

**Electronics Recovery, Reuse, Recycling Project**

**FDEP Grant Number: IG1-03**

**Final Report**

**Submitted by**

Charlotte County Government

to

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**A. Introduction**

Charlotte County Government was awarded funding by the Florida Department of Environmental Protection (FDEP) to develop Florida's first countywide public-private, non-profit based electronics collection, reuse, dismantling, re-manufacturing, and recycling program.

The County believed that a non-profit collection strategy would be especially effective for small and medium sized counties, which lack resources to otherwise collect and process electronics.

The project team included Charlotte County Government, Goodwill Industries of Southwest Florida, Inc. and Resource Management Group, Inc.

***A-1. Project Background***

Florida residents are replacing outdated technology at an increasing rate. Out-of-service electronics present disposal problems, both for non-profits, which receive donations of equipment not suitable for resale, and communities, where improper disposal can cause environmental pollution.

Rapidly increasing quantities of used electronics equipment is a fast growing environmental problem. Between 2000 and 2007, 500 million personal computers will become obsolete in the U.S., according to a survey by the National Recycling Coalition. Televisions and computer monitors contain pounds of lead used to protect viewers from radiation exposure. Circuit boards, batteries and switches can contain other environmentally toxic metals like mercury, chromium and cadmium.

Improper disposal of electronics is a violation of Florida's hazardous waste regulations and violators may be further subject to Federal Superfund cleanup liability. Landfills in Florida no longer accept waste electronics.

Individuals, businesses and governments have been bringing their worn out computers and TVs to places like Goodwill for a long time. But year after year, Goodwill and similar charities have been incurring the disposal costs of electronic merchandise that it cannot resell - ultimately causing the organization to spend money on hefty disposal fees rather than vital community programs. Florida hazardous waste requirements mean that Goodwill is liable for the materials once they have accepted them as donations. In fact, due to the quantities involved, the non-profit may unwittingly become a regulated

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hazardous waste generator, which subjects the organization to increased management costs.

Rather than refusing electronics donations altogether, Goodwill and Charlotte County agreed to try a pilot program to cooperate in implementing a legal and efficient electronics waste management system for the County and the non-profit.

***A-2. Project Goals and Objectives***

The County's goal in undertaking this project was to establish a sustainable reuse and recycling program at Goodwill Stores in Charlotte County and a blueprint of the most cost-effective activities for non-profits to collect and process electronics for reuse and recycling. The County also wanted to evaluate the costs and benefits of utilizing the existing infrastructure provided by the non-profits as a county-wide approach to managing electronics, versus monthly household hazardous waste collection events.

To meet these goals, the County's objectives included:

- Implement innovative technologies and processes that meet the unique collection and marketing issues of small and mid-sized counties.
- Identify multiple cost-effective strategies for source reduction of potentially discarded electronics.
- Create adequate information, knowledge and documentation about the program so that it can successfully continue and be replicated.

***A-3. Project Innovation***

While recycling of electronics is increasing, the vast majority of electronic scrap in Florida had been disposed when this grant was applied for. This project set out to expand on the existing private and public collection models by creating transferable materials, such as brochures, marketing guidance and training manuals.

The project focuses on the unique collection and marketing issues of small and mid-sized counties that lack the infrastructure and knowledge base to manage electronic discards with minimal cost. The following innovations were explored with this project:

- Focus on reuse of older electronics compared with recycling.
- Create electronics processing facility at a Goodwill retail store.
- Establish a dedicated electronic retail store within the Goodwill system.
- Extract and resell inventory of computer parts.

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- Collect discarded electronics using Goodwill stores donation centers instead of county collection events.
- Utilize or install innovative software to facilitate computer resale

***A-4. Project Presentation***

Resource documents developed for this project are available for public viewing and/or download from the following web site: [www.recyclesmart.com](http://www.recyclesmart.com).

The project team has submitted proposals to present the findings of this project at the following venues: annual conferences of National Recycling Coalition (2002), Michigan Recycling Coalition (2002), and regional conferences of Solid Waste Association of North America (2002). The project team plans to propose an additional formal presentation of the project at the RFT conference scheduled for June 2003.

As of December 12, 2002, one presentation abstract has been accepted: SWANA has accepted “Hard to Recycle Material Diversion Programs for Electronics” to be presented February 24, 2003. The lead presenter is Michael Murphy, Executive Director, Recycling Task Force of Hillsborough County, the Charlotte County project will be approximately 50% of the presentation.

**B. Project Implementation**

Charlotte County implemented the *Electronics Recovery, Reuse, and Recycling Project* by subcontracting the majority of project implementation to a non-profit retail store and a solid waste management consultant. The County provided oversight, guidance, project management, and in-kind support. Neither the County nor its subcontractors purchased any capital items with grant funds.

***B-1. Equipment and Services Utilized***

After comparing service and price options for electronics recycling firms in Florida, the County hired the Tampa recycling vendor ‘Secure Environmental Electronics Recycling, Inc.’ (SEER) to collect and properly dispose of donations found not suitable for resale. SEER has a process for separating components from bulk collections, and then removing toxic materials, like lead, as well as valuable materials; like copper, aluminum, and even gold. SEER claims to utilize domestic (U.S.) end-markets for recycling, which the project team valued for program integrity.

