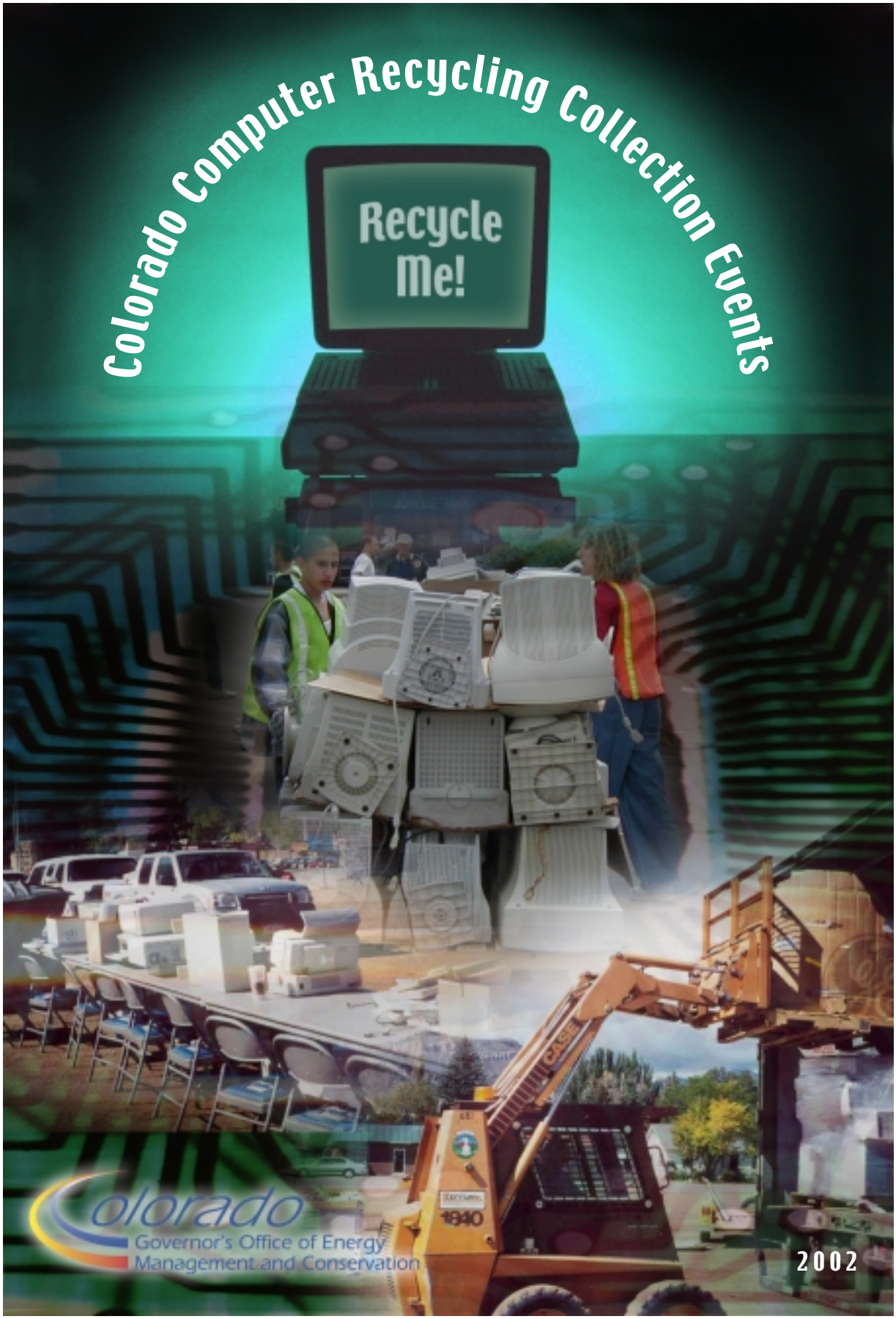
Colorado Computer Recycling Collection Events
Recycle Me!
Colorado
Governor's Office of Energy Management and Conservation
2002

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Executive Summary

In response to the national attention focused on hazardous chemicals in computers and electronics equipment, OEMC formed a task force to study and investigate methods of proper disposal and demanufacturing of electronics waste. OEMC wanted to help citizens and businesses understand the implications of a growing hazardous waste stream and its impact on state and local government's ability to keep this waste out of Colorado landfills. To do this, OEMC and the Computer and Electronics Task Force examined market conditions, infrastructure needs and community interest.

As an outcome, the Task Force recommended that OEMC sponsor a series of one-day computer collection events for residents and small businesses around the state. Fifteen events were held over a period of four months collecting 300,000 pounds of unwanted computer equipment. OEMC's goals in these collection events were to increase awareness of this growing waste stream and its probable hazards, and to divert as much material as possible to recycling instead of landfills.

Data were collected about the events' participants, the expenses involved in hosting an event, the outreach utilized by each community and the various factors that affected participation rates such as, recycling awareness in general and community support. Each community organized their event differently, using a variety of volunteer labor resources, partners and advertising strategies. The communities leveraged local resources that best suited their geographic regions. Approximately 1,000 households and 200 small businesses and local governments participated.

In order to alleviate the financial risk for communities willing to host a pilot event, OEMC partially subsidized the costs of the events, covering some logistical costs and all recycling costs. Fees were charged to participants to offset the overall cost. OEMC helped establish vendor relationships between vendors and local communities and identified the gaps in infrastructure and funding needs in these communities.

OEMC will continue to work with state leaders and government officials to address the proper handling of these hazardous materials and to identify ways to increase the recycling and re-use of electronics waste generated in Colorado.

Background

In the fall of 1999 The Governor's Office of Energy Management and Conservation, (OEMC) initiated a task force to look into the issues surrounding the potentially hazardous nature of computer and electronic equipment, and the safe disposal of these materials. Representatives from a variety of organizations were asked to participate including, recyclers, large and small waste haulers, scrap metal dealers, manufactures, retailers and government officials. This group met monthly for one year to share their expertise in the growing field of waste electronics scrap. The Computer and Electronics Recycling Task Force was charged with identifying the size of the problem for Colorado and recommending a map for future infrastructure development in the state.

At the inception of the Task Force there was a national dialogue underway to look at toxicity issues and the impacts of hazardous materials in computer components, most specifically the lead found in Cathode Ray Tubes (CRT's). The Task Force closely followed the national discussions and accepted the findings of the University of Florida's research which demonstrated that computer monitors, when crushed, did not pass the EPA TCLP test[1], thereby creating a hazardous waste. Based on this finding the Task Force moved forward to quantify the problem for the state of Colorado and its landfills.

To determine the size of the problem, the Task Force estimated the average number of personal computers found in households in Colorado and the rates at which computer components become obsolete. It was determined that as of 2001 there were approximately 1.6 million computers in Colorado homes. With the assumption that household computers become obsolete every four years, it was estimated that approximately 600,000 computers were ready for disposal or re-use. This is expected to climb to as many as 1,000,000 computers per year by 2005. In 2001, it was noted that many of these obsolete computers are stored in basements or garages, a fraction of them are donated and the remainder thrown away.[2] In addition to home computers, OEMC estimates that there could be upwards of 2.1 million computers currently in use in Colorado businesses. All of this equipment contributes to the growing concern that if this equipment is thrown away instead of recycled over 7,000 pounds of lead could enter our state's landfills.[3]

Next, the Task Force focused on infrastructure for collecting the materials, and on the economics of end markets. During the year that the Task Force met, end markets for raw materials and older equipment were in a state of flux. Precious metal prices fluctuated and the overseas shipment of monitors and other electronics were increasingly subject to scrutiny in the industry. Profitability and environmental concerns were going head-to-head in discussions all across the world. Asian countries were paying significant amounts of money for both working and non-working equipment that US recyclers were shipping abroad. This made collecting the equipment in the US more profitable. However, highly publicized stories about environmental hazards to Chinese workers and the Chinese environment raised public concern. This caused exports to slow down

[1] Toxicity Characteristic Leaching Procedure – See Appendix C for definition
[2] See Appendix D – "Calculating Colorado's Household Scrap Computer Generation Rate" prepare by Gracestone Inc. for OEMC, April 2001; updated November 2002.
[3] See Appendix E – "Calculating Colorado's Number of Business Computers in Use," prepared by Gracestone Inc. for OEMC, April 2001; updated November 2002.

having a negative impact on U.S recycling and demanufacturing companies. For further information on overseas electronics issues see www.svtc.org

Despite fluctuations in market prices and export concerns, interest in electronics recycling within Colorado was increasing. During 2000 – 2001, when the Task Force was meeting, most of the electronics recycling activity for individual computer owners was taking place on the Front Range. There were fewer than five major players who were holding collection events in the communities of Boulder, Denver and Fort Collins and Colorado Springs at that time. Moreover, only a handful of private companies working in Colorado would collect non-working equipment from residents. However, since that time, market development has matured and in the metro area there are at least 25 firms that offer computer recycling or re-use opportunities.

Market development has occurred in part to answer increased demand from businesses for electronics recycling. Being that electronics components can be considered hazardous waste, the Colorado Hazardous Waste Commission adopted the Universal Waste Rule for electronics equipment in June of 2001. This rule provides a set of hazardous waste management standards that reduce the regulatory burden on facilities that generate these wastes and encourage recycling.

