

Creating Closed-Loop Economies Through Reuse, Recycling and Bioproduct-
Based Economic Development
Site Assessment Report for The Illinois Valley/Lower Rogue Region, Oregon

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1. INTRODUCTION

This report assesses opportunities for stimulating closed-loop environmentally sound economic development in the Illinois River/Lower Rogue region based on the reuse and recycling of 1) solid and industrial waste materials; and 2) agricultural and forestry biomass waste streams.

Prepared by The Center for Watershed and Community Health (CWCH) and Self Reliance, Inc. (SRI), this assessment focuses on the Josephine and Jackson Counties in the Illinois Valley and is referred to as the Illinois/Lower Rogue River region. This report follows two previous assessments conducted by CWCH and SRI of the potential for closed-loop economic development in Hood River, Wasco and Sherman Counties and the Southern Willamette Valley region.

The collaboration between CWCH and SRI is based on the CWCH's extensive experience in sustainable economic development and conservation, and SRI's extensive experience in waste-based economic development.

The effort is part of a multi-year initiative that seeks to identify the policies and practices required to foster closed-loop waste-based economic development throughout the entire Pacific Northwest.

The principal researchers are Bob Doppelt, Lynda Dowling-Wu and Robin Hawley, of CWCH, and Neil Seldman of SRI.

The researchers used the following methodology in the first phase of this project:

- gather preliminary waste stream data;
- site visits including meetings with government, industry, agriculture, forestry, community and environment leaders to assess existing waste streams, business opportunities and community interests;
- research and analysis exploring technical and business conditions appropriate for unique needs of the area;
- preparation of this draft report;
- feedback from interested parties on the draft;
- final report completion and distribution;
- on-going technical assistance, due diligence, business site specification and financial planning leading to implementation.

Initially, this report is being issued to the Illinois Valley Community Response Team which has voiced an interest in the findings. More than thirty participants from the Illinois/ Lower Rogue River area (including local government officials, community leaders, and business representatives) shared their time, experience and expertise with the research staff in the preparation of this report (see Appendix B).

2. CREATING CLOSED LOOP ECONOMIES THROUGH WASTE-BASED ECONOMIC DEVELOPMENT

Throughout the U.S. our "use and discard" economic system generates many environmental problems. For example, tons of waste are buried or burned daily and the environmentally benign landfill and incineration sites are tapped out. This has forced the use of sensitive sites (e.g. landfills associated with wetlands, dense population, airsheds). Many landfills will continuously leak contaminants as many buried materials include fossil fuels, CFCs and other toxins. Similarly, untold amounts of toxins continue to accumulate in the atmosphere due to incineration. In addition, while we bury or burn tons of materials, we continue to cause extensive environmental damage by extracting more virgin metals, minerals, wood and other resources from our landscapes for use as production feedstocks.

This same system has created a number of economic problems nationwide. For example, the financial burden on households is skyrocketing as disposal tipping fees and taxes increase to maintain sensitive landfills and incinerators. Environmental restoration costs mount while we simultaneously continue the resource extraction and waste disposal practices that cause the problems in the first place. At the same time, thousands of low income people need non-subsidized jobs as government cuts back welfare and social service programs. Many of the materials being buried or burned could be turned into viable products by businesses. However, our current system fails to promote the use of waste as an economic resource, thus exacerbating economic and environmental woes. The source and nature of jobs is, of course, a central issue, since the need is to create jobs that provide livable wages, add value to the community and protect the environment. The approach proposed in our project focuses on communities internalizing jobs derived from the waste stream. The approach of creating jobs and community benefits through the reuse of society's castoffs (waste) is well established. For decades charities have taken donated and discarded clothing, redistributing it to needy member of the community. What differs in our approach is the creation of job generating, self-sufficient businesses based on the value-added reuse and remanufacturing of waste into value-added products and services to meet specific niches in the marketplace.

We have developed a unique approach to Sustainable Community Development within economically distressed rural communities and urban neighborhoods: The job creation through waste-based economic development within Community Development Corporations (CDCs) and other non-profit Community-Based Organizations (CBOs). We believe that waste-based business enterprises can be linked with affordable housing and land and water conservation programs to the benefit of the community and environment. The approach seeks to integrate and leverage jobs, housing and conservation resources for the benefit of all. This a true Sustainable Community Development strategy.

Our Sustainable Community Development approach places CDCs and CBOs at the center of effort to establish long-term jobs, affordable housing and conservation programs

within their community. . CDC/CBOs have long known that affordable housing alone is an inadequate response to the low-income needs of a community. Job creation is also needed to provide rungs on the economic ladder to assure community vitality. Likewise, without affordable housing, low income populations cannot take advantage of many job opportunities. Similarly, conservation interests have come to appreciate the need for viable economies and communities to ensure long-term environmental health. To address these issues, locally generated stable employment is needed to foster environmental and community health. The basic building block, then, to sustainable communities is jobs.

The source and nature of jobs is, of course, a central issue, since the need is to create jobs that provide livable wages, add value to the community and protect the environment. This approach focuses on CDCs/CBOs internalizing jobs derived from the waste stream. The approach of creating jobs and community benefits through the reuse of societies castoffs (waste) is well established. For decades charities have taken donated and discarded clothing, redistributing it to needy members of the community. What differs in our approach is the creation of job generating, self-sufficient businesses based on the value-added reuse and remanufacturing of solid, industrial waste or (agricultural/forestry waste) into value-added products and services to meet specific niches in the marketplace.

Local and regional waste streams offer numerous opportunities for CDCs/CBOs to access materials that can be turned into viable products. Many of these sources are very familiar to the thrift industry, such as clothing, housewares, bedding and appliances. For numerous reasons the private sector has in the last two decades ignored this source of waste as potential marketable products. This is largely due to the high cost of acquiring goods from curbside pickup, the traditional manner for thrifts to acquire goods. Curbside pickup creates high labor costs, and in highly urbanized areas curbside access to remove appliances and other hardgoods has made it difficult to access the materials for the use by thrifts. Yet the need and opportunity to reuse and recycle these items has not diminished. Rather, as the thrift system has abandoned collection of these goods, municipal waste systems have become, by default, the recipients of the materials. This huge waste results in a significant opportunity to collect materials from the waste systems which can be turned into marketable products and services.

3. BACKGROUND ON JOSEPHINE AND JACKSON COUNTY

A. Unemployment, Underemployment and Welfare Reform.

The region suffers from a very high unemployment rate of about 30% in the Illinois Valley with an unemployment rate for 1997 at about 8.8% in Josephine County and 7.6% in Jackson County. These figures are high compared with the State of Oregon's jobless rate which is projected at 5.4%.

There is also high underemployment, although the rate has not been documented. Recently passed welfare reform legislation may make the current employment situation

more difficult, given that former recipients will now have to find employment to maintain their benefits.

B. The Need for Community Cohesion in the Development of Waste-Based Enterprise Development

To the researchers there appears to be little agreement as to the direction the local economy should move or the types and size of businesses the community wants to establish in the area. Divergent views on each of these issues appears strong. In no other community in which the researchers have worked have we experienced the level of personal acrimony for new ideas or proposals as we did in the Illinois Valley. The lack of cohesion may make it difficult to develop an economic development strategy based on closed-loop business opportunities. Until some level of consensus can be reached, expanding or stimulating new waste-based businesses in this area may be limited.

On the other hand, if the community can resolve its differences, waste-based enterprises can make a significant contribution to expanded employment and entrepreneurial opportunities in the area due to the fact that they are labor intensive. For example, just processing and sorting recyclable materials sustains 10 times more jobs on a per-ton basis than landfilling or incineration. Making new products from the old offers the largest economic development benefits in the recycling loop. Waste-based manufacturers can create more than 20 times more jobs than disposal; these jobs often represent high-paying, skilled industrial jobs. About 20% of the nation's municipal solid waste consists of reusable items. Some waste-based operations create 200 jobs for every one job at a disposal facility. Thus, waste-based economic development can be a significant employment growth sector for the Lower Rogue/Illinois Valley if the community could agree on the direction it wants to take.