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As typical with recycling vendors, SEER's fee structure included a flat fee for collection / transportation of palletized materials plus additional fees or rebates based on the material types and quantities collected.

Pickups were necessary at intervals of approximately two months, removing an average of 12 pallets and a few boxes of material from the processing facility. Over the period, six pickups cost \$8,504.48, or approximately \$1,417.00 per pickup. See Table 1, *Recycling Expenses*, for recycling expense detail.

<i>Recycling Expenses</i>	
Recycle pickups	Cost
12/11/01	\$ 1,285.50
01/18/02	\$ 1,176.00
03/06/02	\$ 1,700.05
05/07/02	\$ 1,455.51
07/25/02	\$ 1,597.84
09/12/02	\$ 1,289.58
Total:	\$ 8,504.48

**Table 1, *Recycling Expenses***

Table 2, *Equipment and Description of Use*, lists items utilized during the project period, the estimated value of the item, and a short description of its use.

<b>EQUIPMENT AND DESCRIPTION OF USE</b>			
Equipment	Source	Price	Description of Use
Air compressor	Leased	\$ 37.50 / mo.	Removing dust from electronics
Pallet jack	Leased	\$ 85.00 / mo.	Moving recycling pallets
Cabinets	Donated	-	Secure storage of tools and documents
Workshop Shelving	Purchased	\$ 339.63	For stacking of equipment for processing or in inventory
Display Shelving	Purchased	\$ 312.49	The project team constructed low-cost shelving used in the retail space to display computers for sale
Display Casing	Donated	-	Display of small, valuable retail items.
PC toolkits	Purchased	\$ 21.38	Repair and disassembly
First aid kit	Purchased	\$ 12.99	Health safety
Fire extinguisher	Donated	-	Fire safety
Protected power strips	Purchased	\$ 13.75	For safe equipment testing and power for tools
Safety glasses	Donated	-	Health safety
Back support	Donated	-	Health safety
Display Banner	Purchased	\$ 49.22	Retail sign

**Table 2, *Equipment and Description of Use***

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The project utilized several kinds of equipment for collection, processing and sales of used electronics. Virtually all of the equipment utilized was leased or purchased by project partners and donated to the project as in-kind contributions. Subcontractors provided their own tools. Grant funding paid for some consumable supplies, a number of tool kits for computer disassembly, and display and storage shelving.

Equipment investment was approximately \$2,098.00. This included \$750.00 in purchases and \$1,348.00 in rentals. Examples of equipment used were an air compressor, pallet jack, cabinets, shelving and work table, as well as PC tool kits and cleaning supplies. Safety equipment included: a first aid kit, fire extinguishers, protected power strips, safety glasses and back support.

Continuing equipment investment included supplies for ongoing program management. Table 3, *Supplies and Description of Use*, lists items utilized during the project period, the estimated value of the item, and a short description of its use.

SUPPLIES AND DESCRIPTION OF USE			
Equipment	Source	Price	Description of Use
Cleaning supplies	Donated	-	Retail preparation
Office supplies	Purchased	\$ 93.90	Disks, pens, papers, etc.
Electronics supplies	Purchased	\$ 21.23	Small parts as needed to support processing
Pallet wrap	Donated	-	For securing sorted parts to recycling pallets
Pallets	Donated	-	For storage of sorted parts to be recycled

**Table 3, *Supplies and Description of Use***

By partnering with an existing retail establishment, the project team was able to conserve resources and utilize materials and equipment that was already on hand to support the store in its primary function.

***B-2. Cooperative Recycling Effort***

The project was inherently regional in nature, because Goodwill Industries of Southwest Florida operates in several counties: e.g. Charlotte, Sarasota, Lee and Collier. Lessons learned by Goodwill were transferred. During the grant period, the Goodwill processing facility handled only materials collected in Charlotte County.

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Charlotte County hosted an electronics recycling grant kick-off meeting with other counties in the region on October 24<sup>th</sup>, 2001. This meeting was attended by government representatives from Charlotte, Sarasota, Lee and Collier counties. This informal meeting included presentations by each county and an RMG facilitated site visit to Goodwill's processing/retail facility in Englewood. It was anticipated at the time that the County might host additional regional meetings after the project was further along to share experiences and insights relating to the various recycling approaches. However, there was no interest expressed by other counties or FDEP to hold additional meetings.

In an effort to provide information to other counties regarding this recycling project, Charlotte County has developed a *Program Manual* (Appendix A) for setting up an electronics reuse and recycling program as well as a online guide to upgrading computers (the *Computer Upgrader*). Both of these resources are available on the Internet at <http://recyclesmart.com/> and are available not only to other counties in the region and throughout Florida, but also to everyone with access to the World Wide Web.

***B-3. Project Elements and Timeline***

The project focused on developing a reuse, resale, and recycling strategy that Goodwill could implement at its Southwest Florida retail stores. To accomplish this, the project team established two operations: a retail electronics storefront, and a tech-center for managing donations through repair, refurbishing, or recycling. These operations were co-located at Goodwill's Englewood store located at 1501 Placida Rd, Englewood, FL 34224.

There were four primary project elements: Collections, Processing, Recycling and Retail. These project elements are described below in more detail.

**Collections**

Because the project focused on materials collected at a non-profit, collections (a solid waste management term) are characterized as "donations." This is consistent with Goodwill's terminology as well as the mindset of the generators (or "donors" in Goodwill terminology) that participated in the program.