Task Force Recommendations

The Task Force recommended that OEMC sponsor a series of regional computer collection events and education activities to increase statewide infrastructure development. The Task Force had a budget of $75,000 supplied by the OEMC, and it agreed to divide the money between collection events and an education campaign. Of the available budget $58,781 was spent by OEMC on the regional collection events.

OEMC had two goals in mind when it designed its series of collection events, as recommended by the Task Force.

1. To collect as much material as possible, and
2. To gather information about the recycling infrastructure in diverse regions

A community collection event is defined as a one-day recycling event that is coordinated by local community members to collect unwanted computer equipment. An easily accessible area of town is selected and residents drive to the site to drop off their computers. The events usually last four to five hours and are generally held on weekends. In most cases, the events are staffed by volunteers. Municipalities may also hold events and staff them with employees. Organizers decide whether or not to charge fees and those fees can vary depending on the region and sponsoring communities.

Community Selection

OEMC issued a solicitation to select the communities in which the collection events would occur the solicitation encouraged smaller rural towns and regions to respond. A subcommittee of the Task Force reviewed the submittals and selected twelve cities and regional areas to participate. The outcome of the selection yielded a broad geographical representation of communities. Mountain resort areas, Western Slope agricultural communities, rural eastern plains and one

metropolitan region were chosen. It was felt that this diversity would facilitate the understanding of recycling economics and sustainability in a range of communities, some of them distant, hard-to-reach areas. In the competitive evaluation, points were also awarded for community partnerships, ability to provide additional funding and a vision for long term sustainability of electronics recycling.

In addition to the twelve selected communities, OEMC helped support three Front Range collection events that were already in the planning process and had financial support from other co-sponsors. These events were held in Fort Collins, Colorado Springs and Louisville. Of the 357,126 pounds collected at the fifteen events, 140,000 pounds were generated by these three Front Range events.

Vendor Selection

OEMC held a competitive bid process and selected two vendors to provide collection and recycling services to all the communities. Waste Not Recycling of Pierce Colorado, and Recycle America Asset Recovery Group (Waste Management's division handling electronics recycling) were selected based on price and disposal methods.

Electronics recyclers offer a variety of options for recycling from total destruction for security reasons to a high rate of refurbishment and re-use. OEMC and the Task Force wanted to hire vendors that could provide strong environmental assurances that equipment was being processed in an environmentally sound manner. Included in the appendix is a list of criteria OEMC used to select the participating vendors.

Waste Not Recycling is a long-standing, full-service recycling company based in Northern Colorado. They process over a million pounds of electronic equipment per year and have a staff of 33. For the OEMC contract they used UNICOR, the federal prison labor system, to process all collected equipment. The CPU's, printers and all miscellaneous materials are demanufactured to be recycled for precious metals, plastic and scrap metal content. Monitors are a disassembled and the leaded glass is recycled back into CRTs. UNICOR processing facilities are located in Federal prisons around the country. All the material collected in Colorado was shipped out of state for processing.

Recycle America Alliance eCycling Services provides electronic recycling services throughout the US. They process several million pounds annually. All their material collected in Colorado was sent to Phoenix, Arizona, where it was demanufactured and processed according to strict environmental policies. The CRT glass from the monitors they collect, after demanufacturing at their facility, are sent to either Doe Run, a lead smelter in Missouri, or to EnviroCycle in Pennsylvania, for glass-to-glass recycling. Some material, after being processed at Recycle America Alliance's plants, is shipped overseas for recycling in Recycle America Alliance audited facilities. Recycle America was able to provide OEMC assurances that the material being sent to foreign processing plants would be managed in an environmentally sound manner.

Both vendors provided excellent customer service and were flexible enough to meet the diverse needs of communities far from any major markets. Per the contract with OEMC, the vendors

provided trucks and staff to oversee each event. The communities were happy with the level of service and expertise the vendors provided. For ten of the twelve communities this was the first time they had sponsored a collection event of this magnitude. The expertise of the vendors was needed and appreciated.

A vendor can provide many levels of service. Communities wanting to hold collection events in the future should consider what type of service they need. Some vendors will host the entire event, and offer the organizing entity a turnkey approach. This approach provides the advertising, staffs the event, and provides all logistical supplies, as well as handles the transportation and material processing. Other options include picking up a load on a one-time or periodic basis from a single site. For the OEMC collection events we utilized a partner approach where the vendor supplied what was needed by the local community, based on the local community needs. OEMC was fortunate to have responsive and reputable vendors to partner with on this large statewide project.

Community Collection Events

Each community selected to participate in OEMC's collection events was given a grant of $2,000-5,000 and asked to attend a full-day training session put on by Task Force members. Hands-on demonstrations were given about how to handle the equipment, media materials were distributed and organizers were given EPA-sponsored "How To" manuals. This training session was critical to the smooth-running success of all the local events.

The grant money allocated to each community was to be used for costs related to putting on the event. The allocations were made based on population and need. It was assumed that it would be difficult for a municipal or non-profit organization to support the costs of a first-time collection event. In all cases, the logistical grant was needed to offset the costs associated with hosting an event. Communities spent the money on everything from advertising to refreshments for the volunteers. Most grantees felt that this amount was more than adequate and it was agreed that any funds unspent after the event would be used for future electronics recycling projects. A further discussion and table of individual community expenditures follows on page 12.

Below is a description of each community selected and a brief synopsis of their event. There were six non-profit organizations and six county governmental organizations selected to host events. Events were held in June, July, August and September of 2002. They are listed by region in chronological order of the event date.

Roaring Fork Valley

The Roaring Fork Valley's collection event was served by a coalition of municipalities, county governments and non-profit organizations. It was run by Valley Resource Management, a regional non-profit recycling organization. The population of the area served was just over 30,000. This group pulled together a large number of governmental and non-governmental partners for a multi-site event. Due to the number of miles between each participating community, a "milk run" was set up to collect from each site on the day of the event. This was the first event where such a strategy was attempted and it was very successful. The partners included the towns of Glenwood Springs, Basalt, Carbondale, the Pitkin County Landfill, and the non-profit

organizations Kids 4 Community, and the CRT Recycle Project. The Re-use partners were able to recycle a large amount of equipment that had been collected in the region prior to the event and they were also able to take equipment that would be re-used and redistributed in the communities.

32,357 pounds collected – 292 participants served

Eagle County
Eagle County covers the I-70 Corridor from Vail to Gypsum, and has a population of 41,000. This event was hosted by the county landfill. The Eagle County Landfill partnered with two non-profit organizations, Eagle Valley Alliance for Sustainability and Eagle Valley Community Fund, to hold two events, one on a Friday morning and one all day on the following Saturday. The two events were held in different locations to optimize participation since the Eagle Valley is a widely dispersed area. Eagle Valley Community Fund collected re-useable computers for distribution to local low income households. Participation for this event was lower than expected. It is unclear as to exactly why since there was widespread advertising and significant local support. The demographics of a resort town like Vail may suggest a lower rate of personal computers in homes given the high number of vacation homes.

8,260 pounds collected – 53 participants served

Southeast East Central
The event held in the south eastern plains of Colorado covered five communities with a total population of 87,154 and 39,200 miles of territory, making it the largest geographic area, with the lowest population density served. It was sponsored by a regional recycling association, Southeast East Central Recycling Association. The participating communities were Lamar, La Junta, Limon, Burlington. This event was particularly successful because it built on recycling infrastructure that was already in place. The sponsor, SEEC provided a regional pickup (milk run) on the day after the collection event occurred in each outlying community and aggregated it in one central location in Lamar for pickup several days after the individual collection events.

45,650 pounds collected – 172 participants served

Elbert County
Elbert County Public Health Department hosted the computer collection event at the Elbert County fair grounds. It was the first event of this kind the county has supported. Elbert County worked in conjunction with Southeast East Central Recycling Association (SEEC). They did not charge any fees to participants. They did, however, ask for donations. They collected $96 and felt that people would have willingly paid a set fee had they chosen to charge fees. They hoped to leverage their learning's from the computer collection event into successful household hazardous waste events and perhaps more computer collection events in the future.

4,680 pounds collected – 32 participants served

Pueblo County
Pueblo County Environmental Pride Association a non-profit arm of Pueblo County Health Department held its event over a two day period. They had many local partners, including Staples Inc. , where the event was held. Labor was provided by Pueblo County Inmate Labor. While the event was well coordinated and well located, the turnout was significantly below projections. During the event a local re-use organization, SEEDS Youth Outreach, took a lot of older equipment to use in their refurbishment program, this may have contributed to the low number of pounds collected. Also, Pueblo has very little recycling infrastructure and no community recycling leadership. The coordinators were positive about the outcome noting that for a first-time event they considered it a success!

3,763 pounds collected – 38 participants served

Steamboat Springs
Steamboat Springs is a mountain resort community with an affluent population. Its event was coordinated by a volunteer organization that works on recycling issues for the area, Yampa Valley Recycles. Yampa Valley Recycles partnered with the city, county and local businesses to co-sponsor a well attended, well coordinated event that garnered a large participation rate from the local population. Schools and businesses also participated in large numbers. The Northwest Chapter of GIVES Inc was able to participate as a re-use/recycling partner collecting sixty computers for refurbishment. It is hoped that this business will be able to support computer recycling in the area in between potential collection events. Participation exceeded estimates; this is likely due to a high awareness of recycling issues in the community in general.