4. RECYCLING AND WASTE MANAGEMENT IN JOSEPHINE AND JACKSON COUNTY

In 1991, the Oregon Legislature set a statewide 50% material recovery goal by the year 2000 and individual county recycling goals for the year 1995. The goals for Jackson and Josephine Counties in 1995 were 25%. This goal was exceeded by both counties in 1995 and 1996. The 1996 recovery rates show Jackson County exceeded its goal by 9% and Josephine County exceeded its goal by 13%. Jackson County has the sixth highest recovery rate in the state of Oregon and Josephine County has the third highest recovery rate.

County	Population	Total Annual Garbage Generated (in tons)	Recovery Goal	Recovery Rate
Jackson County	168,609	115,011	25%	34%
Josephine County	72,182	35,873	25%	38%

*Population estimates are based on U.S. Bureau of the Census 1996 census data. Annual tons generated, recovery goal and rate are based on 1996 data compiled by the Oregon Department of Environmental Quality and presented in draft copies of the 1996 Oregon

Material Recovery Survey.

· Sanitation. There are a total of four hauling companies in the Jackson/Josephine County areas. Within Josephine County there are two garbage/recycling haulers. The one county-franchised hauler is Southern Oregon Sanitation. The City of Grants Pass (which is located in Josephine County) franchises with Grants Pass Sanitation. However, these two companies do have some overlap in their service areas. For instance, Southern Oregon Sanitation picks up some sites within the City of Grants Pass and Grants Pass Sanitation picks up a few sites outside the city limits.

Three haulers service customers in Jackson County. The main franchised hauler for the county is Rogue Waste Systems. The City of Ashland franchises with Ashland Sanitation and Southern Oregon Sanitation services a few rural residents within Jackson County.

Josephine County manages the closed landfill sites and oversees the franchised hauler. The City of Grants Pass has a solid waste engineer who oversees the state recycling requirements, curbside recycling program and the drop-off sites for recycling. The recyclable materials the haulers are required to pick up curbside are: glass (clear, brown and green), cardboard, newspaper, clear HDPE (#2 milk jugs), and oil. They do not offer tin can recycling at this time because Schnitzer Steel takes it and is convenient enough for the community. Additionally, the City has tried to implement the program slowly by adding one material at a time.

Jackson County's franchised hauler also owns and manages the landfill. The County oversees the hauler and the recycling program. The recyclable materials the haulers are required to pick up are the same as for Josephine County except in for plastics. In Jackson County the haulers are required to pick plastics #1-7.

· Landfill Situation. There is one landfill in Josephine County. It is the Merlin landfill which is targeted to close between the years 2000 and 2003 because it has reached its capacity. Previously the land was leased from the Bureau of Land Management, but now it is the City of Grants Pass' responsibility. The tipping fees are around \$75.00 per ton. This money pays for the City's Solid Waste Engineer and the future closure of the landfill. Currently, there are two landfills in Jackson County: the South Stage and Dry Creek landfills. The South Stage will be closed by the end of 1998 for not only capacity reasons, but for minimal environmental concerns, as well. That leaves Dry Creek landfill as the only facility in the area for garbage disposal. Rogue Waste Systems owns and operates this landfill and is constructing a new lined cell which has a 60-100 year life expectancy. The tipping fee at Dry Creek is considerably less than at the Merlin landfill. It costs around \$30.00 per ton for disposal.

5. OVERVIEW OF EXISTING CLOSED-LOOP ECONOMIC DEVELOPMENT PROGRAMS.

Closed-loop activities are taking place in the Illinois/lower Rogue River region. The following descriptions are representative of the activity in reuse and recycling:

· J & R Reduction. Presently, J & R Reduction processes and shreds tires for transport to Yreka, California. Owners of J & R Reduction are working cooperatively with the City of Yreka to utilize the municipal solid waste (MSW) generated in the area to blend it with the shredded tires from J & R to produce a very strong material that can be manufactured into products such as floor tiles, sea walls, and sound deflection walls. It also has the potential to be manufactured into more products, but has to pass extensive strength testing first. The MSW, which is 92% fiber, is first cleaned and deodorized. The tires are ground down to dust and become the binding agent for the MSW. The two are blended into phluff (which comprises 80% MSW and 20% tire) and put into a compression chamber. The result is what they call a carbonizer block. J & R Reduction's owner claims they will be able to collect 75-80% of all tires in Southern Oregon and 60% of all tires in the state of Oregon when all the plants are up and running.

· SPARC Enterprises. SPARC is a nonprofit organization that employs people with developmental disabilities. The mission of SPARC is to provide services to the community to enrich the lives of the people that work for them. Among other services SPARC provides, it operates a facility that receives recyclable materials for cleaning, baling and shipping to various mills around the state. Additionally, it provides, free of charge, office paper pick-up services; confidential paper shredding services and pick-up; and drop-off sites for newspaper recycling to businesses in the Grants Pass and Cave Junction areas. Further, SPARC contracts with two main sanitation companies to pick up milk jugs and cardboard from businesses and residents around the county. SPARC estimates that they capture 1,518 tons of newspaper (which is 35% of DEQ reported tonnage for newspaper), 323 tons of ledger paper (30%), 37 tons of milk jugs (24%), and 2,186 tons of cardboard (15%) each year.

· Biomass One. Biomass One is a wood fired cogeneration plant which converts wood waste into energy. Specifically, it converts the waste into electricity and steam. The electricity is sold to Pacific Power to supply over 20,000 homes with power and the steam is sold locally for the drying of lumber and veneer. It receives various kinds of wood debris including land clearing material, demolition waste, pallets, tree trimmings and slash. Annually, Biomass One recovers 355,000 tons of wood waste from the area. The process is a clean alternative for wood waste disposal in southern Oregon and Biomass has made a commitment to being a good neighbor.

· Illinois Valley High School. The Illinois Valley High School is pro-active in the community in regards to recycling. They provide drop-off sites to the community of Cave Junction for three recyclable materials (office paper, magazines and newspaper). In the past they have tried to include cardboard, steel "tin," plastic bottles and glass. However, they have not been successful in finding a company that will pick-up and recycle these materials for them. At one point the high school collected hundreds of plastic milk jugs and flattened tin cans which were stored in the school barn, but because no company would take the materials they were disposed of with the garbage. Currently, they have a whole barn full of cardboard waiting for someone who will recycle it. They recycle 24-36 tons of magazines and newspaper and twenty 55 gallon drums of office

paper each month. Southern Oregon Sanitation takes the magazines and newspaper and SPARC takes the office paper.

- NaturTech Composting Systems. NaturTech manufactures easy-to-use, containerized, in-vessel composters that can handle all types of solid waste, even biosolids. The system involves low capital outlay, low operating costs, and leachate prevention. A 4-ton per day composting system package includes software, computer, license, air management system, wiring, operations manual, four composting containers, biofilters, delivery, installation, and staff training. Customized recipes and electronic scales are used to obtain a proper mix of materials, moisture level, and porosity.

- Schnitzer Steel. Schnitzer Steel offers recycling of ferrous and nonferrous metals which includes metals such as appliances, copper, brass, stainless steel, steel, aluminum, tin cans, compressors, electric motors, automobiles, tanks and so on. Schnitzer is capturing around 40-45% of all nonferrous metals in the area and believes about 90% is captured overall by smaller metal recyclers who either bring the metals to Schnitzer or drive them to Portland or south for better prices. Of the ferrous metals they believe they are capturing about 85% in the area. They offer a drop box service to larger industrial customers and drop-off availability for smaller generators.

The following factors are also important in the development of reuse and recycling strategies:

- Illinois Valley Community Response Team. In 1985, the Illinois Valley Community Response Team was developed as a result of the federal government's plan to stimulate economies in areas of high poverty level. There are two community response areas of interest: the Suny Wolf team which focuses development in and around Merlin and the Illinois Valley team which focuses its efforts in the Cave Junction area. A list of strategies and action plans have been determined as part of the Response Teams Strategic Plan for Community Development. The categories that have been targeted for community development include business development, education, environment, families and youth, health, housing, and public infrastructure.