Donations were collected or received from various sources, including households, businesses, and institutions. Residential donors commonly dropped off equipment donations at one of the area Goodwill stores. Businesses and institutions arranged for special pickups from their locations by calling the Goodwill program manager. A fee was assessed for special pickups.

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Donations were collected using three methods: store collection, contracted pickups, special event collection.

As an example of a special event collection, the project team held a mobile collection on April 27<sup>th</sup> 2002 in the parking lot of the County Library, in Murdock, FL. See Figure 1, *Collection Event*. The purpose of the event was to provide a well publicized event at a location other than the Goodwill Englewood store and typical amnesty day events for residents and business to drop off their electronics.

The collection was held in conjunction with the Keep Charlotte Beautiful annual clean up day, and included radio spots, newspaper advertisements, and promotion by flyers. It also provided the project staff and volunteers a chance to meet and survey local community members.



**Figure 1, *Collection Event***

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**Processing**

Processing includes sorting, triage, testing and repair. The processing of electronics equipment was the most complex and labor intensive part of the program. However, processing represents a value-added element, which allowed the program operator to capture value from donated equipment. By piecing together “good” elements from “bad” systems, a salvaged system can rise like a phoenix from the wasteland of old electronics. This accomplished the ultimate goal of selling some systems for \$50, \$100, or more, instead of paying \$10-25 per system for disposal.

The sorting process divided incoming materials into simple initial categories. Electronics were identified from all other donations. Televisions were separated from computers. Whole computer systems were kept together. Remaining parts were categorized by type: Computer system (CPU, box), monitors/terminal, large peripheral or small peripheral.

The primary processing document was the Data Record Sheet (DRS). Staff used this document to keep track of all equipment managed at the processing facility. The DRS was developed to manage information for reporting to the project’s funding organization. Table 4, *Description of Data Record Sheet*, outlines the data collected using this form. Some data may not be required for managing an ongoing self-funded operation.

<b>Description of Data Record Sheet (DRS)</b>	
<i><b>DRS Column Headings:</b></i>	<i><b>Explanation</b></i>
<b>Logged By</b>	Initials of technician filling out the Data Record Sheet.
<b>Date In</b>	Date item arrived at the processing facility.
<b>Source</b>	Private donation, institutional delivery or special collection.
<b>Category</b>	General equipment type: Monitor, CPU, large peripheral, etc.
<b>Brand</b>	Name of manufacturer: Dell, Sony, HP, etc.
<b>Description</b>	Specific type of equipment: P100, MS3, KB, FX, CP, ETC.
<b>Age</b>	Only if TV or monitor: estimated age in years.
<b>Condition</b>	Resell ‘as is’, repair and resell, or recycle.
<b>Status</b>	W = working, NW = nonworking
<b>Tracking</b>	Retail Tracking # (MMDDYYA) <b>or</b>
	Pallet # (e.g. 2D) written on item and on retail sign

**Table 4, Description of Data Record Sheet**

A triage decision making process determined if an item was in one of three conditions: resell ‘as is’, repair and resell, or recycle. Decisions were often made by internal or non-obvious information about the piece of equipment. Therefore, such decisions had to be made by a technician.

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Testing was done to determine if a system was ready for retail, needed repair, disassembly, or ultimately sent to recycling.

Repair was limited to low cost fixes: like reconnecting a loose wire, or removing and replacing a faulty component such as a hard drive or memory. Technicians were trained not to put too much time into any one machine – no more than a half hour, and rarely more than a five or ten minutes. Chapter 4 of the Program Manual describes processing in some detail.

**Recycling**

As the project team anticipated, not all the materials donated could be either resold or traded for useful parts. These truly obsolete items were recycled properly. Refer to Chapter 5 of the Program Manual to read about the project's recycling plan in greater detail. To the rear of the processing facility, the team created a recycling holding area for pallets of materials being readied for recycling, see Fig B-3.2, *Pallets of Recyclable Electronics*.



**Figure 2, *Pallets of Recyclable Electronics***

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The project team considered several Florida based vendors to handle recycling of electronics, including: Creative Recycling Systems, RecycledPCParts.com, Jack's Recycling and Salvage, Secure Environmental Electronics Recycling (SEER) and Unicor. Based on overall value to the project, the project team utilized the services of SEER for recycling service as described in section B-1.

**Retail**

The economic success of the program depended on the resale of computers and televisions. The retail part of the program needs the attention and support of the store manager to ensure that customers see a clean and orderly retail display, and that they get any of their questions answered promptly and simply.

The first step in creating the retail display at Goodwill's Englewood store was to remove a large part of a wall. Figure 3, *Wall to Be Removed*, shows the view from the entry door. Removing the wall opened up a large room to full view from the front entrance, as shown in Figure 4, *Wall Removed*. Any customer entering the store would see the electronics display right away.