39,960 pounds collected – 180 participants served

Summit County
Summit Recycling Project serves the towns of Frisco, Silverthorne, Breckenridge, Dillon and parts of Park and Lake Counties. This event was the second computer recycling event hosted by Summit Recycling Project. It is interesting to note that they did not see a significant decline in the amount of material collected for the second year, speaking to the increasing demand for computer recycling services. Because they had experience in hosting a collection event, OEMC selected them to collect televisions as well as computers. They collected 41 television sets, for a fee of $15 each. Further discussion of television collections can be found on page 16.

36,140 pounds collected – 150 participants served

Grand County
This event was held in the town of Granby and hosted by Grand Recycles the local non profit recycling organization. Grand County is a large rural county with a population of 12,000. Grand Recycles mailed a flyer to all county residents announcing the collection event and other recycling services in the area. The Northwest Chapter of GIVES Inc. participated as the re-use partner and received 55 of the computers collected. Gives Inc. refurbishes and redistributes equipment to individuals and non profits that are not able to afford them otherwise. The event had a strong turnout, especially given the low population density of the area.

6,681 pounds collected – 67 participants served

City of Montrose
The event held in Montrose was organized by city staff and was modeled after their household hazardous waste collection events. They combined resources with Delta and San Miguel counties for advertising and organizing support. The three events were held on two consecutive weekends to give residents the chance to drop any one of the three locations. The local junior high school computer club provided volunteers for the day. In exchange they took equipment to be used in their computer refurbishment and rebuilding program that distributes computers to students in need. Organizers expected a much larger turnout rate. While it is difficult to determine the cause, it is possible that their results were spread out over the three county area.

5,509 pounds collected – 90 participants served

Delta County
The event was held in the town of Delta. It was coordinated by the county commissioner and city staff. The turn out was lower than expected due to several large events happening in the region that day and a low level of awareness about recycling in the region.

4,309 pounds collected – participant count not supplied by community.

San Miguel County
This event was held in the town of Telluride and was coordinated by the Environmental Health Department of the county. With a population of just over 7,000, San Miguel County was the smallest population center served. They partnered with a local business to collect any reusable components for refurbished computers. The staffing of the event was entirely provided by the county, there were no volunteers involved. The city and county brought their used computer equipment and were given significant discounts on their fees in exchange for their in-kind contributions to the event. This is an innovative way to gain local government support.

8,486 pounds collected – 36 participants served

Southwest Region, Cities of Durango and Cortez
The San Juan Basin Recycling Association is a five county organization with members in nine communities including the Southern Ute Tribe. The bulk of the event coordination was contributed by City of Durango's recycling program. There were simultaneous events in the towns of Durango, Cortez and Ignacio. It was a combined "milk run" and "collect and aggregate" event. The equipment collected in Ignacio was brought to Durango and aggregated there. The truck then went to Cortez to pick up the equipment collected at that site. Per the organizer in Cortez after their 6,000 pounds had been loaded "there was no more room to put anything else in the truck".

26,862 pounds collected – 217 participants served

Table 1. Results by Region

Community	Pounds Collected	Participants* Served
Valley Resource Management, Roaring Fork Valley	32,357	292
Southeast-East Central Recycling Assoc.	45,650	168
Elbert County, Kiowa	4.680	36
Eagle County Landfill, Vail	8,260	53
Pueblo City-County, Health Dept.	3,763	38
Yampa Valley Recycles, Steamboat Springs	25,120	180
Summit Recycling Project, Summit County	25,509	142
Grand Recycles, Grand County	3,910	65
Montrose City and County	5,745	90
Delta County	4,309	n/a
San Miguel County, Telluride	8,486	36
San Juan Basin Recycling Assoc., Durango & Cortez	26,551	137

*These figures include schools, local governments and small businesses

Participation Rates

Table 2 outlines the actual participation rates by community. OEMC used a formula (see example below) to calculate projected participation rates and make budget plans. As you will see, even with our low projected participation at 1.2% of households, our estimation was high. In retrospect we recognize that participation rates can be affected by things like weather, competing local events, minimal municipal support, poor advertising, or just a low level of awareness about recycling in a given community. National participation rates are documented to be 1.5% to 2% of the population. Participation in the majority of OEMC events was less than 1% of possible households. While it is difficult to identify the reasons for a lower-than-average turnout rate, it is likely that the rural nature of most of the communities is the reason for a lower-than-average turnout rate. The national numbers are based on collection events held in the northeast area of the country, where population density is considerably higher.

Table 2. Participation Rates

	Population (number of households in region)	Pounds Collected	Number of Participants	*Participation Rate**
Roaring Fork Valley	27,432	32,357	292	*1.06%*
Eagle County	22,111	8,260	53	*0.24%*
Southeast East Central	38,449	44,702	172	*0.44%*
Elbert County	7,113	4,680	32	*0.45%*
Pueblo	58,926	3,763	38	*0.06%*
Steamboat Springs	11,217	39,960	180	*1.60%*
Summit County	24,201	36,140	150	*0.62%*
Grand County	10,894	6,681	67	*0.62%*
Montrose	14,202	5,509	90	*0.63%*
Delta	12,374	3,992	n/a	*n/a*
Telluride San Miguel County	5,197	8,486	36	*0.69%*
Durango, Cortez	39,299	26,862	217	*0.52%*
TOTALS	**271,415**	**216,711**	**1,317**	

*These figures can only be considered approximate as the number of participants at many events was boosted by non-residential contributors (e.g., schools) which could not be reliably subtracted from the totals.

Understanding projected participation rates helps organizers to plan for things such as: number of volunteers needed; amount of supplies to order, traffic plans or site locations; and budgeting for recycling costs as participation rates can be translated into estimates of pounds of material to be collected.

Example *Participation Rates Estimation Formula used by OEMC*

Number of Households	1.2% participation rate	# Households x 94 pounds
70,000	840 households	78,960 pounds

94 pounds is an average based on data collected in Boulder County at three pilot collection events in 2001.[4] A "carload" or household on average will bring in three pieces of equipment weighing approximately 94 pounds. While OEMC used this number for planning purposes it does not reflect the outcome of the statewide events. The pounds per household were substantially higher due to the participation of schools and local governments in OEMC's events, averaging 166 pounds per household.

In the budgeting process OEMC over anticipated individual household participation and under anticipated pounds per participant and institutional participation.

OEMC and the contracted vendors agreed to take electronic waste from local governments and schools that brought material to the collection events, even though that was not part of the vendor solicitation or the original task force design for these events. During the planning stages it became apparent that there was a great need for collecting equipment from these sectors. Government organizations in the local communities heard about the upcoming collection events and were anxious to participate. OEMC allowed the vendors to serve local governments and a few larger businesses at the market rate and utilize OEMC sponsored transportation. OEMC felt this was justified because in most cases there were not any local providers (electronics recycling vendors) to service these organizations. It is hoped, however, that local recyclers will emerge and be able to provide professional pickup services to institutions and large businesses in rural Colorado in the future.

Expenses

The following four categories of expenses were shared by the communities and OEMC. Most of the logistical expenses were covered by the grants given to the communities up front.

1. Logistical supplies, such as stretch wrap, clip boards, safety equipment, packaging materials (if not supplied by the vendor), food for volunteers and signage.
2. Labor, whether donated, in-kind, or paid staff.
3. Advertising, OEMC saw a wide range of advertising tactics from expensive mass mailings to free on-air promotion by local radio stations. Advertising is the largest contributing factor to the variance of event costs listed below. Those areas with high event costs spent more on advertising. They did not however get a larger turn out than those events with less "paid-for" advertising.
4. Recycling fees paid to vendors will range greatly depending on the level of service provided by the vendor and geographic area being served.

With the exception of the Southeast region, geographic location did not affect the costs incurred by the communities. Due to the large number of square miles and towns covered by Southeast East Central events, SEEC incurred larger transportation and supply costs.

[4] EcoCycle Electronics Recycling and Demanufacturing Project Final Report, see www.state.co.us\oemc.

Table 3. Event Cost by Community

Community	Event Costs Incurred by Community	In-Kind Contributions
Roaring Fork Valley	$2,605	n/a*
Eagle County	$1,658	$620
Southeast East Central: Limon, Lamar, La Junta Burlington,	$6,229**	$10,632
Elbert County	$849	$3,255
Pueblo	$1,264	n/a
Steamboat Springs	$2,286	$1,562***
Summit County	$1,018	$1,200
Grand County	$3,296	$1,400
Montrose	$3,038	$2,619
Delta	Data not available	
Telluride	$1,109	n/a
Durango,Cortez	$2,269	n/a

* In-kind contributions were not reported by all communities.
** This represents four regional events combined
*** This figure does not include $4,272 of reported volunteer time.

Average event expenditure without recycling costs, without in-kind contributions and with SEEC subtracted from the list is $1,939. (SEEC expenses are not representative of the overall average and were therefore removed from the calculation of averages). The average increases to $3,800 when in-kind contributions are added in. Most of the in-kind contributions are labor contributions by city, county or volunteer staff.