- Rendata Corporation. Rendata Corporation owns a large industrial park in Merlin, Oregon and currently have four commercial tenants. Formerly, this was the site of a saw mill and Rendata purchased the land and buildings in May of 1996 for rehabilitating. Rendata will renovate the buildings for any new company coming in. There is room for one million square feet of building space and presently 330,000 square feet is under cover. They encourage businesses that utilize recycled or reused materials to locate at the industrial park.

6. WASTE STREAMS NOT BEING RECOVERED OR BEING MINIMALLY RECOVERED.

This list was compiled by the individuals CWCH researchers interviewed. The researchers believe that more materials are being recovered at some level. However,

compared to other communities in which we have worked, we found it very difficult to obtain good information on the quantities, types or qualities of recycled materials:

Appliances: Currently, Schnitzer Steel is handling appliances. They strongly recommend professional freon removal and a certificate of removal. If a person does not remove the freon, Schnitzer will charge a \$15.00 fee and remove it themselves. Schnitzer believes 90% of all freon in appliances is removed properly. They believe they are capturing almost all of the appliances generated in the area since the landfill will not take them anymore.

China cups, plates, bowls: There is no market for broken china and no estimation of quantities landfilled.

Construction and Deconstruction waste: Biomass One takes construction debris at the cogeneration plant. We do not know the percentage Biomass thinks they are capturing.

Fish Waste: There is potential for processing fish waste into liquid fertilizer for farms in Southern Oregon. There is an estimated 100 million pounds of fish waste generated on the Oregon coast and less than 1% is being utilized. There are possibly other products that could be made out of this fish waste. For example, methane gas is a bi-product of fish waste. Additionally, it was indicated that there are other chemicals that can be extracted from it.

Food waste: DEQ indicated there is nothing being done about food waste locally. However, nearer to the coast some pig farmers have collected restaurant waste to be used as feed.

Furniture/carpet/mattresses: This is a problem area, but it is not known how much is generated or disposed of in the area.

Glass: This is a highly problematic material to recycle. For glass that does not have any value (mostly the green and brown glass) DEQ has allowed recyclers to store it at the landfill and use it as road bed.

Hazardous Materials: There is no reported quantities in DEQ's material recovery survey for the Lower Rogue River region. Residents can save household hazardous wastes to recycle on a specified day in May.

Landclearing materials: Biomass One takes landclearing materials at the cogeneration plant. The quantities are not known.

Low quality fabric: 62.8 tons of textiles are being recovered in Jackson and Josephine counties per year.

Plastics: Only Jackson County offers recycling for plastics #1-7, but since only 732 tons (most of it from #1 PET beverage containers) are recycled each year in Jackson and Josephine Counties there is probably room to recover more. However, it is not estimated what percentage is generated in the area.

Plastic wrap (visquin): Currently, there is no market for plastic wrap and it is not included in the Oregon Material Recovery Survey.

Porcelain: The only county in Oregon recovering porcelain was Jackson County. In 1996 they recovered 8.9 tons (.108 lbs per capita) of porcelain.

Tires: J & R Reduction, Rendata Corporation and Scott Burns are recovering tires in the Lower Rogue River region. The 1996 Oregon Material Recovery Survey estimates that in Jackson and Josephine counties 3,506 ½ tons of tires were recovered.

Yard debris: Jo-Gro and Biomulch in Kerby accept used lumber and clean yard debris such as grass clippings, leaves, branches, etc. Biomass One collects yard debris, as well.

7. POTENTIAL OPPORTUNITIES TO ESTABLISH OR EXPAND CLOSED-LOOP ECONOMIC DEVELOPMENT

A. POTENTIAL BUSINESS ENTERPRISES FROM SOLID WASTE MATERIALS

The research team focused on categories where (1) an existing business can be expanded, (2) a new business can be attracted, and (3) infrastructure changes could reduce business or government operating costs. We found that there were a number of potential projects in each of these three categories.

We also found that the greatest potential for expanded waste-based enterprise development was not with DEQ-mandated materials, but with yard debris and wood pallets; and we found that the best option for these materials was local use, rather than increased collection of mandated materials and shipment to the Portland Metro area for marketing.

Likewise, the research team found that local uses of glass are superior to shipping to traditional markets in Portland. Traditional markets pay very little for glass and all local haulers are losing money in their mandated glass programs. The research team is currently gathering data from various jurisdictions which have used glass as a road bed material.

B. NEW BUSINESS ENTERPRISES

We have identified real companies in each of the fields below. However, to protect their confidentiality, the companies are listed simply by representational letters.

HDPE Plastic Market Coop and/or Manufacturing Plant

Regional markets for HDPE (milk and water jugs) have been discovered by recyclers in other parts of Oregon. For example, a hauler in Hood River assembles truckloads of this plastic and ships it to a Portland processor, which in turn ships the material to the Garten Foundation in Salem. The materials are sorted in Salem and shipped to processors and end-users in California or to the Pacific Rim.

The key to this hauler's ability to market HDPE at prices that provide a profit margin is quality control. The shipments to Portland do not have to be re-packed because of the consistently high quality and absence of contaminants. About 100 tons of material are shipped annually.

Two potential enterprises are based on this information:

(1) Franchised haulers in the Illinois/Lower Rogue area could form a cooperative marketing arrangement to ship their HDPE materials. Alternatively, a hauler can develop their own operation, and accept high quality loads from the other franchised haulers and ship them to the Garten Foundation or the Portland metro area.

(2) An HDPE processing and manufacturing plant could be attracted to the region. Company A is one such company that has been operating at a profit from a rural location in Spickard, Missouri. The company imports baled, post-consumer HDPE bottles (milk and water jugs).

Company A uses a system that efficiently grinds the plastic into flakes, washes and dries them, and then stores the flakes for later use or for sale to other manufacturers. End-products are made using one of three technologies: (1) vacuum forming, (2) extrusion, and (3) rotational molding. These products are sheets of plastic that are used as a substitute for wood in pallets and a variety of building applications.

Company A also extrudes plastic profiles in the sizes 1" x 2" and 2" x 4," with varying lengths. It also fabricates these profiles into a variety of products, including furniture. With its rotational molding equipment, Company A has the capacity to produce over 30 products, including gas tanks, water reservoirs, animal feeders, dog houses, buckets, helicopter seats, pans, 18-gallon curbside containers, and 2-cubic yard dumpsters.

Company A needs between 500-1,000 tons per year of baled post-consumer HDPE to operate at a profit. The Josephine County areas may generate about 150 tons per year of this material. However, additional supplies could be obtained from the Jackson county area. According to conversations with solid waste officials in Portland and with the Garten Foundation of Salem, ample materials would be available for a plant in the target region. Alternatively, a plant in another region of the state would support an expanded recovery of the material in the area.

Capitalization for the construction of Company A's plant is estimated at \$750,000, not including land and building costs. About 30,000 square feet under roof and another two acres for outside operations would be needed. Company A would make its technology available and provide start-up, management and market development assistance to an enterprise if there were a local partner to invest in this plant. Approximately 8-10 semi-skilled and skilled machine operator positions would be created.

Below is a profile of Company A.
Company A

Feedstock Used HDPE (milk and water jugs)
Amount of Feedstock Used 500-1,000 tons per year
Feedstock Cost 21-22 cents per lb.
Location of Facilities Midwest
Sales (current year) \$2 million
Maximum Capacity (1 plant/1 shift/1 year) 750 tons
Minimum Capacity for Positive Economics 500 tons
Capital Investment (w/o lot and buildings) \$800,000
Operating Expenses N/A
Number of Jobs per Facility 10-12
Types of Products sheeting, molded products, vacuum formed products
Prices of Product Sold \$1-2 per lb. of recycled plastic
Expansion Plans Interested in new rural sites

Small-Scale Paper Pulping

High- and low-grade papers are being recycled in the southern Oregon, northern California area. and are routinely handled by area haulers. This material is valued from \$20 to \$125 per ton, minus the cost of transportation to markets. Company B of New Orleans offers a new technology that pulps 30 tons of material per day into 25 tons of market pulp. Current market prices for pulp are \$525-800 per ton, providing sufficient margins to accommodate transportation costs. The unit costs \$5 million outright, but can be purchased through a lease with a \$1.5 million up-front investment. It requires three acres to operate. Company B, which sells the technology but does not operate plants, provides the following services for their clients:

- facility permitting assistance,
- business planning assistance, and
- market development, including trials of pulp with potential purchasers, obtaining letters of interest from cellulose insulation, molded products, fiber board prior to investment in the plant. In other words, the pulp would be pre-sold pending development of the plant.