**Figure 3, *Wall to Be Removed***



**Figure 4, *Wall Removed***

Cash registers were moved to the front of the store, close to the electronics display. This close proximity was designed to allow Goodwill staff to closely monitor the display and be available to answer customer questions. The retail display was completed November 26<sup>th</sup>, 2001, see Figure 5, *Computer Retail Display*



**Figure 5, Computer Retail Display**

The processing technician discovered immediately they were constantly pulled away to answer customer questions. To reduce demands on their time, the technician created a list of Frequently Asked Questions (FAQ) to answer common customer and employee questions. It was posted at the display, with a copy made for the register area, and is included as an appendix to the Program Manual. To further address customer needs, the project instituted easy to read retail signs with customized information that addressed typical customer questions. See Chapter 6 of the Program Manual for Retail Display design, procedures and other details. Figure 6, *TV Retail Display* and Figure 7, *Additional Retail Display*, depict retail display areas at Goodwill during the project.



**Figure 6, TV Retail Display**



**Figure 7, Additional Retail Display**

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**Timeline**

The project commenced on June 1<sup>st</sup>, 2001, with a one-year term. FDEP granted a six month extension on May 29, 2002, extending the project to Dec 15<sup>th</sup>, 2002. Goodwill suspended the program due to internal organizational issues on September 13<sup>th</sup>, 2002 and the project closed on Dec 15<sup>th</sup>, 2002.

***B-4. Problems Encountered***

The project encountered obstacles that impeded optimization of the program economics. The most significant problem was low volume of materials collected, accompanied by lower than expected sales of refurbished systems. Additional problems included insufficient workspace available and program management issues. These problems are described below.

**Low Volume of Materials Collected**

The project team estimated the quantity of electronics ready for disposal and likely to be collected in Charlotte County during the grant period. We calculated the quantity by multiplying the national average (per capita) by the Charlotte County population. Additional planning estimates were provided by Goodwill. Actual collection quantities were much lower than expected.

Both the County and Goodwill were surprised by the lower-than-expected collection results. Goodwill noted that for much of the year regular donations were “down” compared to previous years. This general economic condition may have contributed to the lack of community drop-offs at Goodwill collection venues.

Additionally, Goodwill experienced staffing issues (terminations and resignations) that caused the organization to provide only limited backhaul of electronics from other stores in the County to the processing facility. This lack of regular transportation also decreased the total number of systems processed through the pilot program.



*A Charlotte County employee removes a computer for recycling from the trunk of a vehicle at a community collection event.*

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The County held regular electronics collection events in conjunction with its household hazardous waste (HHW) collection days. Attendance at these events often met the County's goals, however the fraction of electronics diversion was much smaller than the rest of the HHW waste stream.

The project team attempted to educate and motivate the public to contribute used electronics to the program. Some strategies used, include:

- Special community collections were held.
- Local advertisements of in-store promotions were placed in local papers and magazines.
- Local press was invited to run a story about the program.

Because donations and other collections were not channeling large enough quantities of used electronics through the system, processing costs were higher than expected on a per unit basis. The project team worked to reduce labor and material cost wherever possible. Some stop-gap measures included:

- Triage criteria was changed to mandate recycling for all PCs with chips older than Pentium class, as well as all Apple equipment unless it worked right out of the box. Originally, the project team anticipated utilizing and re-selling older systems, however the return on investment was not practical.
- Staff resources were reallocated to more efficiently meet the consequence of the low flow of electronics.
- Data recording sheets were modified to speed up data entry and make interpretation easier.
- Inventory was checked only periodically to shorten and simplify materials tracking.

The project team considered that the older and less affluent demographics of Charlotte County (compared with neighboring counties) may have contributed to the lower than expected diversion.

**Low Retail Sales**

The project hoped to demonstrate that the sale of reusable computers would help offset the cost of recycling non-reusable products responsibly. During the first months of the project, the program did not generate sufficient quantities of usable equipment to keep the retail sales area fully stocked. As a result, the retail display area was frequently "sold-out." Thus the sales figures were less than anticipated.

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By the beginning of 2002, systems were available and set out for sale. This improved the overall look of the electronics resale area and created the impression of “full stock.” However, January and February are typically sluggish sales months following the holiday season, and the program continued to have sales figures below expectations.

The Project Team developed a plan to increase sales, including:

1. Advertising computers on the store marquis.
2. Print advertising (e.g., newspaper).
3. Press releases & interest stories on the program.
4. Education of all Goodwill salespeople to serve customers.
5. Display more in-store signage.
6. Advertising (e.g., flyers) in other Charlotte Goodwill stores.

Another strategy to increase revenues and cover the cost of recycling fees was the implementation of a recycling “fee”. Goodwill set this fee at \$5.00 for the contribution of a TV or monitor to the program. As an incentive, donors received \$5.00 in “Goodwill Bucks” to spend in Goodwill Retail Stores, thus the consumer perceives no net cost to recycling. Goodwill’s data indicated that many donors do not shop at Goodwill stores, and the Goodwill Bucks were thought to offer an additional benefit of bringing in new customers.

Due to undetermined reasons, the plan to increase sales was not fully implemented by the retail store. A limited number of clients participated in the \$5.00 contribution program, and some customers rejected the concept of paying a fee altogether. Ultimately, sales did not meet proforma projections, resulting in lower economic benefits than predicted.

**Insufficient Workspace**

Original plans imagined 1000 square feet of space available for electronics processing at the Englewood facility. Only about 500 square feet was actually allocated due to conflicts with Goodwill’s needs for its own regular program.

Although collections were lower than expected, so were retail sales. Unsold inventory collected on the shelves, cutting into workspace. Also, occasional large deliveries by the County pushed processing



*Area was used for storage and was re-designated for computer repair and processing.*

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space to its limits and quickly filled pallets in the recycling area. The occasional overcrowding reduced program efficiency and effectiveness.

