofit providers of education, training, and career services for people with physical, mental, and emotional disabilities, as well as those with disadvantages such as welfare dependency, homelessness, and lack of education or work experience. There are 53 Goodwill stores in Georgia, located in 32 counties. Like other nonprofit organizations that accept donated goods, Goodwill stores are often stuck with piles of computers and televisions that they have

to pay someone to dispose of safely. At present, Goodwill operates very successful computer recycling operations in California, Texas, and South Carolina, but none in Georgia. A Goodwill spokesman told the Council that in 2003, the Goodwill agencies in Georgia had disposal costs of more than $1 million—most of which was for e-scrap.

Another nonprofit computer recycler is ReBoot (www.gatfl.org/reboot), which has distributed almost 5,000 computers to people with disabilities and has four training centers in the state. Major support for the ReBoot programs comes from the Georgia Department of Labor's "Tools for Life" program, which is designed to increase access to assistive technologies for Georgians with disabilities.

Relative to economic opportunities for the state, and information security for its citizens, the Computer Equipment Disposal & Recycling Council offers the following recommendations:

The state of Georgia should facilitate e-scrap reuse, refurbishment, and recycling in order to
- increase jobs, corporate incomes, and tax revenues,
- enhance information security in both public and private sectors,
- capture the value of material resources that currently are often exported or landfilled, and
- avoid potential environmental risks.

Strategies for making this happen include
- educating the consumer (see next section of this report),
- enhancing the development of the private sector for e-scrap collection and processing, and
- improving state government procedures for handling its own e-scrap assets (see final section of this report).

Action items for state government may include some of the following
- stimulating the private sector, including nonprofit organizations, with allowable tax deductions for direct costs related to e-scrap collection and processing (e.g., equipment rental, mileage, labor, etc.), and implementing other tax incentives to promote recycling,
- clarifying the legal definition of "manufacturing machinery and equipment" to allow e-scrap recyclers to exempt from sales tax the purchase or maintenance of the machinery used in their operations,
- enabling counties to exempt designated e-scrap recycling companies from ad valorem taxes on inventory and motor vehicles,
- encouraging public and private funding for programs that use the recycling of electronics to train and employ persons with disabilities, and
- recommending that electronics recycling be considered a priority strategic industry with the Commission for a New Georgia.

The Council believes that these recommendations will attract new companies, promote the expansion of existing companies, promote job training for the disadvantaged, and ultimately increase local and state tax revenues.

Recycling Education for All Computer Users

Recent surveys of the public indicate a general lack of knowledge concerning the recycling of electronics and computer equipment. There is a lot of activity at the national and international levels on these issues, but a comprehensive national strategy is not in place to recycle the vast amount of obsolete electronics equipment in storage.

The May 2005 issue of *e-scrapnews* (published monthly by Resource Recycling, Inc.) reported the results of a survey that was commissioned by Hewlett-Packard, Inc. Among the findings were:

- 95% of Americans don't know the meaning of the term "e-scrap;"
- 68% of Americans have e-scrap stockpiled at home;
- 63% feel e-scrap is as important or more important an environmental issue than air pollution; and
- 58% are not aware of electronics recycling opportunities in their community.

A vast amount of excellent information regarding computer and e-scrap recycling is available on the Internet. Especially valuable are the pages at the US-EPA, (http://www.epa.gov/epaoswer/hazwaste/recycle/ecycling/index.htm), the Northeast Recycling Council (www.nerc.org), the California Integrated Waste Management Board (http://www.ciwmb.ca.gov/Electronics/), and Earth911 (http://www.earth911.org/master.asp?s=lib&a=electronics/elec_index.asp). Information about commercial and nonprofit computer recycling companies in Georgia can be found at the P^{2}AD website (http://www.gadnr.org/p2ad/Assets/Documents/escrap_home.html). The Department of Community Affairs provides information at http://www.dca.state.ga.us/development/EnvironmentalManagement/programs/downloads/electronicrec.pdf

During the last two years, there have been several computer recycling events in metro Atlanta that targeted residential e-scrap. The largest, sponsored by Dell, Inc., collected 74 tons of e-scrap in one day. Other one-day drop-off events have been sponsored by various Keep America Beautiful affiliates, the Athens-Clark County and Rome-Floyd County recycling centers, and the City of Atlanta. During the summer of 2004, Hewlett-Packard partnered with Office Depot stores nationwide to allow consumers to drop off e-scrap at the stores. More than 5,000 tons of materials were collected during the seven-week pilot program.