The plant would eventually create 8-10 skilled jobs. Pulp manufacturing has a very high multiplier impact of 10-15. This means that the 8-10 jobs in the plant could impact from 80-150 indirect jobs in the immediate area of the plant.

An entrepreneur in the Hood River area is pursuing the development of the small scale paper pulping business in the Columbia Gorge. This individual was successful in obtaining a grant to complete market business feasibility studies. However, Company B has voiced an interest in establishing another plant in Northern California. It is possible that a southern Oregon location close to the I-5 corridor would do.

Below is a profile of Company B:

Company B

Feedstock Used all grades of paper

Amount of Feedstock Used 30 tons per day

Feedstock Cost \$5-80 per ton

Location of Facilities Mid West, South East

Sales (first year) n/a

Maximum Capacity (1 plant/1 shift/1 year) 30 tons per day, can build multiple units

Minimum Capacity for Positive Economics 30 tons per day

Capital Investment (without lot and buildings) \$5 million

Operating Expenses n/a

Number of Jobs per Facility 8 10

Types of Products paper pulp

Prices of Product Sold \$400 - \$750 per ton

Expansion Plans interested in plants throughout the US

Asphalt Roofing Recycling

Company C recycles asphalt roofing. This company has a facility in the Willamette Valley and has voiced interest in expanding and opening a collection and transfer station in the Grants Pass area. Company C collects used asphalt roofing shingles and recycles the material for use as roadbed substrate and other uses. They need a population base of roughly 50,000 to be profitable, which the Grants Pass/Medford area would provide. They would need 3-5 acres located near I-5 to make the site cost effective. There would be no materials processing at their site, just collection and transfer.

Company C needs a grant or low interest loan of \$10,000 to \$25,000 to open a collection site. These funds would be used to lease and prepare the facilities, for the purchase of a trailer and front end loader, and for market plan development. At least one full time person would be hired at approximately \$12 an hour or \$2,500 a month to operate and manage the site, handle accounts and collection etc.

This enterprise would benefit the community by diverting a large amount of roofing construction material from local landfills and provide at least one well paid full time job.

Wood Pallets

A number of companies can be located in the area that would add value to the abundant supply of wood pallets. In 1994, a nonprofit local development corporation created Company D, a for-profit reclaimed wood manufacturing business. Company D receives discarded wood shipping containers and pallets, reclaims and remills them, and makes new solid wood products. The enterprise has three operating divisions: (1) pallet making, (2) reclaimed lumber sales and distribution, and (3) furniture, flooring, and specialty building materials manufacturing.

Company D has pioneered a unique system to produce high value-added products from wood pallets: flooring, butcherblock tables, bookshelves, and other furniture. Its flooring gives the raw material a market value equivalent to \$1,200/ton; its furniture gives the raw material a market value of \$6,000/ton. In contrast, a ton of wood ground into chips and used in fiberboard brings only \$30/ton.

In addition to producing goods from reclaimed wood, Company D aims to advance the mission-driven values of its parent organization: (1) attract private capital to the community, (2) create blue-collar jobs and training opportunities, (3) help local business and government reduce disposal costs, (4) divert waste from landfills and incinerators, (5) conserve forest and timberland, and (6) protect the environment. The parent organization is working to meet these goals by operating a woodworking job training program, providing participants with basic environmental and recycling education and preparing them for entry-level jobs in the local wood products manufacturing industry. In its first year, 22 training program graduates were placed. In addition, every 100,000 ft² of flooring produced by Company D saves local businesses \$35,000 in waste disposal costs, diverts 135 tons of waste from disposal, creates 7,300 hours of work for its employees, and, based on the use of virgin materials, conserves one billion BTUs of energy and 22 acres of forest.

The Process

Company D receives discarded pallets from local businesses. Many of the pallets received each year are refurbished and sold back to these businesses. This part of the operation—representing closed-loop recycling—uses conventional pallet repair techniques.

Company D's distinction in the field, however, lies in its pallet remanufacturing process, which upgrades discarded pallets into high value-added products. In response to the wide range of incoming wood and the variety of finished products, the system is designed to be flexible; it is labor intensive, optimizing the quantity and quality of the reclaimed wood, and minimizing the capital equipment cost.

Using conventional equipment and techniques in a proprietary manner, the system denails, joins, planes, sorts, grades, reclaims, remills, and dries the discarded wood to make finished products from oak, maple, pine, cherry, mahogany, and other types of wood.

Other Information

Company D is soliciting expressions of interest and qualifications from companies interested in licensing its system. The license privilege includes access to Company D's know-how through technical assistance, feasibility analysis, business plan preparation, and a managerial training program. Prospective licensees must have business experience with at least one of the following:

- (1) recycling, reprocessing, or remanufacturing operations

- (2) sale, distribution, or manufacturing of pallets; or
- (3) sale, distribution, or manufacturing of flooring, furniture, or wood products.

Below is a profile of Company D:

Company D

Feedstock Wood pallets of any size; also chokes, skids and crates

Amount of Feedstock Used 180,000 pallets/year (3,600 tons/year)

Feedstock Cost Suppliers pay a service fee averaging \$0.75/pallet. If they repurchase pallet after repair, the fee is waived.

Collection Strategy Most pallets are delivered to sites, occasionally Company F will pick up loads

Service Area 50 mile radius for pallet repair operation, value-added products have national market

Location of Facilities 2 sites in Bronx, NY

Years in Business Since May 1994

Sales \$1,000,000 (within three years)

Capital Investment \$1.5 million in initial capital; 30,000 ft² building with exterior yard space

Operating Expenses n/a

Number of Jobs 20 (includes production and management)

Operating Schedule 1 shift/day, 52 weeks/year

Products Rebuilt pallets, furniture, flooring and other value-added products

Price of Products Pallets ranges in price from \$2.50-6.00; Furniture ranges from small pieces, which wholesale for \$75, to large pieces, which sell under contract for \$2,000; Flooring sells to contractors for \$1.50-1.85 per ft²

Company E is a wood waste recycling and disposal company that started in 1984. It primarily processes wood pallets, crates, and housing debris. The majority of its wood comes from commercial facilities, such as warehouses and manufacturing operations. The company also accepts bale cardboard and bale plastic, which is then sent out for further processing and recycling. It processes 18 tons of steel per week, which is then resold.

Company E accepts 600 tons per week of waste materials. Most of the waste is picked up by truck; however, some wood waste is dropped off on-site. A tipping fee of \$4.50 per cubic yard is charged for this service. Company E does not handle very much construction & demolition debris because the area landfill price for this material (\$25-28/ton) is not high enough to generate any incentive for companies to seek alternative disposal methods.

Company E processes all of its wood waste on-site. It converts the wood waste into rebuilt pallets, and grounds all remaining wood for sale as boiler fuel. The company does not generate any waste streams. Their facility is located on a 7-acre site.

Company E is very interested in expanding their operations. Replicating their current facility would cost approximately \$1.5 million (including operating expenses). First year sales should exceed \$1 million, and the plant would employ 30 people.