**Program Management Issues**

Goodwill set out to develop a new business component by creating the Electronics Store and Processing Facility. Thus, the project team encountered typical start-up business management challenges, such as: staffing turnover, lack of expertise, and institutional resistance to change.

***High employee turnover rate***

The nature of Goodwill's charity is to offer employment support to those with employment challenges. Thus, training and graduating workers to seek new employment is consistent with Goodwill's mission. However, this created challenges for demonstrating the cost-effectiveness of the program. A great deal of time was spent interviewing candidates, selecting candidates, training new hires, and documenting activities. These factors increased the cost of processing, blurring the lines of return on investment.

***Lack of Expertise***

As with many new enterprises, Goodwill's lack of expertise with the business of electronics recycling reduced program effectiveness. The project team worked extensively to create resource documents for Goodwill to overcome lack of institutional expertise, offered training opportunities to Goodwill employees, and created many areas of support to create a sustainable program.

***Institutional Resistance to Change***

Goodwill was cautious about widespread public promotion of the program, due to concerns that once this concept was seated in the minds of area residents, it would be difficult to slow or even stop the flow of materials if the project did not continue after the grant period.

Goodwill's main retail focus is on the resale of donated materials. This model involves a simple triage of incoming materials as falling into one of four streams:

1. Price donated item and place it into retail operations;
2. Store item for later sale;
3. Transport the item to central facility for secondary markets;
4. Dispose of item.

This model included only minor repair of a limited number of items.

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The Electronics Recovery Reuse and Recycling Program diverged greatly from the Goodwill model. It involved targeting a specific donation stream, taking in materials that would be non-reusable, extensive repair operations, costly disposal requirements, asking donors to pay fees, and developing expertise in electronics to effectively sell the refurbished items in the retail environment.

## **C. Project Results**

Charlotte County Government sought funding to develop Florida's first public-private, non-profit based electronics collection program in partnership. The County's goal in undertaking this project was to establish an on-going sustainable program with Goodwill Industries of Southwest Florida to recover, reuse, and/or recycle electronic discards generated in the County and to create a blueprint of the most cost-effective activities that non-profits could use to collect and process electronics for reuse and recycling. Furthermore, the County set out to share the experiences learned during this innovative recycling project by creating durable documentation and tools.

### ***C-1. Meeting the Project Goals***

Small and mid-sized counties in Florida have rural populations making collections more challenging. They tend to have fewer government resources to spend on solving the problem of keeping discarded electronics out of the solid waste stream or illegal dumping sites. Charlotte County, in particular, has a population that is spread out in many areas of the county, with many physical barriers making cross-county travel slow and inconvenient.

The project team believed that a non-profit with buildings, staff, and multiple locations in the county, could provide the basic necessary infrastructure. Non-profits also have an inherent interest in solving the problem as they find themselves the recipient of electronics "donations" that can be more of a liability than an asset.

Given these points, the challenge was to create a system that could pay for itself, without requiring additional grant funding for sustenance. The question was: "Could the project add enough value to donations through processing, upgrading, and repairing so they could be resold, and have the value of the sale cover costs of labor and recycling expenses, while at the same time assisting Goodwill to achieve its mission?" Goodwill of Southwest Florida determined that the project was not sustainable for maintaining at its Charlotte County stores.

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The processing element of the project added the most value and also required the greatest labor investment. The primary innovation of this project was to create a well-defined, cost effective process for identifying or creating sellable machines (primarily computer systems) out of a stream of equipment donations, while properly recycling items that could not be sold.

Prior to this project the solution was to resell only the few donated machines that would work without repair. All others were disposed, potentially ending up in a landfill or waste-to-energy facility.

The project did well in designing a system for identifying and repairing equipment for resale. Equipment was successfully diverted to the processing facility from different parts of the County. During the project period, all incoming donations were resold or recycled, and no targeted material was disposed in area landfills.

The project was unable to prove full economic sustainability, but analysis indicates that the same system, with proper management and support, could pay for itself if donation levels were kept high enough. To further offset costs, a fee system is necessary. A nominal fee of \$5.00 was charged in the Pilot program. This fee did not cover the cost of recycling all non-recyclable equipment. As presented in Section C-3, note that we only resold 3% of the monitors that were donated, and the average cost of monitor recycling exceeds \$5.00 without handling costs factored in. In considering programs like this applied elsewhere, the fee should be adjusted in amount and scope (i.e., items requiring a fee) to meet shortfalls based on site-specific considerations.

Creating an electronics specialty store was another project goal. The project created a store within a store for electronics retail. The idea was to move computers away from the old cameras and phones, and give them their own display section in a well-trafficked part of the store.



*The side view of the Goodwill retail store located in Englewood, FL (Charlotte County). The Electronics Specialty Retail Area and Reuse/Recycling Processing area was located in this facility.*

Care was taken to keep the display attractive and informational. While the project was able to create a display and sell more computers than before, insufficient marketing

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investment may have been responsible for relatively low sales. Seasonal factors, and prevailing economic conditions, likely played a role as well.

**Program Blueprint**

The County determined that it was important for the results to be easily replicated and the lessons learned to be remembered and clearly conveyed. To that end, a thorough program manual was created to be a program blueprint, a reference document, and a training manual all in one (see Appendix A.)