The Council recognizes that much more education about computer and e-scrap recycling opportunities is needed in Georgia, not only for the public at large, but also for local officials and school boards. This effort should be part of a larger state environmental education campaign. A key focus should be education of the public on the merits of electronics recycling and to inform them of their options. The campaign should also educate the business sector on proper management and recycling options. Additionally, the campaign should work in partnership with all relevant state agencies to support proper recycling of state computers and related electronics.

Most computer users are now connected to the Internet and regularly search it for information. Using a popular search engine, a recent search for the phrase "computer recycling" returned 4,730,000 pages. The phrase "computer recyclers GA" returned 12,200 pages with P^{2}AD's webpage ranked #1.

As part of the Department of Natural Resource's ongoing environmental education initiatives, P²AD proposes convening a group of stakeholders to develop a statewide plan for electronics recycling education. Working with organizations such as the Department of Community Affairs, Association County Commissioners of Georgia, Georgia Municipal Association and existing environmental education organizations, P²AD anticipates coordinating education efforts already in place and expanding them to meet the goal of developing an effective, strategic method of educating all Georgians about the critical need to recycle used electronics.

The Council encourages state agencies to develop a website called *Computer & Electronics Recycling Information for Georgia (CERIG).* CERIG would serve as an umbrella site where Georgia citizens and businesses could find all the information they need for recycling computers and e-scrap, as well as information on why recycling is both economically and environmentally important. CERIG would also have a calendar listing e-scrap recycling events around the state. It could also maintain a running "score board" summarizing the results of e-scrap recycling events, including the number of cars served, number of units received, and tons of materials recycled.

Information Security

On June 9, 2005, the New York Times reported that, according to the Federal Trade Commission, 10 million consumers are now falling victim to some form of identity theft each year. However, there are many more types of sensitive or confidential information that may be retrieved from personal, corporate, and government-owned computer systems. In 1996, the U.S. Congress passed the Health Insurance Portability and Accountability Act (HIPAA). HIPAA contains detailed, mandatory provisions for the management, protection, and destruction of all types of medical information gathered by doctors, hospitals, pharmacies, and insurance companies. The Council was very concerned with issues related to the security of confidential personal and medical information stored in state-owned computer systems.

The state, with 83,000 employees, is probably the single largest public purchaser of computer and information technology in Georgia. It is probably also the single largest generator of obsolete, surplus, or unwanted e-scrap. The University System of Georgia (USG) may be the second largest public purchaser, with more than 35,000 employees and almost 239,000 students. A spokesman for USG estimated that there are 500,000 to 1 million computers in the system, but they do not know how many are in use or are being stored awaiting disposal.

DOAS's Surplus Property Division manages the end-of-life disposition of some state and federal capital assets (http://gasurplus.doas.state.ga.us/apps/gss/surplus.nsf). When it was established, this office (then the surplus property unit) was primarily tasked to handle surplus office furniture and vehicles. Consequently, computers and information technology equipment have been handled the same way: by first offering it to state and county agencies, then to approved nonprofits, and finally, by auction, to the general public**.** Until recently, there have been no clearly defined or required methods for managing state-owned surplus computers and other electronic equipment when they reach the end of their useful lives.

However, as a result of frequent discussions with the Georgia Chief Information Officers Council, the surplus property administrator, and advisors to the Council, DOAS has been reorganized. The surplus property unit is now a separate division within DOAS led by Director Steve Ekin. It is expected that on July 1, 2005, a new policy for managing surplus computers will go into effect for *all* agencies of state government. It will clearly specify the procedures required for destroying confidential information before a computer can be surplused. Recognition of the need for this policy has been driven mainly by the HIPAA requirements.

Acknowledgements

The Council expresses its enormous gratitude to the more than 50 invited speakers and guests who shared their expert knowledge about e-scrap and computer recycling with us. They represented both commercial and nonprofit recyclers, many state agencies, computer manufacturers, and the world of academe. They helped us understand critical issues facing the state and shaped the Council's recommendations. Many offered reviews of this report before it was finalized. To all of them, we offer our sincere thanks.[*]

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[*] Printed on acid-free paper with 30% recycled content.

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Council Members

Initial meeting of the Council with the sponsor of HB-2, Rep. Terry Coleman.

(L-R) Steve Levetan, Carlos Cardoso, Jane Ammons, Rep. Coleman, Bob Donaghue, Joe Sports, and Richard Harden.