Below is a profile of Company E:

Company E

Feedstock Wood pallets, crates, housing debris (other materials including steel, cardboard, plastic)

Amount of Feedstock Used 600 tons/week

Cost for Feedstock Charge a tipping fee of \$4.50/yd³

Collection Strategy Pick up loads with truck, some materials dropped off on-site

Location of Facilities 7 acres site in West Point, VA

Products Produced Rebuilt pallets, boiler fuel

Capital Investment \$1.5 million (included operating expenses)

Jobs Created 30

Revenues \$1 million/year (first years sales)

Re-Use Enterprise

Re-use of commodities has a far greater beneficial impact on the waste stream than traditional recycling of glass, metal, or paper, which must be processed into new products. The reusable portion of the waste stream is bulky, and occupies an estimated 5% of landfill space. Furniture, construction materials, appliances, computers, bicycles and motors are parts of this re-use stream.

Re-used commodities are recaptured at their highest value. They may have to be repaired, but do not have to be broken down and re-manufactured. Small businesses and do-it-yourself repair projects benefit greatly from re-use enterprises as they can obtain commodities in good condition at a fraction of their original cost. Often commodities no longer available in the market place are available through the re-use enterprise.

Re-use enterprises can either be for-profit or not-for-profits. They train and employ workers and provide skills training allowing for increased wages. Research by the Self-Reliance, Inc. has identified nearly 100 re-use operations nation-wide. Most are non-profit enterprises which, for start-up costs, need financing from foundations or government grants.

Company F is one of the for-profit enterprises. It is a private company based in a large metropolitan area in California, and is a pioneer in the field with 25 years of experience in the collection and marketing of used commodities.

The company has incentive packages for employees providing for (1) base wage rates, (2) bonuses based on trading, and (3) a year-end bonus based on the company's overall performance. Further, the company has developed working relationships with local

governments whereby it pays no rent for the use of public land, but pays a fixed percentage of its profits to the sponsoring local jurisdiction.

Recently, Company F has been engaged to design a re-use system for a community of 60,000 people. This population base is similar to that of the Josephine/Jackson county area.

Total capitalization is estimated at under \$100,000. This cost is based on arrangements for sites from the three counties in exchange for a share in future profits.

Below is a profile of Company F:

Company F

Feedstock Used used appliances, furniture, computers, building materials, tools, art, music, household and office furniture, bicycles...

Amount of Feedstock Used 5-10% of local waste stream

Feedstock Cost \$250,000 in purchasing; feedstock donated, traded and purchased

Location of Facilities California

Sales (current year) \$1.6 million

Maximum Capacity (1 plant/1 shift/1 year) n/a

Minimum Capacity for Positive Economics n/a

Capital Investment (without lot/buildings) under \$100,000

Operating Expenses up to \$1.6 million

Number of Jobs per Facility 26 FTE. Small, rural area facility to employ 4-5 people.

Indirect effects on employment

Types of Products Same as feedstock used above; clean and recycle broken glass, scrap and salvage to prevent landfilling of these materials add value

Prices of Product Sold varies

Expansion Plans Currently doing site planning for facilities to serve populations of approximately 60,000; wants to expand to many more sites.

Company G is a non-profit community development corporation located in the Willamette Valley that operates very sophisticated reuse operations. They operate thrift stores as well as recycling and remanufacturing operations (refrigerators, washers, dryers, glass and other commodities). Company G has voiced interest in providing technical assistance to a local non-profit in the Illinois Valley/Lower Rogue that wishes to establish a reuse operation or other waste-based businesses.

Garnetting Factory

A garnetting factory reprocesses post consumer textile waste or their by-products (discarded second hand clothing and other products that consumers no longer need and decide to discard due to wear, damage etc.) into the original product stream or into new useful end uses. Because the production of nonwoven fabrics require less fiber, labor, equipment, time and money that the production of woven or knitted fabrics, most reclaimed fabrics are used in nonwovens rather than reconstructed into woven or knitted

products. Textile companies have found nonwovens to be a profitable way of reusing used fiber.

Company H contracted for a feasibility study on the potential of establishing a garnetting factory. Their intention was to establish their own company somewhere in the Willamette Valley. The study found that the current markets for recycled fibers are just beginning to blossom and the increased public awareness of environmental issues and conservation of resources is certain to increase the interest in and value of the use of recycled materials for many products.

The Company H feasibility study identified five product areas that they consider suitable for application of the secondary fibers that Company H has access to: carpet cushions, home insulation, polyester stuffing for pet products, clean-up products and mattress pads. The study recommended that due to the characteristics of the recycled fibers and the current market, it is better to use the secondary fibers in a variety of fiber applications rather than focusing on a single product. After the materials are collected and transported to the factory, the clothing is shredded and used in any of these five products.

To operate a garnetting factory profitably, it is important to have a reliable and efficient collection and transportation system, and to operate the factory in a systematic and organized manner. Due to the nature of their business and long history of success in the collection and reprocessing/reuse/recycling of products from across the west, these are attributes that Company H provides extremely well.

A complete garnetting plant would cost between \$2 to \$3 million, depending on the type of equipment purchases etc., and create 15-20 jobs.

At this point however, Company H is not interested in operating this facility. They are therefore willing to partner with or sell the business proposal to a non-profit organization or a local entrepreneur in exchange for the following:

- a. Company H is hired to provide the consulting services needed to aid in the set up. This includes an initial feasibility study to determine the likely success of a garnetting facility in the Illinois/Lower Rogue Area, the number of jobs it would create, a land/facilities site assessment etc. Company H would prepare the information for the community to review before moving forward with full-blown business planning. Costs for this will be \$10,000 to \$12,000. These funds could be secured through a grant or other source.
- b. Company H would have the right of first refusal to supply the raw material for the plant.
- c. Company H would have the right of first refusal to be able to contract for the rights to distribute the end products and to use the materials in their own stores and housing operations.

C. INFRASTRUCTURE IMPROVEMENTS

Companies I, J and K. Some operations would improve the infrastructure of the current solid waste management system while at the same time paving the way for ongoing enterprises. One operation involves using a crusher to process mixed glass. The processed glass can be used as an aggregate for construction building materials and road beds. Also, Deschutes County, Oregon is experimenting with processing glass into a fine sand and using it in the County's water treatment system. Contacts for using crushed glass as an aggregate are: Linda Hayes-Gorman, Oregon Department of Environmental and Deschutes County, and Justin Browson, Babcock Bros. Construction Company.

Company I provides businesses, communities, and governments with the technical expertise to establish a scrap tire recycling program. The program outlines the use of whole tires or shredded tire pieces integrated with concrete to manufacture building products used in civil engineering applications, including dams, prisons, and other major facilities. The program incorporates the principles of local ownership, economic development, environmentally sound manufacturing practices and materials efficiency.

The patented recycling technology is linked to the customer by a licensing agreement. The benefits are patented building products of economic value and a comprehensive recycling program that may create jobs, job training, and may establish a community resource conservation program.

Below is a profile of Company I:

Company I

Feedstock Used scrap tire or tire pieces

Amount of Feedstock Used 1 ton (120 tires) for each standard block

Feedstock Cost The company receives money to dispose of material from the state.

Location of Facilities Facilities not necessary. Machinery is very mobile; tires baled on site of where tires are located and construction site.

Sales (first year) approximately \$6 million

Maximum Capacity (1 plant/1 shift/1 year) n/a

Minimum Capacity for Positive Economics n/a

Capital Investment (without lot and buildings) approximately \$100,000

Operating Expenses

Number of Jobs per Facility 3 per shift for baler

Types of Products concrete building material used civil eng. applications

Prices of Product Sold based on region and application; distance of material from project

Expansion Plans interested in leasing its technology nation-wide

4. AGRICULTURAL AND FORESTRY WASTE MATERIALS

A. FORESTRY WASTE

Established in 1984, Company J produces fuel oil primarily from wood waste. The company operates three facilities, one in Manitowac, Wisconsin (Red Arrow Products, Ltd), and two smaller plants in Ontario. The Manitowac facility uses Company J's patented Rapid Thermal Processing technology to process approximately 8,000 dry tons of waste wood per year (16,500 wet tons per year) into 1,200,000 gallons of Bio-Oil (comparable to fuel oils). In fact, the primary product from Red Arrow is hydroxyacetaldehyde, a food flavoring agent, and the bio-oil is used to power to the facility.