In-kind contributions offset a large portion of "expense" for the communities hosting an event. The biggest type of in-kind contribution was labor, both staff labor from municipalities and volunteer labor. Other significant in-kind contributions came in the form of large equipment like forklifts and trash-hauling trucks and drivers. The average expenditure of $3,058 includes volunteer time which is not a true "cost" unless you have to pay city or county staff for labor you could not get through volunteers.

Press Coverage

In addition to paid or "free" advertising, all the communities received some press coverage, and most had articles both before and after the event. OEMC provided publicity assistance including press release creation, distribution and media outreach. A summary of all press articles received is included in the appendix.

Pricing

Recycling fees or "processing fees" are determined by the amount of equipment collected. Vendors usually charge a per-pound price or a per-unit price or sometimes a combination of both. Price structures can vary based on anticipated quantities. OEMC received a quantity pricing break at 10,000 pounds. Budgeting for recycling expenses can be difficult given the potential for unexpected success or lower than anticipated turnout rates. For example, inclement weather could impact participation drastically. Or, as in the case in Steamboat Springs, a neighboring school district brought an unanticipated truckload of obsolete equipment.

OEMC paid the following rates per pound of equipment type collected. Six of the events collected less than 10,000 pounds and were subject to higher pricing per pound.

Table 4. Pricing Rates

	Monitors	**CPU**	**Laptop**	**Mice & Keyboards**	**TV's**	**Other**
Vendor A						
< 10,000 lbs	.35	.25	.10	.35	.35	.35
> 10,000 lbs	.28	.28	.10	.28	.28	.28
Vendor B*						
<10,000 lbs	.47	.19	.19	.76	.45	
>10,000 lbs	.41	.12	.12	.31	.39	

*Prices were averaged over four regional areas. Regional prices varied depending on geographic location of communities.

Recycling fees charged around the country average $.25 per pound for monitors. Some recyclers may pay up to $.02 per pound for CPU's without transportation. The OEMC rates are higher because they include transportation and embedded event support costs. Fees will also vary depending on geographic locations, end markets and vendor labor costs.

OEMC paid $54,000 for recycling 187,469* pounds of material at a net average cost of .28/pound. This is in line with national prices.

*This number represents what OEMC paid for, there were additional pounds collected that were paid for by schools, local governments and large businesses.

Revenues/Fees

It is generally understood that recycling costs money and consumers need to understand the economics of hazardous material disposal issues, especially if future State or Federal regulations are likely. OEMC believes that fees must be charged to residents for computer recycling if recycling the material is to be economical and sustainable – or some other method of paying for the collections must be instituted. While we did not make collection fees mandatory, we did strongly suggest that communities consider charging fees for all materials collected. This would not only reduce the financial burden for OEMC but would serve to communicate the message that "recycling costs money" and that sustainability is not an easy thing to achieve; especially without some direct charge to the participating public or to the manufacturing and retail sectors or both.

There was only one regional area that did not charge fees. Southeast East Central Recycling felt that its constituency would not be able to pay, or if the association did charge fees participation would be significantly reduced. SEEC is a regional recycling association which already charges fees for recycling services to the towns it serves; they did not feel they could add additional charges to these communities. OEMC negotiated a transportation agreement whereby SEEC agreed to pay transportation costs to offset the reduction in fee revenue that other communities were contributing.

Of all the factors affecting the financial success of an event, fees are the most critical. As shown in the charts below, those communities that charged higher fees came very close to "breaking even." While it is not entirely feasible to say that if you charge high enough fees you can cover all your costs, communities have the opportunity to make events as cost-effective as possible. Monitors are the most expensive material to process for recycling (and the heaviest to ship), and thus are the highest-priced commodity when collected from the residential electronics waste stream.

Currently in the Denver Metro area, recycling companies are charging anywhere from $14 to $25 to collect and recycle a single monitor. At that rate, the subsidization by OEMC for these collection events was anywhere from $10 to $15 per monitor collected. That percentage of subsidization is clearly not sustainable. However, it was not the intent of these events to find a clear route to sustainability, but rather to gauge the interest in recycling electronics, the ability of the collection infrastructure to respond and the education opportunities generated by the event for the event sponsors and participants.

Table 5. Fee Rates by the Piece

Rate	Monitors	CPU's	Laptops	Printers
High	$ 8.00 to 10.00	$ 5.00	$ 5.00	$ 5.00
Medium	$ 5.00	$ 3.00	$ 3.00	$ 3.00
Low	$ 3.00	$ 2.00	$ 2.00	$ 0

Table 6. Regional Pricing and Event Expenditures

Community	Pounds Collected	Recycling Cost	Grant Award	OEMC Direct Cost	Fees Collected *Revenue*	Total OEMC Cost	Price Per Pound
Roaring Fork Valley (low fees)	32,357	$13,456	$5,000	$18,456	$3,896	$14,560	.44
Eagle County (medium)	8,260	4,333	2,000	6,333	1,256	5,077	.62
Southeast East Central (no fees)	44,702	8,496	4,200	12,696	0	11,196	.34*
Elbert County (no fees)	4,680		1,977	1,977	96**		
Pueblo (low)	3,763	1,142	4,000	5,142	460	4,682	1.24
Steamboat Springs (medium)	25,120*	7,033	2,000	9,033	6,448	2,585	.20
Summit County (high)	24,509*	6,862	1,913	8,775	2,244	6,531	.27
Grand County (high)	6,681	1,490	2,000	3,490	1,438	2,052	.22
Montrose (medium)	5,509	2,416	2,000	4,416	944	3,472	.63
Delta (medium)	3,991	1,137	2,000	3,137	458	2,679	.67
Telluride (medium)	8,486	1,551	2,000	3,551	1,259	2,292	.27
Durango (high)	26,862	6,086	5,000	11,086	9,312	1,774	.07

* Does not include pounds collected and paid for by businesses and institutions.

As these data show, there is considerable variety in the economics of an event based on community decisions governing fees, sponsorships, advertising and vendors. Indeed, those communities that charged fees in the "high" range were much closer to breaking even on expenditures than those that did not. The three issues that affected the cost incurred by OEMC are

1. Fees: Were participants charged or not?
2. Vendor prices: Higher prices were paid for regions that were distant from any major transportation centers. Higher prices were paid for lower quantities collected as well. (see pricing Table 4)
3. Population: Population served determined the level of grant award

Televisions

Televisions are a considerable concern given the size of their CRT tubes and the quantity of televisions per household. Summit Recycling Project collected televisions sets as a pilot test during their computer collection event. They charged $15 per TV and did not allow large console TV's. Summit County found that TV's are much harder to stack for transport given that their sizes have much greater variability than those of computer monitors. This means fewer pallets or "stacks" per truck, as monitors are generally stacked five to six high and loaded on to pallets which are then packed into semi trailers. This translates to higher transportation costs as you can get fewer TV stacks per truckload than monitor stacks. TV's also pose greater injury risk to volunteer and staff as they are heavier and bulkier than most computer components. Through this pilot project, Summit Recycling Project has determined that their community will continue to ask for television recycling and they are currently trying to figure out how to include televisions in upcoming collection events they host. The problem will be the added expense that collecting televisions adds to the overall cost of hosting an event. Television recycling will be increasingly important as new technologies that force rapid TV replacement enter the market place.

Survey Outcomes

OEMC required each community to survey their event participants on issues surrounding the collection of computer equipment. The survey also served a dual purpose of providing easy-to-count records of participants and fees. Accurate surveys and counts were crucial to OEMC to oversee a large statewide event.

The following charts are a compilation of the survey questions asked at each event. This data is not statistically reliable and is intended only to be anecdotal information. Not all communities asked all questions, and not all participants filled out surveys. The communities were given a template survey, which they could edit and add questions that suited their region. In some outlying areas surveys were not used, likely due to a lack of supervision or training at these sites.

Table 7. Survey Results

Does your equipment come from home or business?

Residential	75%
Business*	25%

* Defined as any entity other than an individual household.

What is the status of your computer?

Working	71%
Non working	39%
Pentium working	4%
Pentium not working	22%

It is interesting to note that most of the equipment turned in was described as "still working but not useable" by its owner, most likely due to outdated software/hardware, or other incompatibilities.

What is the most convenient way for you to recycle electronics?

Recycling Center	71%
Retail Store	8%
Mail to Manufacturer	1%
Collection Event	17%
Curbside Pick up	2%
Donation/Resale store	1%

Only two communities asked the above question. One of which had its event sponsored by the local recycling center.

Who should pay to properly dispose of computers?

Consumer/User	35%
Manufacturer	28%
Retailer	1%
Government	3%
Shared between all	38%
Other	4%
Don't know	

The question above was being asked at computer collection events around the country to gauge what direction any national initiatives might take. Colorado responses track with national findings.

One note: it was not apparent to most participants that the event in which they were participating was being heavily subsidized by government funds. Had that been known, respondents may have answered differently – recognizing that without the subsidy, the community organizers would have to charge significantly higher fees.