Appendix A

***The Status of Unwanted Computers and Scrap Electronics in Georgia, Executive
Summary*** **(Report to the Legislature, 2004)**

This report summarizes the preliminary findings of the state of Georgia's *Computer Equipment
Disposal and Recycling Council* based upon its 2003 investigations. At monthly meetings
throughout the year, experts briefed the Council on issues related to the growing quantity of used
electronics accumulating in homes, businesses, government offices, and schools throughout the
state.

There are at least 4.4 million PCs and 8 million TVs in the 3 million households in the state. With
an average weight of 54 pounds this e-scrap will eventually become 334,800 tons of waste. The
picture tubes (CRTs) in monitors and TVs each contain about 5 pounds of lead oxide embedded in
the glass. Thus, the 12.4 million CRTs contain about 31,000 tons of lead, known to be a highly
toxic hazardous waste.

At present, Georgia law does not ban landfill disposal of e-scrap coming from residential
sources, although some landfills will not accept them. The U.S. EPA has proposed that
end-of-life (EOL) e-scrap should be regulated as recovered materials for the purpose of
recycling, not as "wastes." Fortunately, Georgia law already makes this distinction and it will
facilitate the recovery of vast tonnages of base and precious metals, plastics, and glass.

There are only five commercial recyclers serving Georgia, about 20 companies that refurbish and
resell whole computers or parts, and about six nonprofits that accept working PCs. Collectively,
they cannot appropriately manage all the unwanted and discarded e-scrap in the state.

There are no systematic inventories of PCs owned by the scores of branches of state government
and the University System of Georgia (USG). The USG estimates it owns up to a million computers,
but does not track them. The state's Surplus Property Office oversees reuse and recycling of some
federal- and state-owned e-scrap.

County and municipal governments, facing severe budget shortfalls, cannot afford to build the
facilities needed to collect and store unwanted computers and televisions prior to shipping to
recyclers.   With the problem comes opportunity—economic development and job creation
associated with building a statewide network of e-scrap collection centers that are accessible to all
citizens. A recent Georgia Tech study has estimated that under varying conditions this
infrastructure could be economically viable, with net annual profits in the low million dollars range.

Next steps include the formulation and analysis of Council recommendations—which may assume
any of several forms including potential state policy development, pilot and/or ongoing programs,
and other alternatives. The long-term goal of the Council is to facilitate state actions to capitalize on
the potential economic development and job creation opportunities provided by the growing stream
of e-scrap, along with its associated economic and ecologic value, while at the same time heading
off potentially serious environmental hazards associated with heavy metals.

Appendix B

Types of electronic equipment that become e-scrap

- Desktop computers
- Mini-towers
- Laptop computers
- Monitors
- Servers
- Work stations
- Keyboards
- Mice
- Joystick game controllers
- Printers
- Zip drives
- Speakers
- PDAs
- Pagers
- Hubs
- Routers
- Scanners
- Digital projectors
- UPS units
- Main frames
- Component parts
- Cables

- Telephones
- Telephony equipment
- Adding machines
- Calculators
- Typewriters
- Label makers
- Copiers
- Fax machines
- Answering machines
- Digital cameras
- "3-in-1" devices (printer + copier + fax)
- Television sets
- VCRs
- DVD players
- Cable converter boxes
- Remote controls
- Stereo equipment
- Radios
- Portable CD players
- Portable game players
- GPS receivers

Appendix C

Evaluation of the State of Georgia's E-Scrap Handling Alternatives, Executive Summary
(Ammons and Realff, 2005)

In 2004, the Computer Equipment Disposal and Recycling Council of the State of Georgia commissioned our research team to analyze several new alternatives to collect and process used electronics (e-scrap). This final report documents a project conducted at the Georgia Institute of Technology to examine all the alternatives proposed by the Council. Some alternatives concentrate on how e-scrap should be collected, while others deal with regulations that could be applied in the future. Associated optimization models and data are structured so that the impact of uncertainty can be examined. Results are analyzed and reported that enhance the understanding of e-scrap reverse production systems for Georgia and facilitate policy development.

The method of this study is to apply our Reverse Production System (RPS) mathematical programming model to different types of collection in order to gain more understanding of how these alternatives may perform.

We examine the financial viability of each alternative and compare the alternatives under similar assumptions. From the examination of all alternatives, we have obtained three major insights.

- The first one is that collection costs do not differ greatly among the various collection alternatives considered by the Council.

- The second insight is that a combination of permanent collection centers and retailers is slightly more financially viable than other alternatives proposed by the Council.

- Lastly, a critical factor is who is responsible for the collection and administrative expenses for the product stewardship and Advanced Recycling Fee (ARF) alternatives studied by the Council. The state could face major expenses in each of these alternatives, an important consideration.