***C-2. Advanced Technologies***

This project exhibited novel application existing technologies and processes. While non-profits are inundated with discarded electronics and are forced to deal with them (illegally, but perhaps typically, by disposal with trash), this project was the first non-profit/County partnership to manage countywide electronics recycling for both commercial and residential sectors. Additionally, the project focused on reuse of older electronics versus recycling only, by upgrading to minimum standard (such as modem and CD ROM drive), and use of innovative or advanced software to make the computer system ready for consumer purchase in the Goodwill Store.

The extensive system to recover, refurbish, reuse, and recycle electronics is described in the Program Manual, attached as Appendix A. Program results are summarized in Table 5, *Summary of Advanced Technologies*, below:

<b><i>Summary of Advanced Technologies</i></b>		
<b>Advanced Technology</b>	<b>Program Result</b>	<b>Commentary</b>
Establish a sorting, disassembly, refurbishing, and recycling operation.	Operation cost exceeded program revenues.	Low quantities of items increased unit costs, recycle fee was not collected, more advertising and promotion needed.
Establish a technology jobs training program.	Trained five employees. Turnover high.	Funding is needed to keep the training program going.
Establish a retail store (sales area) dedicated to electronics resale.	Increased presence of Electronics for sale. Sales staff resisted training and program maintenance.	Management must promote the Electronics program as part of the store's sale goals.
Create an inventory system using Excel.	We did not utilize on-line function due to low volumes of program and limited Goodwill staffing.	Inventory useful for large volume operations. For small volume operations, a more hands-on system is acceptable.

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<i>Summary of Advanced Technologies</i>		
<b>Advanced Technology</b>	<b>Program Result</b>	<b>Commentary</b>
Build networks among other Goodwill Stores, non-profits, repair shops, and other interested entities.	Was not able to utilize these relationships for distribution of surplus component supplies, due to low quality of donations and limited quantities received. Made several trades of materials.	Building relationships is important and more time invested in this activity would provide for more opportunities. On several occasions “friendly competitors” donated materials that helped us build saleable systems.
Repair/Upgrade TVs and build bridges with private repair stores.	We were unsuccessful in repairing many TVs or building relationships with TV repair shops.	TV repair is a specialty area with limited overlap with skills of computer repair technicians.

**Table 5, Summary of Advanced Technologies**

The project relied heavily on the Internet, an advanced technology, to assist in making used equipment saleable. Computers need the right software to run its hardware. The project technicians used the Internet to download highly specialized device drivers to allow the computers to function. Due to security concerns, the project team opted to reinstall operating systems on computers that were resold. These reinstalls were made possible only by specialized software that was downloaded from the Internet. Electronics pricing and trade information was researched on the Internet.

**C-3. Quantities Recovered**

There is no doubt that the project diverted very toxic materials from the County’s landfill. Electronics equipment can contain toxic metals such as lead, mercury, chromium and cadmium. Monitors and televisions can contain pounds of lead, which may leach into groundwater if disposed improperly. Older TVs can contain PCBs – a known carcinogen.

Table C-3.1 depicts the quantities of electronics recovered during the grant period. The period is broken down by month and categorized into five types of waste described in the key: Central Processing Units (11% of CPUs were resold), TV’s (29% of TV’s received were resold), Monitors or Computer Terminals (3% of monitors were resold), Large Peripherals, and Small Peripherals. Note the inset in Table 6, *Equipment Sales*, indicating the percentage of equipment sold for each type collected.

## Equipment Sales

**KEY:**

CPU = Central processor box  
 TV = Televisions, large and small  
 MT = Monitor or terminal  
 LP = Large peripheral  
 SP = Small peripheral

Category	% Sold
CPU	11.03%
TV	29.09%
MT	3.19%
LP	11.82%
SP	1.65%
<b>TOTAL</b>	<b>8.02%</b>

ProcTotal	SoldTotal
2144	172

Month	Processed				
	CPU	TV	MT	LP	SP
October	NA	NA	NA	NA	NA
November	31	0	54	66	54
December	15	13	17	4	74
January	4	37	30	46	2
February	170	28	29	63	0
March	7	26	31	1	0
April	74	6	28	56	144
May	38	18	57	84	189
June	7	10	7	14	22
July	16	20	57	43	67
August	47	7	56	58	138
September	26	0	10	5	38
<b>GRAND TOTALS</b>	<b>435</b>	<b>165</b>	<b>376</b>	<b>440</b>	<b>728</b>

Month	Sold				
	CPU	TV	MT	LP	SP
October	3	0	0	2	0
November	5	1	1	5	0
December	5	3	2	2	0
January	4	3	4	7	2
February	11	11	0	13	0
March	2	5	0	4	0
April	10	10	0	8	0
May	1	2	0	6	0
June	1	2	0	2	2
July	4	9	1	0	5
August	2	2	4	3	3
September	NA	NA	NA	NA	NA
<b>GRAND TOTALS</b>	<b>48</b>	<b>48</b>	<b>12</b>	<b>52</b>	<b>12</b>

**Table 6, Equipment Sales**

The County diverted 829 items through the Goodwill processing facility, accounting for over a third of all materials processed. These items were collected at County sponsored regular collections in the community, or came from the County’s information technology department. The County paid for recycling services with In-Kind cash contribution to the project. The County participation demonstrated the feasibility of adding a commercial collection component to the program and provided raw materials that produced the resale, and thus reuse, of approximately 83 items, or 10% of the diversion.