Project Sustainability

Education on the issues of electronics waste as hazardous waste will be the focus of OEMC's future activities. In Colorado, the infrastructure for electronics recycling is still in its infancy for the outlying areas of the state. There are a small number of vendors who serve the larger population centers on the Western Slope and highly populated mountain towns, though most communities will have to rely on collection strategies such as one day events to service the needs of their residents. Most of the communities that participated in the OEMC collection events in 2002 have said that in order to hold an event in 2003, or the near future, they would need to look for substantial outside funding. It is not likely that OEMC will be funding more collection events in 2003. Funding will have to come from local sponsors, local governments and other fundraising efforts. Several communities are considering hosting events every couple of years, citing the significant effort and cost required for an annual collection event. Some have considered combining electronics and computer collections with annual household hazardous waste round ups. This is currently being done in Louisville. As was seen in the experience of Summit County, demand does not drop from year to year, so communities hosting events on a two year basis could potentially see a high participation rate and large amounts of material

collected. Training events similar to the one held in 2002 may be provided if enough interest is generated from local communities.

Current Activities

The 2001 Colorado legislature passed HB1106, which created the Cathode Ray Tube Recycling Pilot Program. The legislature allocated funds to the Colorado Department of Public Health and Environment for a two-year project beginning in 2002. These funds came from the Colorado Commission on Higher Education Advanced Technology grant fund. The goals of the project are to develop educational materials for all generators of scrap CRTs; to develop further the local CRT recycling infrastructure; and to work to improve state government's practices of computer recycling. The legislation provides minimal funding and includes fundraising as a component of the expected outcomes. For this reason, OEMC hopes to work with CDPHE in developing outreach materials and leveraging the work and knowledge of both organizations. Several members of the Task Force serve on an advisory committee to CDPHE.

Conclusion

Although the participation rates were lower than expected, the overall outcome of the state- wide collection events is considered a success by OEMC. Many strides were taken in educating the public about the issues surrounding outdated electronics equipment. Communities are better informed about the costs to collect and recycle equipment on a local scale, and the state has a growing body of professionals who understand the issues and are supporting market development and infrastructure growth. Fees collected from the participants minimized the cost burden to OEMC. The biggest lesson from these events for OEMC has been that with good planning and reasonable fees charged to residents, communities can budget for similar events in the future. The challenge for each community will be two fold: they will need to find ways to educate their community about the necessity of recycling electronics and they will need to develop relationships with vendors who can collect and process the equipment generated in each community.

OEMC would like to thank all the community co-sponsors who dedicated so much time and effort to this project. Many, many hours of learning and hard work went in to each event and the efforts of everyone involved should be applauded.

Appendix A

Computer and Electronics Recycling Task Force Policy Statement

The Colorado Governor's Office of Energy Management and Conservation Computer and Electronics Task Force supports long-term sustainable solutions to electronics waste management issues that;

Incorporate responsibilities for environmental stewardship and waste diversion by all stakeholders, while pressing for progress in aspects of product stewardship and design for the environment. We seek solutions that leverage the interest, fiscal contributions, involvement and collaboration of multiple stakeholders.

It is our goal to assist and educate the consumers and small businesses of Colorado in the value of recycling and re-use of electronic equipment. In this process we hope to promote and support local markets.

Task Force Members

Linda Case, Larimer County Dept. of Natural Resources

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Chris Hoofnagel, Pitkin County Resource Recovery

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Appendix B

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Appendix C

Toxicity Characteristic Leaching Procedure Test Definition

"The TCLP test is performed on a representative sample of a waste and is intended to simulate the conditions in the landfill as if the waste had been land disposed. This procedure creates a liquid leachate that is similar to the liquid expected to be found in the ground near a landfill containing the same waste. Once the leachate is created in the lab, a waste handler must determine whether it contains any of the 39 different toxic chemicals above specified regulatory levels. If the leachate sample contains a sufficient concentration of one or more of the specified chemicals, the waste exhibits the toxicity characteristic and carries the waste code(s) associated with the compound(s) or element(s) which exceeded the regulatory limit. EPA used groundwater modeling studies and toxicity data for a number of common toxic compounds and elements to set these threshold concentration levels. Much of the toxicity data were originally developed under the Safe Drinking Water Act."

Kathy Hotovec, Environmental Protection Specialist
Compliance Assistance and Technical Support Unit, Hazardous Materials and Waste Management Division, Colorado Dept of Public Health and Environment

Appendix D

Calculating Colorado's Scrap Computer Generation Rate

1. *How many scrap computers (rendered obsolete by original owner) are being generated in Colorado?*

These shipments are to homes and businesses, and exclude larger mainframe systems.

National						Colorado				
forecasted unit shipments [1]	actual unit shipments	estimated no. obsolete [2] ave 2.2 yrs lifespan	estimated no. obsolete ave 4 yrs lifespan [3]	*Appliance* mag units to be replaced [3]	Estimated no. recycled [7]	forecasted unit shipments	estimated no. obsolete 2.2 yr lifespan	4 yr lifespan	Estimated no. recycled [7]	% recycled per year [7]
42,600,000	47,058,000	23,800,000	13,090,000		2,700,000	651,780	364,140	200,277	41,310	20.6%
54,273,000		31,600,000	17,380,000	6,485,000	3,200,000	830,377	483,480	265,914	48,960	18.4%
63,480,000	44,000,000	41,900,000	23,045,000	6,485,000	3,800,000	673,200	641,070	352,589	58,140	16.5%
74,252,000		55,400,000	30,470,000		4,800,000	1,136,056	847,620	466,191	73,440	15.8%
87,238,000		63,300,000	34,815,000		6,000,000	1,334,741	968,490	532,670	91,800	17.2%
102,643,000		61,100,000	33,605,000		7,600,000	1,570,438	934,830	514,157	116,280	22.6%

Population Colorado [4]	U.S. [4]	percentage
4,301,261	281,421,906	1.53%

2. *How many scrap computers are generated by Colorado households and then recycled ?*

Assuming an average computer lifespan in a HH of 4 years. A "computer" = CPU, CRT & keyboard.

% of HHs w/ PCs [5], [8] [12]	# households in CO [6], [9], [12]	# of PCs in HHs	obsolescent PCs	weight in tons [10]	tons of lead in these PCs [11]	% recycled per year [7]	# recycled per year
8.0%	1,282,489	102,599					
19.0%	1,318,666	250,547					
25.0%	1,354,843	338,711					
37.0%	1,391,020	514,677					
40.0%	1,427,197	570,879					
39.6%	1,463,374	579,496	102,599	2,052	333		
40.1%	1,499,551	601,320	250,547	5,011	814		
40.0%	1,535,728	614,291	338,711	6,774	1,101		
44.0%	1,571,905	691,638	514,677	10,294	1,673		
54.0%	1,608,081	868,364	570,879	11,418	1,855	20.6%	117,752
64.0%	*1,659,000*	*1,061,760*	579,496	11,590	1,883	18.4%	106,697
64.0%	*1,659,000*	*1,061,760*	601,320	12,026	1,954	16.5%	99,155
64.0%	*1,659,000*	*1,061,760*	614,291	12,286	1,996	15.8%	96,771
64.0%	*1,659,000*	*1,061,760*	691,638	13,833	2,248	17.2%	119,197
64.0%	*1,659,000*	*1,061,760*	868,364	17,367	2,822	22.6%	196,386
			1,061,760	21,235	3,451	*25.0%*	*265,440*
			1,061,760	21,235	3,451	*29.0%*	*307,910*
			1,061,760	21,235	3,451	*30.0%*	*318,528*

Note: Italics are author's extrapolation based on the model.

SOURCES

[1] All numbers in this column are forecasts from *Appliance* magazine. The numbers for 1999 are from 1998 forecasts; the rest are from "Predicting the Landing: 2001 APPLIANCE Statistical Forecast (for Selected Products)" Diane Richey, Appliance, January 2001. These are all shipments going to homes & businesses, and exclude mainframe systems.

[2] numbers in green: "Electronic Product Recovery and Recycling Baseline Report: Recycling of Selected Electronic products in the United States," National Safety Council's Environmetnal Health Center, May, 1999. Note that these numbers are based on the NSC obsolescence rate based on unit shipment and average lifespan projections made in early 1999.

[3] "The Life Expenctancy/Replacement Picture: Business Appliances/Personal Computers" *Appliance* magazine, Dana Chase Publications, 9/00, p. 89.

[4] "Population Change and Distribution:1990 to 2000," Census 2000 Brief, Marc Perry & Paul Mackun, April 2001, C2KBR/01-2, U.S. Dept of Commerce, Economics and Statistics Administration, U.S. Census Bureau, p. 2.

[5] "23rd Annual Portrait of the U.S. Appliance Industry: 2000," The Saturation Picture, Consumer Electronics, Home Computers *Appliance* magazine, Dana Chase Publications, January 2001.

[6] "Household and Family Characteristics: 1990, United States -- Region, Division, and States, U.S. Census Bureau; and note [4] source for 2000 estimate of number of households in Colorado.

[7] "Electronic Product Recovery and Recycling Baseline Report: Recycling of Selected Electronic products in the United States," National Safety Council's Environmetnal Health Center, May, 1999. "Fig. 17: Forecast of U.S. PC CPU Shipments, Obsolescence, and Recycling, 1997-2005.

4.5

[8] See "West Coast Cities Among Most Wired in U.S.," Michael Pastore, CyberAtlas, April 3, 2001, showing Denver having 63.2% of households in March 2001 wired for Internet use (up from 47.3% in March 2000), at http://cyberatlas.Internet.com/big_picture/geographics, accessed 4/6/01.