Rapid Thermal Processing (RTP) heats the dry waste wood to between 400° and 900° Celsius for about a half second at ordinary atmospheric pressure with no oxygen. The rapid heating of the biomass causes fragmentation of the chemical structure ("cracking" the chemical bonds) thus producing the liquid Bio-Oil. Rapid cooling prevents the completing of chemical reactions, therefore preserving the liquid state. There is no waste stream generated with this process. Approximately 74 percent of the resulting product is liquid Bio-Oil, 15 percent is char (which can be processed into activated carbon), and 11 percent is gas. Bio-Oil is comprised primarily of water, depolymerized lignin, carbonyls, and smaller amounts of carboxylic acid, carbohydrates, phenolics, and alcohol.

A minimum-capacity plant, producing only fuel products, would transform 36,300 dry tons of waste into 5.3 million gallons of bio-oil each year, and would cost approximately \$4.5 million. Nine direct jobs would be created. A maximum-capacity plant would transform 90,940 dry tons of waste into 13.3 million gallons of bio-oil each year; data on capital investment and jobs created are not available at this time. Company J does not pay for any of the feedstocks, nor does it charge a tipping fee. Generally, Bio-Oil has half the heating value of light oil but is still considered to be competitive with petroleum fuels on the basis of equivalent energy. For example, a 100 ton/day plant could generate 7 to 8 megawatts of electricity in a direct-fired turbine-enough power to meet annual needs of 400-500 homes.

Liquid biomass fuels, such as Company J's Bio-Oil, have several logistical advantages over solid biomass fuel sources. Generally, they are easier and less costly to transport than solid fuels. Liquid heating oils are the primary source of energy for turbines and diesel generators, and therefore biologically-derived liquid fuels have a vast potential market. According to Company J, current fuel oil-burning generators can be easily modified to use Bio-Oil.

Company J is very interested in expanding their operations into communities with large amounts of wood waste.

Below is a profile of Company J:

Company J

Feedstocks waste wood, sawdust, cardboard, newsprint, ag wastes, pulp sludge, other fibers

Amount of Feedstock Used WI Plant: 8,000 dry tons/year (16,500 wet) yields 1.2 million gallons of Bio-Oil

Cost for Feedstock \$0/ton; no tipping fee

Location of Facilities Manitowac, WI; also 2 plants in Ontario

Years in Business Since 1984

Revenues n/a

Minimum Capacity 36,300 dry tons/year = 5.3 mil gal Bio-Oil

Maximum Capacity 90,940 dry tons/year = 13.3 mil gal Bio-Oil

Capital Investment Minimum capacity plant = \$4.5 million

Operating Expenses n/a

Number of Jobs 9 for a minimum capacity plant

Product Bio-Oil, comparable in heating value to No. 2 Fuel Oil

Price of Product (based on \$/BTU)* Bio-Oil = \$0.27/gal (75,000 BTU/gal) No. 2 Fuel Oil = \$0.48/gal (135,000 BTU/gal)

* These figures are estimates based on the average composition of wood waste.

Company J has expanded into the Southeast. The Southeast Regional Biomass Energy Program (SERBEP), Environmental Resource Services (ERS) of Oklahoma City, and Company J have joined forces to build a plant in Anniston, Alabama to manufacture Bio-Fuel and other value-added products from wood wastes. Wood waste from the surrounding area, including the Anniston Army Depot and Fort McClellan will be processed and the fuel sold back to the Army and other energy consumers to replace fossil fuel. The plant is expected to process 100 tons per day of feedstock. In addition to construction jobs, the new plant will create 30-40 permanent jobs, indirectly create 65-90 additional jobs, and generate over \$300,000 in tax revenues per year.

In addition to saving landfill space, this project can also solve disposal problems for area wood waste generators. The current tipping fee for private landfills in the Anniston area is \$24/ton vs. \$12.50/ton for wood wastes delivered to the city's wood recycling center. Another benefit is the reduction of 1,700 tons of sulfur and 689,000 tons of carbon dioxide emissions from fossil fuel combustion, expected over the lifetime of the plant. In addition, the bio-fuel manufactured in the Anniston area is expected to displace 1.4 million barrels of imported oil in 20 years of the plant's operation. Markets exist in the Anniston area for the fuel, however the Presidential Mandate for federal government installations (including military bases) to utilize more renewable energy is expected to increase the demand for the Bio-Fuel.

Company K uses old pallets, crates, forestry waste, and other sources of dry, relatively clean, wood to produce wallforms. Mineralized wood waste and cement are combined (a patented mix of 91% waste wood and 9% cement) to produce construction forms (8" high, 16" wide, and 8.25" deep, the same dimensions as conventional concrete blocks). These permanent forms interlock without mortar, and reinforced concrete is poured into the cores. These blocks have a four-hour fire rating and are "practically non-combustible." Because of this, insurance premiums are low for structures using this system. The product is quite "breathable" compared to construction techniques using

vapor barriers, thus improving indoor air quality. The wallforms are also a good sound barrier, and is lighter, yet sturdier, than normal concrete blocks.

R values, which measure of the insulation quality of a material, for this product range from 11 to 24, but can be increased by using a slightly thicker block (12" instead of 8.25"), and by placing insulation materials in the subsequent 3" holes in the blocks. The company currently uses extruded foam product insulation containing some post-consumer recycled material; however, because it would like to switch to "greener" products, the company is investigating the use of 92% recycled content mineral wool/fiberglass.

The unit price of the blocks is currently higher than conventional concrete blocks, but the company estimates that the life-cycle savings are 10% in overall costs and 20% in construction costs. Overall costs are determined by energy savings, insurance premium reductions, and construction cost savings. Construction costs are reduced because the product is lighter and easier to work with than traditional poured-concrete foundations and walls, and requires no supplemental insulation material.

At this time, the company utilizes urban wood waste, which is relatively clean and dry (lumber mill residues can also be utilized). According to company officials, two truckloads of pallets and crates can build one modestly-sized home. Cotton residues have also been tested for use as the cellulosic component of this product, but the greatest success has been with waste wood.

Company K's Iowa facility has been operational for about 2 years, and is capable of producing 80,000 to 100,000 square feet of material per month (thickness based on 8.50" x 12" thick wall section). Current production levels are at half capacity. This plant employs approximately 17 people. The Midwest facility licenses the technology from Company K, and takes these stabilized fibers, combines them with concrete, and produces wall forms.

Company K owns the patent and licensing rights to a process which transforms chips into stabilized fibers, known as the K-X^Ô Process. In this process, scrap wood chips are hammermilled to the pinch size needed for a particular product (short for roof tiles, medium for wallforms, and coarse for panels). The pinchips are then processed with two mineral solutions to the point where the minerals have penetrated into the fine pores of the wood fiber. The treated pinchips are no longer susceptible to rot or decay because the elements of the wood that cause rot and decay (polysaccharides, resins, oils, and tannic acid) have been sealed within the pores or bound to the minerals. The wood fibers don't lose their positive characteristics including thermal insulating ability, light weight, and workability, but are now in a form that allows them to combine with cement to gain additional important qualities such as fire and pest resistance. The pinchips, now in this "free aggregate" form can generally be used in the same way as any gravel based aggregate (blocks, slabs, etc.), but due to its light weight, K-X aggregate can also be manufactured into many other products for which heavy aggregate mixtures are ill-suited, such as roofing tiles, sound absorption panels, and insulation panels. The minimum

capital investment for this step of the process is approximately \$204,000 for equipment. Approximately 20 jobs are created.

Ideally, if an existing concrete products' manufacturer was interested in expanding their product offering, an investment in the K-X process and new molds could create production capacity for the wallforms. If an existing concrete products manufacturing facility could not be found, an additional \$372,000 would be required for this type of processing equipment. Company officials also estimate approximately \$424,000 in working capital (including inventory), license fees, PR, advertising, and consulting fees are needed. Company K is very interested in funding a new plant by raising equity, not loans, and relying on investors to become shareholders in the company. Currently, K-X Arkansas, Inc. is processing industrial waste wood to K-X aggregate, and is selling this to concrete block plants in the south.