This project was also able to create a marketable product out of potentially toxic waste. The project did an excellent job of both identifying good equipment, and recovering reusable equipment when practicable. Over 170 units were resold in an 11 month period, including 48 of which were whole systems. While larger quantities were expected, these amounts are still significant. Goodwill reported that they were selling less computer equipment before the program, so the efforts improved sales.

### ***C-4. Transferability***

The transferability of the program design was a major objective of the project. The Program Manual (Appendix A) is designed to meet this objective.

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The program manual includes transferable elements and documents such as:

- Informational brochures for homes, businesses and other institutions
- Retail FAQ to answer customer questions
- Hiring procedures and interview questions
- List of county electronics shops and other potential generators of e-scrap.
- List of potential FL recycling vendors
- A questionnaire for assessing & eliciting business program participation.

In addition, an “Upgrader Web Site” at [www.recyclesmart.com/upgrader](http://www.recyclesmart.com/upgrader) was launched to help community members make upgrades to their current computer systems in order to extend their useful life. Extending system life reduces total disposal tonnage. People can log on and be taken, step by step, through the process of replacing parts or upgrading software.

### ***C-5. Cost Effectiveness***

Approximately twenty tons of electronics were diverted in this program. Exclusive of start up expenses, program documentation, and grant related efforts, cost of this diversion, was approximately \$21,000. Sales and recycling fee revenues were approximately \$11,500. Therefore, the net cost of the pilot recycling program was approximately \$500 per ton (\$0.25 per lb.), which is consistent with the cost of other electronics recycling programs.

The \$21,000 budget accounts for the salary paid to the Goodwill electronics repair technician and fees paid for recycling of un-saleable equipment. One way to look at this is that the program revenues (sales and donor fees) covered the cost of the extra employee and the Innovative Grant funding paid for the recycling fees. To continue the program in this manner, Goodwill must identify funding the deficit of approximately \$8,000 to \$10,000 per year for recycling fees.

The Innovative Recycling Grant funded many of the training, equipment, and outreach elements of the pilot program. To evaluate long-term cost effectiveness, the project team has created a hypothetical “proforma” budget for continuing the program at Goodwill. The proforma takes into account the added operational expenses that were assumed by Goodwill or other project partners as “in-kind” contributions, or otherwise funded through the grant.

The proforma includes estimates for the cost of fully involving staff in the electronics recovery effort. Table 7, *Goodwill Employee Responsibilities and Effort*, include an

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allocation of labor/effort for responsibilities of maintaining, managing and expanding an electronics recycling program. This table identifies the staff position that is involved, the responsibilities of that position as it relates to the electronics reuse and recycling program, and the estimated number of hours per month that the staff would optimally spend on this program.

<b>Goodwill Employee Responsibilities and Effort</b>		
<i>Staff Position</i>	<i>Responsibilities</i>	<i>Hours per month</i>
Store Manager	Manage the overall operation and staff	12
Drop-off Attendants	Manage incoming materials, collect fees, pass out flyers	21
Collection Driver	Collect from other Goodwill stores and business locations	8
Marketing Supervisor	Promote the electronics retail program and solicit business donations	8
Retail Associates	Provide sales and customer support and maintenance of the retail space	28
Register Attendant	Accept fees	4

**Table 7, Goodwill Employee Responsibilities and Effort**

Based on Goodwill salaries, the project team estimates that the cost of Goodwill employee support efforts would be approximately \$ 7,000 annually.

In addition to Goodwill staff commitment, the project team believes that training and technical assistance is necessary to maintain a viable operation. A Trainer would consult on a quarterly basis to provide a 12-hour course for new hires. The trainer would cost approximately \$3,000 per year. An Expert Technician would assist with troubleshooting twice a month to keep the Goodwill technicians trained and responsive to market trends. The technician would cost approximately \$3,000 per year.

The proforma also includes Non-Labor Expenses, such as recycling fees, truck expense, advertising, equipment lease/purchase/maintenance, Internet access, cleaning supplies, miscellaneous supplies, and an allocation for rent.

The proforma program budget is presented in Table 8, *Proforma Program Budget*.