[9] "Estimates of Population and Households of Colorado Counties and Municipalities, 7/1/99 (Final, 10/14/00)" CO Demographics Section, Dept. of Local Affairs. Accessed from http://www.dola.state.co.us/demog/estimates.htm. 4/11/01.

[10] Estimate 40 lbs. per computer, as defined.

[11] Oak Ridge National Labs estimates 5-8 lbs. of lead per CRT.

[12] Household penetration rate from "A NATION ONLINE: How Americans Are Expanding Their Use of the Internet," Washington, D.C., February 2002, Nat'l Technical Iinformation Administration and the Economics and Statistics Administration.

Appendix E

Calculating Colorado's Number of Business Computers in Use

Table 1 Number of Colorado Businesses with PC's *

# of computers in the business/industry/of	1-50	51-200	201-500	501-700	701-1000
Agriculture, Forestry, Fishing	7,294	32	1	0	1
Mining	1,445	38	5	0	0
Construction	25,407	158	12	1	0
Manufacturing	10,526	328	77	5	7
Transportation, Communications, Utilities	8,208	224	53	9	9
Wholesale Trade	11,469	109	14	1	0
Retail Trade	36,792	648	60	5	4
Finance, Insurance, Real Estate	21,869	181	32	1	5
Services	90,535	1,345	174	32	14
Public Administration	1,493	244	60	8	9

* Dun & Bradstreet source. PC is defined as a monitor, keyboard, and a CPU.

Table 2 Number of PC's averaged

	Number of PCs in each of these business size categories					Total by Industry	Weight in tons [2]	Tons of lead in these PCs [3]
	10	*120*	*300*	*575*	*800*			
Agriculture, Forestry, Fishing	*72,940*	*3,840*	*300*	*0*	*800*	*77,880*	*1,558*	*253*
Mining	*14,450*	*380*	*50*	*0*	*0*	*14,880*	*298*	*48*
Construction	*254,070*	*1,580*	*120*	*10*	*0*	*255,780*	*5,116*	*831*
Manufacturing	*105,260*	*3,280*	*770*	*50*	*70*	*109,430*	*2,189*	*356*
Transportation, Communications, Utilities	*82,080*	*2,240*	*530*	*90*	*90*	*85,030*	*1,701*	*276*
Wholesale Trade	*114,690*	*1,090*	*140*	*10*	*0*	*115,930*	*2,319*	*377*
Retail Trade	*367,920*	*6,480*	*600*	*50*	*40*	*375,090*	*7,502*	*1,219*
Finance, Insurance, Real Estate	*218,690*	*1,810*	*320*	*10*	*50*	*220,880*	*4,418*	*718*
Services	*905,350*	*13,450*	*1,740*	*320*	*140*	*921,000*	*18,420*	*2,993*
Public Administration	*14,930*	*2,440*	*600*	*80*	*90*	*18,140*	*363*	*59*
Totals	*2,150,380*	*36,590*	*5,170*	*620*	*1,280*	***2,194,040***	*43,881*	*7,131*

[1] Based on a moderate assumptions as to how many computers would be in each business category.
[2] Estimate 40 lbs. per PC, as defined.
[3] Oak Ridge National Labs estimates 5-8 lbs. of lead per CRT.

Appendix F
Recycling Vendor Selection Criteria

EVALUATION CRITERIA: The Evaluation Committee will judge the merit of proposals received in accordance with the criteria described in Section III, Statement of Work and the attachment "Response Sheet" with the following possible scores.

Section	Maximum Points
Experience Previous experience in recycling of electronic waste	15
End Markets Percent of end markets that are recycle, re-use or overseas. OEMC's goal is to re-use or recycle the highest percentage possible with minimum use of overseas markets.	45
Price	30
Availability and Flexibility Number and staging of trucks available for materials transport and storage capacity if needed. Number of employees able to be on site, flexibility in storage and shipping options.	10
Total Points	**100**

Appendix G

Computer Recycling and Collection Events 2002
Media Coverage

Publication	Date	Location	Title, Reporter
KDVR-Fox 31	April 24	Capitol: Governor Signs Proclamation	Mention & Graphic of OEMC
Denver Business Journal & Online	April 26	Capitol	"Computer Recycling Seminars Set"
Front Range Techbiz Magazine & Online	April 26	Capitol	"State Announces Computer-Recycling Program"
Lamar Daily News	April 26	Lamar	"Recycle Computers On June 8"
Summit Daily News & Online	April 28	Capitol	"Governor's Office Support Computer Recycling"
Delta County Independent	May 7	Capitol	"Project to Recycle Computers Progress"
Denver Daily News	April 25	Capitol	"Owens Announces Recycling 'Tour'"
E-Scrap News	May	Capitol	"Coordinated Statewide Events Become More Common"
Front Range Tech Biz	May 10	Louisville	"Louisville Holds Computer-Recycling Event"
Computer Edge	May 17	Capitol	"Fifteen Computer Recycling Events Scheduled"
Post Independent	May 20	Valley Resource Management (VRM): Basalt, Carbondale, Glenwood Springs & Pitkin County	"Here's Your Chance to Save That Old Computer From the Landfill"
The Fence Post	May 24	SE & EC: Burlington, Kiowa, La Junta, Lamar and Limon	"Recycle Your Computers"
Aspen Daily	May 27	VRM	"Valley to Recycle Computers"
The Tribune-Democrat	May 29	SE & EC	"Old Computers to be Collected, Recycled"
Ranchland	May 30	SE & EC	"Kiowa, Limon Among Computer Recycling Sites"
Montrose Daily Press	May 29	Capitol	"Montrose Chosen to Be Computer Recycling Site"
Lamar Daily News	June 6	SE & EC	"Computer Collection Event"
Elbert County News	June 6	SE & EC	"Residents Can Recycle"
Delta Post Independent	June 6	Montrose & Delta Counties	"Recycling Prediction Did Not Compute"
Eagle Valley Enterprise	June 6	Eagle County: Vail & Eagle	"Computer Recycling Collection Events"
The Limon Leader	June 6	SE & EC	"Recycle Your Computers"
The Burlington Record	June 6	SE & EC	"SE & ECRA and OEMC are Sponsoring Computer Recycling

Appendix G

Computer Recycling and Collection Events 2002
Media Coverage

			Collection Event Saturday"
Eagle County Enterprise	June 6	Eagle County	"Computer Recycling Available"
Steamboat Pilot & Today	June 6	Yampa Valley: Steamboat Springs	"Roundup Day Set to Safely Dispose of Computers"
Lamar Daily News	June 13	SE & EC	"Computer Recycling Set for June 8"
Lamar Daily News	June 9	SE & EC	"Computer Collection Event at Fairgrounds a Huge Success"
Greeley Tribune	June 16	SE & EC	"Weld Must Get Serious About Reusing Recycling Programs"
KOAA_TV	June 21	Pueblo	"Eyewitness News at 10"
KKTV-TV	June 21	Pueblo	"11 News Tonight"
South Routt Now	June 26	Steamboat Springs	"Computer Recycling Day July 27 in Steamboat Springs"
Middle Park Times	July 2	Grand County	"Old Computers Finally Have Place to go" By Tracy Ross
Winter Park Manifest	July 3	Grand County	"Computer Recycling Day Set Aug 3"By Tracy Ross
Vail Daily	July 5	Eagle County	"Locals Recycle to Reduce Environmental Damage"
Front Range Tech Biz	July 5	All Front Range	"A Few Web Resources for Electronics Recycling"
Trader	July 10	Steamboat Springs	"Computer Recycling Day"
Summit Daily News	July 25	Summit County	"Electronics Recycling Events Set"
Steamboat Today & Online	July 26	Steamboat Springs	"Computer Roundup Saturday"
Steamboat Today	July 27	Steamboat Springs	"Happenings"
Steamboat Today	July 29	Steamboat Springs	"Recycling Efforts Targets Computers"
Ten Mile Times	August 7	Summit County	"Computer Recycling Collections Almost Double Last Year's Tonnage"
Cortez Journal	September 19	Montezuma & La Plata Counties	"Computer Recycling Event Planned at Landfill"
Durango Herald	Week of Sept 23	Montezuma & La Plata Counties	Event Briefs
Delta County Independent	September 11	Delta, Montrose, San Miguel	"One-Day Computer Recycling Collection Event Set for Saturday, Sept. 21, in Delta"
The Norwood Post	September 4	Delta, Montrose, San Miguel	"County Hosts One-Day Computer Recycling Event"
Yampa Valley Recycles Web site	September	Steamboat Springs	Pre & Post Event information and photos
High Country News	Summer	Capitol	Online Calendar of Events listing for VRM & all other

Appendix G

Computer Recycling and Collection Events 2002
Media Coverage

			collection sites
Recycling Today	Summer	Capitol	Online resource for 15 collection event information
Montrose Daily Press	September 16	Delta, Montrose, San Miguel	Photo of Joe Aho, Waste Management, "Monitoring the Situation"
Telluride Daily Planet	September 24	Telluride	Environmental Brief" Computers On Route to Recycling"
e-scrap Newsletter	October	All sites	Specific site collection charges listed

Press Materials & Outreach:
Each recycling event had a localized press release, media alert and advertisement/flyer for media and community outreach. Also, there will be a final press release that will summarize the findings of the computer recycling and collection events.