Below is a profile of Company K:

Company K

Feedstock Used Pallets, crates, other wood sources

Amount of Feedstock Used 1996: 50,000 tons in 4 plants

Feedstock Cost \$30-40/ton processed K-X aggregate is \$29.50/y³

Location of Facilities Ottumwa, IA; Little Rock, AR; Austin, TX

Sales (first year) 750,000 f² - 1,200,000 f² of wallforms (2 plants)

Maximum Capacity (1 plant/1 shift/1 year) 2,000,000 f² (2 plants)

Minimum Capacity for Positive Economics 450,000 f²/year (per plant)

Capital Investment (without lot and buildings) K-X plant: \$300,000 wallform plant: \$1,000,000

Operating Expenses \$150,000-450,000 (project dependent)

Number of Jobs per Facility 8-17 per shift (includes sales + support staff)

Types of Products permanent concrete forms, sound absorption and insulation panels

Prices of Product Sold 1 ft² wallform: 8.5" = \$2.20 whsl/\$2.65 retail;

12" = \$2.60 whsl/\$2.95 retail

Expansion Plans Company L is seeking licensees and joint venture partners for new manufacturing facilities for K-X aggregate and wallform products

Company L. An English company with a successful 40 year track record makes and markets a construction product made from wheat straw in Europe and Australia, especially in areas where timber supplies are limited. The company is also a licensor to Company L, which is developing U.S. manufacturing capability at this time and has aggressive expansion plans for the next five years. A facility in Rupert, Idaho began producing the product in fall 1997. In addition, Pierce International is currently working with communities in Utah, North Dakota, Nebraska, Washington and Virginia to site plants. The Virginia facility came on-line in the spring of 1998.

The construction product is intended for non-structural (non load-bearing) applications. Produced in 4' x 8' x 2-1/4" panels weighing approximately 125 pounds and serves as a substitute for interior 2" x 4" and drywall walls. The panels have a 1 hour fire rating, an

R value of 9 (which is slightly higher than most interior panels/drywall), and good acoustical properties.

Currently the product is marketed as an interior wall substitution material and as a core for office partitions. An emerging market is flooring. It is currently used as flooring in Europe and is being certified for this application in the United States. Another emerging market is modular home producers. There is a modular home manufacturer who is considering locating next door to the Virginia plant to have a steady, local supply of interior wall material. Mobile home manufacturers are also very interested in using the product, especially since noise is a primary concern among owners. Also, traditional mobile homes have a total fire rating of about 15 minutes, while these panels last four times as long.

The potential for offshoot industries is also very high with these products. Most recently, the archery industry is looking into using the product as targets. Door manufacturers are also looking into the product because of the increased burn time compared to particleboard when used as the core.

A 4' x 8' panel costs \$20.00 to \$25.00, less than or equal to the combined price of normal drywall and 2" x 4" walls. Traditional wall systems cost approximately \$11.00 for the drywall (4' x 8' of drywall at \$5.50 times 2), plus \$13.00 for the 2 x 4s (4 studs times \$3.25 each), for a total of \$24.00. This does not include labor costs, which are much higher for applying drywall than putting a 4' x 8' panel into place. One contractor that uses the product estimates a 25 to 32 percent savings over conventional construction practices. Additional savings arise because the product is more durable than the drywall or veneer paneling thereby reducing replacement costs. The product's flame retardancy can lower insurance costs for some types of homes. There is also savings potential from re-use of the product. To remodel a home you only need to strip the nails and screws from the panel and fill the holes and it can be re-used instead of landfilled.

The product is a heat compressed straw board, using no other resin or adhesive besides the natural lignin. Company L's planned facilities will acquire wheat straw through straw brokers. The facility will use 15 tons of straw per shift per day, at a cost of \$30 to \$35 per ton delivered (potentially rising to \$40 per ton). Again, note that there are custom baling operations available in your region.

A typical plant will cost \$4.0 to \$4.4 million, and will initially employ 35 people. Approximately \$2.4 million of this total is for processing equipment. Company L hopes to reach production levels of five million square feet of the product per year within two years. Thus far, funders for these projects have primarily been private investors and some cooperatives, which also provide straw for production.

Company L licenses an updated technology for the production of the material. In addition, Company M and its parent company offer a complete package of support for 3 to 5 years, including equipment acquisition, training, marketing, technical support, and spare parts. They can provide your community with letters of "intent to purchase" from

major construction material suppliers, as well as identifying markets within a 500 mile radius.

Below is a profile of Company L:

Company L

Feedstock Used wheat straw

Amount of Feedstock Used 15 tons of straw per shift per day

Feedstock Cost \$30 \$35 ton delivered

Location of Facilities Iowa, Idaho, and Virginia

Sales (first year) n/a

Maximum Capacity (1 plant/1 shift/1 year) n/a

Minimum Capacity for Positive Economics n/a

Capital Investment (without lot and buildings) \$4 - \$4.4 Million

Operating Expenses n/a

Number of Jobs per Facility 35

Types of Products panels for interior walls.

Prices of Product Sold \$20 - \$25

Expansion Plans Is talking to people in Utah, North Dakota, Nebraska, Washington

7. USING TAX CREDITS TO STIMULATE ECONOMIC DEVELOPMENT

Recycling Tax Credit

The State of Oregon has three recycling tax credit programs that can possibly benefit those individuals and groups interested in establishing waste-based businesses. The Oregon Department of Environmental Quality has a Pollution Control Facility Tax Credit and a Reclaimed Plastics Tax Credit. The Oregon Department of Energy administers a Oregon Business Energy Tax Credit.

These programs differ in purpose, design and process but all provide credit against Oregon tax liability. The purpose is to encourage investment in recycling and enhance the development of the infrastructure for recycling in Oregon.

The Pollution Control Facility Tax Credit is available to owners or operators of equipment or facilities which take material which would otherwise be solid waste and reuse it or recycle it back into a product of real economic value. The amount of credit is based on the value of the eligible claimed equipment and the portion of the value the equipment which is allocable to recycling. Facilities and equipment certified under this program include small equipment such as cardboard balers in commercial locations and collection bins for residential and commercial recycling. Large facilities which have received tax credits include paper mills, glass container plants, and a variety of large commercial recycling and processing facilities.

The purpose of the Reclaimed Plastics Tax Credit is to encourage the recycling of plastic and the manufacture of reclaimed plastic products. The program provides tax credits for Oregon taxpayers who invest in equipment used to collect, transport, or process scrap plastic for recycling or equipment used to manufacture a product from reclaimed plastic. Recycling equipment certified under this program includes small and medium-sized recycling transportation and processing equipment like trucks, bins, granulators, and washing systems. The tax credit is also available for equipment used to manufacture reclaimed plastic products, including plastic molding and extrusion equipment, molds for specific products, and other handling and manufacturing equipment.

The intent of the Oregon Business Energy Tax Credit program is to conserve energy by increasing recycling. The program provides tax credits for Oregon taxpayers who own specific types of equipment used to process recyclable material. Projects which develop new markets or recycle materials not required by law are eligible. Recycling equipment certified under this program includes small and medium-sized recycling transportation and processing equipment like trucks, balers, and bins. And large equipment associated with processing recyclable materials or manufacturing recycled products like paper, metal, glass, and plastic.

For more information on these tax credit, contact the appropriate state agencies for more information:

Maggie Vandehey
Tax Credit Coordinator
Oregon Department of Environmental Quality
811 SW 6th Ave
Portland, OR 97204
503-229-6878

Sylvia DeLaRosa
Tax Credit Program
Oregon Office of Energy
625 Marion St NE
Salem, OR 97310
503-378-6330

Low Income Housing Tax Credit

The Low Income Housing Tax Credit (LIHTC) was enacted by Congress and is administered, in Oregon, by the Oregon Housing and Community Services Department. It's purpose is to encourage new construction and rehabilitation of rental housing for low income households. Congress recognized that developers may not receive enough rental income from a low income housing development to cover the costs of developing and operating the project and to provide a return to investors sufficient to attract equity investment needed for development. To spur investment, Congress authorized states,

within specified limits, to allocate tax credits for qualifying housing projects. The credits may be shared among owners (equity investors), much as income and losses are shared among business partners for tax purposes.