A significant conclusion is that there is an excellent economic development opportunity in the state for e-scrap collection and processing to be handled by the private sector. Our analysis of some of the most promising alternatives estimates potential annual revenues in the range of $6 million for the collection and processing of three types of used electronic products. By facilitating the development of e-scrap collection and processing, the state has the opportunity to increase jobs, tax revenues, capture the value of a resource that currently is often exported or landfilled, and avoid a potential environmental concern.

Appendix D

Known commercial computer and e-scrap recyclers in Georgia

- Accent Computer Brokers & Asset Recovery, Inc., 679 Pine Valley Rd., SW., Mableton GA 30126

- AERC Recycling, Inc., 120 Willingham Dr., Bolingbroke GA 31004

- Asset Waste Management & Recycling, 212 First St., Ft. Oglethorpe GA 30742

- Atlanta Computer Liquidation, 4851 GA Hwy 85, Suite 315, Forest Park GA 30297

- Atlanta Recycling Solutions, LLC, 1869 McFarland Rd., Alpharetta GA 30005

- Atlantix Global Systems, 1 Sun Court, Norcross GA 30092

- Bizmarts, 1063 Marietta Rd, Canton GA 30114

- BoxQ, Inc., 470 Great Southwest Parkway, Atlanta GA 30336

- Canvas Systems, 3025 Northwoods Parkway, Norcross GA 30071

- Computer Asset Liquidation, 2485 Vulcan Dr., Bldg. B, Lithia Springs GA 30122

- Computer Recycling by Zentech, 1429 Mayson St., Atlanta GA 30324

- Computronics, 6740 Tribble St., Lithonia GA 30058

- Creative Recycling Systems of Georgia, Inc., 85 North Industrial Rd., Palmetto GA 30268

- Data Instruments, Inc., 869 Pickens Industrial Drive, Suite 7, Marietta GA 30062

- GSAN Computer Marketing, Inc., 1038 MLK Jr. Blvd., Gainesville GA 30501

- Imaging Specialty Co., Inc., 5311 Dividend Dr., Decatur GA 30035

- Leapfrog Services, Inc., 1605 Chantilly Dr., Suite 300, Atlanta GA 30324

- MARC5R Processors, Inc., 2445 St. Mountain-Lithonia Rd., Lithonia GA 30058

- Market Velocity Inc., 3885 Crestwood Pkwy. Suite 500, Duluth GA 30096

- MicroSeconds, Inc. (#1), 6427 Roswell Rd. NW, Sandy Springs GA 30328

- MicroSeconds, Inc. (#2), 3505 Gwinnett Place Dr., Duluth GA 30096

- MOLAM Inc., 925 Industrial Park Drive, Marietta GA 30062

- MTSG Recycling, 4507 Mills Pl. SW, Suite L, Atlanta GA 30336

- Pifusion Development Group, Inc., 3973 Atlanta Hwy. 78, Suite 200, Loganville GA 30052

- Premiere Recycling, Inc., 3400 River Green Court, Duluth GA 30096

- Royal Computer Services, Inc., 1375 Weber Industrial Dr., Cumming GA 30041

- Southern Refurb, Inc., 825 Marathon Pkwy. Suite A, Lawrenceville GA 30045

- U.S. Micro Corporation, 7000 Highlands Pkwy. Suite 160, Smyrna GA 30082

- Video Display Corp., 1868 Tucker Industrial Rd., Tucker GA 30084

Appendix E

Known nonprofit computer recyclers in Georgia

- Community Nonprofit Support Services, 3300 Canton Rd., Suite B, Marietta GA 30066

- Free Bytes, Box 550371, Atlanta GA 30355

- Goodwill Industries of North Georgia, 2201 Glenwood Ave., Atlanta GA 30316

- Goodwill Industries of the Coastal Empire, 7220 Sallie Mood Dr., Savannah GA 31416

- Goodwill Industries of West Georgia, 1955 Northside Industrial Blvd., Columbus GA 31904

- Goodwill Industries of Middle Georgia, 5171 Eisenhower Parkway, Macon GA 31206

- KnowledgeBase, Inc., South Cobb Dr., Suite 2114, Marietta GA 30060

- ReBoot, 4508 Bibb Blvd., Suite B10, Tucker GA 30084

- StRUT-Georgia (Students Recycling Used Technology), 1189 Deepstep Rd., Sandersville GA 31082

- Tech Corps Georgia, 1514 East Cleveland Ave., Suite 110, East Point GA 30344