Colorado Department of Public Health and Environment

Compliance Bulletin
Hazardous Waste
Management of Electronics Waste

Why Regulate Electronics Waste?

Many electronic devices contain individual components made with hazardous constituents, primarily heavy metals. Cathode ray tubes (CRTs) found in color televisions and color computer monitors contain significant amounts of lead. Printed circuit boards and complex circuitry found in computers and other electronic devices may contain lead, chromium, and silver. In addition to this, some older computers contain mercury switches, and many kinds of electronic devices contain batteries including nickel-cadmium, lithium, or sealed lead acid. Used electronics are a Resource Conservation and Recovery Act (RCRA) hazardous waste if: 1) the used electronic equipment is no longer useable and has been determined to be a waste; 2) the material exhibits the characteristic of toxicity; and 3) the used electronic equipment originated from non-residential sources such as businesses, academic institutions, or government agencies.

Which electronic devices are not regulated as hazardous waste?

Households are exempt from the Colorado Hazardous Waste Regulations and associated RCRA requirements. "Household" includes single-family homes, apartment complexes, hotels and motels, retirement homes, bunkhouses, ranger stations, crew quarters, picnic areas, campgrounds, and day-use recreation areas.

Households are encouraged to recycle their used electronics, but they are not required to do so and may choose to dispose of this waste in the municipal solid waste stream. Because households can dispose of their used electronic equipment in the regular trash, used electronics generated from residential sources are considered to be a waste when the resident decides to dispose of it. Therefore, when a recycler accepts used electronics from residential sources, they are managing an exempt solid waste. Useful equipment and useful parts taken from this equipment may have value and can be resold as a commodity. Equipment and components that have no resale value are still considered exempt residential solid wastes, even when managed by a recycler. However, since the recycler's stated purpose in accepting these wastes is to recycle them, it is anticipated that even the non-working equipment will be recycled in some manner.

It is important for recyclers to be able to distinguish residential electronics waste from equipment accepted from non-residential sources since these materials have very different regulatory requirements. Wastes from these two sources should be managed separately by the recycler and normal business records should be maintained that document the source of each piece of equipment. Alternatively, the recycler can commingle electronics from residential and non-residential sources, but then all of the equipment must be managed as though it originated from non-residential sources.

Only electronic wastes determined to be hazardous waste are subject to the hazardous waste regulations. Cathode ray tubes (CRTs) associated with monochrome monitors and black & white televisions do not tend to fail the toxicity test for lead and are generally not considered hazardous waste. These CRTs may be managed as solid waste. Electronic wastes from non-residential sources that **are not hazardous** may be disposed of in a properly managed municipal solid waste landfill or sent to a legitimate recycler. Landfills and recyclers may impose their own restrictions to regulate incoming wastes in accordance with local rules or company guidelines. Consult the landfill operator or recycler regarding their requirements.

Which electronic devices are regulated as hazardous waste?

Non-residential sources that send their color monitors, color televisions, or other electronic devices for disposal are considered the generator of the waste and must follow regulatory requirements regarding proper waste management and disposal. Colorado regulations prohibit non-residential sources from disposing of any hazardous wastes in solid waste landfills.

Used electronic equipment and components removed from electronic equipment would be regulated as RCRA hazardous wastes if the material exhibits the

characteristic of toxicity. This is determined by using the Toxicity Characteristic Leaching Procedure (TCLP) test. If the extract from a representative sample of the waste contains one or more of the eight toxicity characteristic metals at a concentration greater than or equal to the maximum contaminant concentration for that metal, the waste would be hazardous waste. For example, wastes exhibiting the toxicity characteristic for lead (TCLP ≥ 5.0 ppm lead) would carry the hazardous waste code D008.

The most recent data available demonstrates that waste cathode ray tubes (CRTs) from color monitors and color televisions consistently exceed the regulatory limit for lead when tested using the TCLP. Due to their weight and size, CRTs comprise a significant portion of the overall monitor or television and will cause the entire unit to be considered hazardous waste. As a result, it should be assumed that non-residential color monitors and color TVs that are destined for disposal are hazardous waste unless the generator has tested their equipment to show that it is not hazardous or has other supporting data from the manufacturer.

With the exception of color monitors and televisions, there is very little information available to make general statements about the hazardous characteristics of intact electronic devices. Certain electronic components have been shown to frequently fail the toxicity test for metals. Electronic devices that contain a high proportion of components that fail the toxicity test should be assumed to be hazardous unless specific information is available to show otherwise. The regulatory status of each device or component will depend on its specific characteristics and how each item is disposed or recycled.

To make a hazardous waste determination, the generator must have information on possible hazardous constituents and their quantities in the waste. With electronic wastes, the generator may have little direct process knowledge on which to make a hazardous waste determination. The generator, however, may base the determination on data obtained from the manufacturer, other generators, or industry studies.

What if the electronics are recycled?

Non-residential sources that send their color monitors, color televisions, or other electronic equipment for recycling are not considered generators of a waste. In this case, electronic equipment destined for recycling is not considered a waste until it is determined if the unit can be resold, repaired, refurbished, used for parts to repair or refurbish other equipment, etc. Typically, the decision on whether a piece of electronic equipment or a component removed from electronic equipment is a waste or not is made by one or more recyclers. The recycler determines whether the unit can be resold, donated, or otherwise repaired or refurbished as a useable item. The recycler may also dismantle the equipment to directly reuse or sell parts from the device. In fact, it is not until the recycler determines that the equipment and/or its components are no longer useable that a waste is generated. In this case, the recycler is considered to be the generator of the waste and is responsible for proper waste characterization and management.

Because the recycler determines whether or not an electronic device or component is a waste, they must maintain documentation that describes how recycling is occurring and that demonstrates that an appropriate waste determination has been made either by them or by a subsequent recycler.

How should electronic equipment and components determined to be hazardous waste be managed?

Electronic equipment and components removed from electronic equipment determined to be hazardous wastes can either be managed in full compliance with the Colorado Hazardous Waste Regulations [*6 CCR 1007-3*] Parts 260-268, 99 and 100, or they can be managed in compliance with the reduced requirements of the Universal Waste Rule in Part 273. The Universal Waste Rule provides an alternative set of reduced management standards that the generator can follow instead of the full hazardous waste requirements. This rule was designed to reduce the regulatory burden on facilities that generate these wastes while at the same time reducing the amount of hazardous waste items illegally sent to municipal solid waste landfills.

What are Universal Wastes?

The Universal Waste Rule [*Colorado Hazardous Waste Regulations 6 CCR 1007-3 Part 273*] includes certain hazardous wastes that are commonly generated by very small to very large non-residential sources such as businesses, governmental agencies, and schools. Universal wastes are subject to wide spread use, which makes disposal of these hazardous wastes difficult to control.

Universal Wastes include many:

- batteries
- pesticides
- mercury-containing devices
- mercury-containing lighting wastes
- aerosol cans
- electronic devices and components

Materials included as universal wastes are regulated under the Resource Conservation and Recovery Act (RCRA) and have been required to be handled as hazardous wastes since the early 1980s. In the past, if these wastes were determined to be a hazardous waste, small and large quantity generators of hazardous waste needed to manage them in full compliance with the hazardous waste regulations, including labeling, employee training, manifest requirements, and restrictive time limits. [*6 CCR 1007-3 Parts 260 - 268, 99, 100*]

Why manage waste electronics as universal waste?

Managing hazardous electronics waste as universal wastes is most beneficial to small and large quantity generators of hazardous waste, or conditionally exempt small quantity generators that would otherwise be small quantity generators if they did not manage some of their wastes as universal wastes. The primary benefits of choosing the reduced management standards of the universal waste rule are that the waste does not count toward the monthly total of hazardous waste in determining generator category; the waste can be shipped without a hazardous waste manifest; the waste can be shipped by common carrier instead of a hazardous waste transporter; there are reduced notification and record-keeping requirements, and the storage time limits are less restrictive. Because universal waste does not require a hazardous waste manifest for shipment in Colorado, it is not considered hazardous waste under US Department of Transportation regulations, though other regulations may apply. State requirements for universal waste transporters are included in 6 CCR 1007-3 Part 273 Subpart D.

What are the requirements for universal waste management?

Categories of Universal Waste Handlers

Under the Universal Waste Rule, persons who generate or accumulate waste electronic devices and components are considered "handlers" of universal waste. [*6 CCR 1007-3 Section 273.9*] [Note: this definition is different from that of a **generator** of hazardous waste].

There are two categories of handlers, Small Quantity Handlers of Universal Waste and Large Quantity Handlers of Universal Waste. A small quantity handler of universal waste is one who does not accumulate more than 5,000 kilograms of total universal at any one time. A large quantity handler of universal waste is a handler of universal waste who accumulates 5,000 kilograms or more of total universal waste. [*6 CCR 1007-3 Section 273.9*] The designation of small quantity or large quantity handler of universal waste has no relationship to a facility's hazardous waste **generator** status. Thus a small quantity generator of hazardous waste may be a large quantity handler of universal waste, and a facility that is a large quantity generator of hazardous waste may be a small quantity handler of universal waste.