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<b>Proforma Program Budget</b>					
<b>Labor Expenses</b>	hours/ month	hourly rate	monthly	annual	NOTES
<b>Collection Labor</b>					
Trailer Attendant	21	\$ 5.50	\$ 116	\$ 1,386	1 hour per day
Business Collection Driver	8	5.50	44	528	1 collection per week, 2 hrs per collection
<b>Processing Labor</b>					
Technician	128	8.00	1,024	12,288	32 hrs/wk determined by Goodwill
<b>Retail &amp; Mgmt. Labor</b>					
Store Manager	12	15.00	180	2,160	5 min/hr to supervise technician @ 32hrs/wk
Marketing Manager	8	8.00	64	768	2 half days each month to prep & deliver ads, etc.
Retail Maintenance	12	5.00	60	720	clean spaces, keep supplied & functioning
Sales & Customer Support	16	5.00	80	960	answer questions, register, upselling
Register Attendant	4	8.00	32	384	1 hour a week to ring up electronics sales
<b>Consultant Labor</b>					
Trainer	4	60.00	240	2,880	12.5 hrs for training new hires 4 times per year
Expert Technician	10	25.00	250	3,000	10 hrs/month to provide ongoing training
<b>Labor subtotal</b>			<b>\$ 2,090</b>	<b>\$ 25,074</b>	
<b>NonLabor Expenses</b>					
			monthly	annual	NOTES
<b>Continuing Costs</b>					
Recycling Fees			\$ 773	\$ 8,504	6 pickups in 11 months:
Truck Rental			100	1,200	1 collection/wk @ 25\$ per
Truck Fuel			40	480	1 collection/wk @ \$10 per
Advertising			100	1,200	2 classifieds per month
Pallet Jack Lease			85	1,020	for recycling
Compressor Lease			38	456	for cleaning
Rent (1000 sq. ft. )			500	6,000	\$6 per sqft., per year
Internet ISP			15	180	for downloads and reserch
Misc supplies			40	480	Cleaning, shrink wrap, etc.
<b>NonLabor SubTotal</b>			<b>\$ 1,691</b>	<b>\$ 20,294</b>	
<b>TOTAL BUDGET</b>			<b>\$ 3,780.63</b>	<b>\$ 45,368</b>	

**Table 8, Proforma Program Budget**

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This budget includes line items for Goodwill salaries, training by consultants, and non-labor expenses. With these other costs factored in, we estimate a minimum total program cost of approximately \$45,000 per year. Because many of these expenses have operational impacts on the host organization, this proforma budget should be considered closer to the actual cost of operation.

Applying this proforma budget to actual revenues, the deficit increases between the program revenues and program costs. A program cost of \$45,500, less program revenues of \$11,500 equals a program cost of \$34,000 or about \$1,700 per ton.

The project team believes that the program deficit should be the basis for calculating the processing fee assessed in the program. For example, if a program estimates that it will accept 1,000 monitors and TV's over the course of a year, and the annual program cost deficit is \$30,000 then the fee for TV's and monitors must be set at \$30 per unit processed. In order for the program to succeed economically, this processing fee would be paid by the generator or the County partner, otherwise the cost is absorbed by the non-profit partner.

**Innovative Grant Budget Summary and In-Kind**

The overall budget was decreased from the original request of \$200,000 to \$171,644 expended during the grant period. This is primarily because of the problems encountered with diverting the planned quantity of electronics. Therefore, over \$19,000 of the grant funds designated for recycling electronics were not spent. Additionally, several tasks were accomplished with less cost than originally budgeted.

The total In-Kind support for the project was \$86,607, this was also less than originally anticipated, primarily due to less processing labor donated. Additionally, IMPAC University was not requested to complete an analysis of the program and this in-kind was not realized. In-kind support contributed to the program included: labor by Goodwill Industries of Southwest Florida, Charlotte County Government, and Resource Management Group, Inc. Additionally, Goodwill did not charge lease fees to the project and contributed materials and supplies to the processing operation. Finally, recycling fees were collected from a number of commercial contributions to the program, and these fees are counted as in-kind to the project.

Ongoing support and maintenance of the Electronics Upgrader web-site will be provided for a period of three years by Resource Management Group, Inc.

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## Conclusions and Recommendations

After a year and a half of pilot program development, operation, and evaluation, the project team still believes that partnering with a local non-profit for collection and processing and focusing on reuse/resale of usable components is a valid strategy for small and medium sized counties to recycle discarded electronics.

We have identified several obstacles to implementing a successful program. These challenges can be overcome with the following activities:

- Obtain a consistent and high-quality stream of electronics.
- Provide business collection services.
- Advertise the program, both recycling and retail.
- Set retail pricing to sell systems quickly.
- Charge processing fee appropriately to offset program costs.
- Use the program as a technology training program, and assume there will be staff turnover as trained individuals seek higher paying jobs.
- Train retail associates to be part of the program.

As a policy objective, it is important for the State of Florida and local governments to create legal or economic incentives to motivate residents and businesses recycle electronics appropriately. Currently, there is no enforcement.

In this project, the program experienced lower than expected diversion and sales. The reason for this low diversion may simply be a factor of Charlotte County's demographics or additional electronics are being discarded, but not captured by either Goodwill or the County's household hazardous waste collection days. The reason for lower than expected sales may be a marketing issue that needs to be addressed by the host organization, or economic issue unrelated to the project.

The project team also considers that a non-profit with a mission devoted to technology reuse and distribution might be a better fit for an Electronics Recovery, Reuse, and Recycling Project. For example, an organization dedicated to addressing issues of digital divide and technological equity would have as part of its mission, the goal of placing technology in the hands of people who would not otherwise have access to it. This approach could expand the revenue scenario and allow the organization to be compensated for public education and technology transfer, while our program was dependent solely on store purchases for revenue.

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Finally, the project was able to create two excellent resources:

- The *Program Manual*, includes start-up, procedural, and operational guidance for organizations considering programs to reuse and recycle electronics.
- The online Computer Upgrader, [www.recyclesmart.com/upgrader](http://www.recyclesmart.com/upgrader), offers residents the opportunity to evaluate if their older electronics might be upgraded instead of discarded, and instruction on how to self-perform several upgrade techniques.

These resources document and communicate the essential lessons learned in this project so that other communities and Florida residents may benefit from this project.