If, at any time during a calendar year, a facility exceeds the quantities for a small quantity handler of universal waste, they would be considered a large quantity handler until the next calendar year when they can reevaluate their status. [*6 CCR 1007-3 Section 273.9*]

Labeling

When a universal waste is generated, it must be labeled as either "Waste *(material type*)," "Used *(material type)*" or "Universal Waste *(material type)*." For example, waste electronics that are managed as a universal waste must be labeled as "Waste Electronics," "Used Electronics," or "Universal Waste Electronics." If the device or component is placed into an accumulation container, only the accumulation container needs to be labeled as containing waste electronics, not the individual devices or components within it. If the electronic device or components are not in good condition or are broken, they must be placed in a closed packing container that is properly labeled and capable of preventing leakage or releases of hazardous constituents to the environment under reasonably foreseeable conditions. [6 CCR 1007-3 Sections 273.14, 273.34] If the accumulation container is not in good condition, it must be over-packed, or the electronic device must be removed and put into a container that is in good condition.

Accumulation of Waste

Universal waste handlers are required to manage their waste in a manner that prevents releases of the waste or waste constituents. [*6 CCR 1007-3 Sections 273.13, 273.33*] There is a one year accumulation time limit, and handlers must be able to demonstrate that universal waste on-site has not been accumulated for more than one year. [*6 CCR 1007-3 Sections 273.15, 273.35*] Although it is not required to be marked with the accumulation start date, this would be the easiest way to document that the waste is in compliance with the one year accumulation limit.

Shipment of Waste

A universal waste handler cannot dispose of universal waste, and treatment by the handler is not allowed except under limited conditions (see the section on handler treatment). Universal waste can only be shipped to another universal waste handler, a destination facility or a foreign destination. Shipment to another universal waste handler is allowed to aid in consolidation of wastes. A destination facility is a facility that is permitted to treat, dispose, or recycle the waste. [*6 CCR 1007-3 Section 273.9*]

Shipment of universal waste in Colorado does not require the use of the hazardous waste manifest system. Therefore, universal waste is not considered hazardous waste under US DOT regulations. Some universal wastes are regulated by the US DOT as hazardous materials because they meet criteria for one or more hazard classes, but the word "waste" may not be used in the shipping name. [*6 CCR 1007-3 Section 273.52*]

Other states may have different requirements for wastes that are managed as universal waste in Colorado. The handler should always confirm the regulatory status of universal wastes in the destination state and in all intervening states the waste will travel through.

Notification

Small quantity handlers of universal waste are not required to notify the Division of their universal waste management activities. [*6 CCR 1007-3 Section 273.12*] Large quantity handlers of universal waste are required to notify the Division of their universal waste management activities and obtain an EPA identification number using EPA Form 8700-12. [*6 CCR 1007-3 Section 273.32*] This must be done even if the facility has previously given notification and received an EPA identification number for its hazardous waste activities. The EPA identification number will remain the same.

Employee Training

Small quantity handlers of universal waste are required to inform all employees who manage universal waste about the proper handling and emergency procedures appropriate to the types of universal waste at the facility. [*6 CCR 1007-3 Section 273.16*] Large quantity handlers of universal waste are required to ensure that personnel are thoroughly familiar with the requirements for universal waste management and emergency response relative to their level of responsibilities in dealing with the waste. [*6 CCR 1007-3 Section 273.36]*

Spills

All handlers of universal waste are required to immediately containerize and appropriately manage any spills or residues from releases of universal wastes. [*6 CCR 1007-3 Sections 273.17(a), 273.37(a)*] The waste generated from a release of universal waste would be considered newly generated waste, and a hazardous waste determination would need to be made. If it is determined that any or all of the released material or residue is hazardous, it must be managed in accordance with the hazardous waste regulations and not the universal waste requirements. [*6 CCR 1007-3 Sections 273.17(b), 273.37(b)*] The handler of the universal waste at the time of the release would be the generator of the newly generated hazardous waste and must adhere to all applicable requirements of the Colorado hazardous waste regulations.

Record Keeping Requirements

A small quantity handler of universal waste is not required to maintain records. [*6 CCR 1007-3 Section 273.19*] However, it is strongly advisable to keep adequate records to document waste management practices and substantiate the facility's universal waste handler status.

A large quantity handler of universal waste must keep written records for universal wastes shipped to and from it's facilities. These records must be kept for at least three years and include: the types and quantities of universal waste shipped or received, the date the waste was shipped or received, and to whom the waste

was shipped. [*6 CCR 1007-3 Section 273.39*]] There is no requirement to maintain formal training records for either category.

Transporters of universal waste are required to keep records in accordance with US DOT requirements. A destination facility is subject to all applicable requirements of 6 CCR 1007-3 Parts 264-268, 99 & 100. If the destination facility recycles the universal waste without storing it, they need only notify the Department of their activity under 6 CCR 1007-3 Part 99 and keep records of each shipment. If the destination facility is a Treatment Storage and Disposal Facility (TSDF), they are required to keep records in accordance with their hazardous waste permit.

Can a universal waste handler treat it's hazardous wastes?

Universal waste handlers can't dispose of universal wastes and treatment by the handler is not allowed except under limited conditions.

Disassembly of universal waste electronic devices is allowed by handlers of universal wastes as long as these activities are conducted in accordance with the requirements of Part 273.13 or 273.33 of the Colorado Hazardous Waste Regulations. Prior to disassembly, a handler must develop and implement a written procedure detailing how to safely disassemble each electronic device managed at the facility. Included in this document must be the type of equipment to be used, operation and maintenance of all equipment and precautions that need to be taken to protect workers. In addition, the document must include a review of the wastes that will be generated from these activities.

Handlers of universal wastes must ensure that the devices are disassembled in a manner that prevents the release of any universal waste or component of universal waste to the environment. Special management procedures necessary to manage the waste properly also need to be evaluated prior to disassembly. Employees must be thoroughly familiar with the procedures for disassembling each electronic device, proper waste handling practices and emergency procedures relevant to their job responsibilities. A spill kit must be readily available in case wastes are spilled during the removal activities. The handler must maintain a system to ensure compliance with the written disassembly and management procedures.

A small or large quantity handler of universal waste who disassembles universal waste electronic devices, or who generates other solid waste as a result of disassembling electronic devices, must determine whether the disassembled device, its components or other solid wastes generated exhibit one or more characteristics of hazardous waste. If the disassembled electronic device or its components exhibit one or more characteristics of hazardous waste, they may continue to be managed as universal wastes. If the disassembled device or its components are not managed as universal waste, then the handler is considered the generator of a newly generated hazardous waste and is subject to all applicable requirements of 6 CCR 1007-3 Parts 260-268, 99 and 100. If other solid wastes generated during disassembly exhibit one or more characteristics of hazardous waste, the handler is considered the generator of the newly generated waste and must comply with all applicable sections of 6 CCR 1007-3 260-268, 99 and 100. If the disassembled devices, its components or other solid wastes generated do not exhibit any characteristics of hazardous waste, the handler may recycle them or dispose of them as solid wastes.

What about Conditionally Exempt Small Quantity Generators (CESQG)?

Conditionally exempt small quantity generators are those that generate less than 100 kilograms (approximately 25 gallons or 250 pounds) of total hazardous waste and no more than one kilogram of acutely hazardous waste per calendar month AND never accumulate more than 1000 kilograms of hazardous waste on site at one time. In Colorado, conditionally exempt generators are not excused from identifying which of their wastes are hazardous wastes and must ensure that their wastes are sent to a facility that is permitted to accept it.

Conditionally exempt small quantity generators may choose to manage their waste electronic devices and components as conditionally exempt wastes or as universal wastes. [*6 CCR 1007-3 Section 273.8*] Because of the reduced management requirements already applicable to conditionally exempt small quantity generators of hazardous waste, it is generally not to their benefit to manage their wastes as universal waste, unless they would otherwise be small quantity generators. Unlike small and large quantity generators of hazardous waste, conditionally exempt generators are not required to notify the State of their

regulated waste activity or to get an EPA identification number. There is no time limit on how long they may store their hazardous waste on site as long as they don't exceed the quantity limits for conditionally exempt small quantity generators, and they may transport their hazardous waste without a hazardous waste manifest under a standard bill of lading.

Conditionally exempt generators may not dispose of their hazardous wastes on site or send them to a solid waste landfill. These wastes must be sent to a permitted hazardous waste treatment, storage or disposal (TSD) facility, sent to a legitimate recycler of the waste, or sent to an out-of-state solid waste disposal facility that is permitted to accept conditionally exempt small quantity generator hazardous wastes.

Note:
There are no solid waste landfills currently permitted to accept conditionally exempt generator hazardous waste for disposal in Colorado, with the partial exception of the Larimer County and Mesa County landfills. These landfills accept mercury-containing lamps and other hazardous wastes from conditionally exempt small quantity generators located in their respective counties in order to assist in consolidation of enough wastes to make it more economic for disposal. The landfills then ensure that all wastes are recycled or disposed of properly, dividing the cost between the generators that contributed to the waste total. They do not actually landfill hazardous wastes at their facilities.

For more information please contact:

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This Compliance Bulletin is intended to provide guidance on the appropriate management of wastes based on Colorado solid and hazardous waste statutes and regulations only. The wastes described in this guidance may also be regulated under other statutes and regulations.

See responsible computer management brochure at
http://www.cdphe.state.co.us/hm/electronicsrecyclingbrochure.asp