The amount of the LIHTC that may be awarded is based on the cost of the building (acquiring, rehabilitating or constructing) and the portion of the project that low income households will occupy.

Once credits have been awarded to a developer, that developer typically sells the credit to private investors. The money that private investors pay for the credits is paid into the project as equity financing. The equity financing is used to fill the gap between the development cost of a project and the non-tax credit financing sources available, such as mortgages, that could be expected to be repaid from rental income. The private investors use the credits to offset taxes otherwise owed to the federal government.

Once a project receives a tax credit, the Housing and Community Services Department is responsible for monitoring that project for compliance with state and federal requirements concerning household income, rents, project habitability and resident services.

To apply for tax credits, a developer must submit a detailed proposal to the Housing and Community Services Department which includes, among other things: threshold criteria, sponsor characteristics, financial feasibility, site review, long-term affordability, resident services, and housing need and demand..

8. NEXT STEPS

Our hope that this final report is just the first step in a long-term effort to establish closed-loop economies in the Illinois/Lower Rogue area through waste-based economic development. We are certain to have missed many opportunities to stimulate closed-loop economic development. Hence, the report is intended as the start, not the end, of the process. It should be used to stimulate an on-going conversation and activity by the businesses, communities and residents of the area about how to create and expand closed-loop economic development.

To continue this effort, we recommend the following:

- Economic development agencies and governments should establish technical assistance programs to prioritize, assist and help finance waste-based businesses in reuse, recycling and bioproducts;
- Steering committees should be developed at the community, county, watershed and regional levels to help plan and implement closed-loop economic development;

- "Waste exchanges" should be developed within each community and/or area allowing local businesses, institutions and non-profits to identify and exchange waste materials;
- New policies should be developed at all levels of government to support waste-based business enterprises;
- Local news media should track and publicize not just recycling goals, but the amount of waste diverted, the quantity and cost savings of deferred use of virgin materials, increases in productivity and profitability, and the number of jobs generated through businesses in reuse, recycling and bioproducts;
- The Josephine and Jackson County Commissioners should partner with local governments, the Illinois Valley Community Response Team, Chambers of Commerce, business associations and citizen groups to hold a conference on opportunities for environmentally sound economic development through waste-based reuse/recycling and bioproduct businesses and other closed-loop steps.
- Local entrepreneurs should investigate small scale waste-based business enterprises by identifying waste streams that can be utilized by small operators and which have viable markets.

APPENDIX A

DEQ

Total Tons of each Material Recovered in
Jackson and Josephine Counties for 1996

Material	Tons Recovered	Population
#1 PET Beverage	420	240,791
#2 HDPE Milk Jugs	151.2	
#2 HDPE Other	53.3	
#3 Polyvinyl Chloride	.2	
#4 LDPE	107.4	
#5 Polypropylene	.7	
#6 Polystyrene	0	
Aluminum	1,323.9	
Animal Waste/Grease	871.7	
Antifreeze	N/A	
Cardboard/Kraft	14,208.9	
Composite Plastic	20.4	
Container Glass	2,888	
Fluorescent Lamps	N/A	
Glass Other	2.8	
High Grade Paper	1,117.1	
Lead Acid Batteries	29.7	
Magazines	910.3	

Mixed Plastic 6.1
Mixed Waste Paper 395.7
Newspaper 4,387.1
Paint N/A
Phone Books 129.9
Plastic Bottles N/A
Porcelain 5.0
Rubber Tire Buffings 183.4
Scrap Metal 556.9
Solvents N/A
Textiles 62.8
Tinned Cans 115.5
Tires 3,506.5
Used Motor Oil 2,970.1
Wood Waste 28,279.5
Yard Debris 17,877.4
TOTAL 81,329.4 240,791

Appendix A: Lower Rogue River Contact List

People we have contacted: People we have met with:

Mark Amerheim City of Grants Pass 101 NW 'A' Street Grants Pass, OR 97526 Tel: 541-474-6355
Rochelle Desser Forest Service PO Box 555 Cave Junction, OR 97523 Tel: 541-592-2166

Jim Bonnes J&R Reduction 900 Azalea Dr. Grants Pass, OR 97526 Tel: 541-8109
Robbie Hanson Illinois Valley High School 5398 Holland Loop Cave Junction, OR 97523 Tel: 541-592-2116

Terry Bonney/Wanda Morris Biomass One 2350 Avenue 'G' White City, OR 97503 Tel: 541-826-9422
Fax: 541-826-6186
Betty Lewis PO Box 1091 Grants Pass, OR 97526 Tel: 541-592-6483

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Creating Closed-Loop Economies Through Reuse, Recycling and Bioproduct-Based Economic Development

Site Assessment Report for The Illinois Valley/Lower Rogue Region, Oregon

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1. INTRODUCTION

This report assesses opportunities for stimulating closed-loop environmentally sound economic development in the Illinois River/Lower Rogue region based on the reuse and recycling of 1) solid and industrial waste materials; and 2) agricultural and forestry biomass waste streams.

Prepared by The Center for Watershed and Community Health (CWCH) and Self Reliance, Inc. (SRI), this assessment focuses on the Josephine and Jackson Counties in the Illinois Valley and is referred to as the Illinois/Lower Rogue River region. This report follows two previous assessments conducted by CWCH and SRI of the potential for closed-loop economic development in Hood River, Wasco and Sherman Counties and the Southern Willamette Valley region.

The collaboration between CWCH and SRI is based on the CWCH's extensive experience in sustainable economic development and conservation, and SRI's extensive experience in waste-based economic development.

The effort is part of a multi-year initiative that seeks to identify the policies and practices required to foster closed-loop waste-based economic development throughout the entire Pacific Northwest.

The principal researchers are Bob Doppelt, Lynda Dowling-Wu and Robin Hawley, of CWCH, and Neil Seldman of SRI.

The researchers used the following methodology in the first phase of this project:

- gather preliminary waste stream data;
- site visits including meetings with government, industry, agriculture, forestry, community and environment leaders to assess existing waste streams, business opportunities and community interests;
- research and analysis exploring technical and business conditions appropriate for unique needs of the area;
- preparation of this draft report;
- feedback from interested parties on the draft;
- final report completion and distribution;
- on-going technical assistance, due diligence, business site specification and financial planning leading to implementation.

Initially, this report is being issued to the Illinois Valley Community Response Team which has voiced an interest in the findings. More than thirty participants from the Illinois/ Lower Rogue River area (including local government officials, community leaders, and business representatives) shared their time, experience and expertise with the research staff in the preparation of this report (see Appendix B).

2. CREATING CLOSED LOOP ECONOMIES THROUGH WASTE-BASED ECONOMIC DEVELOPMENT

Throughout the U.S. our "use and discard" economic system generates many environmental problems. For example, tons of waste are buried or burned daily and the environmentally benign landfill and incineration sites are tapped out. This has forced the use of sensitive sites (e.g. landfills associated with wetlands, dense population, airsheds). Many landfills will continuously leak contaminants as many buried materials include fossil fuels, CFCs and other toxins. Similarly, untold amounts of toxins continue to accumulate in the atmosphere due to incineration. In addition, while we bury or burn tons of materials, we continue to cause extensive environmental damage by extracting more virgin metals, minerals, wood and other resources from our landscapes for use as production feedstocks.

This same system has created a number of economic problems nationwide. For example, the financial burden on households is skyrocketing as disposal tipping fees and taxes increase to maintain sensitive landfills and incinerators. Environmental restoration costs mount while we simultaneously continue the resource extraction and waste disposal practices that cause the problems in the first place. At the same time, thousands of low income people need non-subsidized jobs as government cuts back welfare and social service programs. Many of the materials being buried or burned could be turned into viable products by businesses. However, our current system fails to promote the use of waste as an economic resource, thus exacerbating economic and environmental woes. The source and nature of jobs is, of course, a central issue, since the need is to create jobs that provide livable wages, add value to the community and protect the environment. The approach proposed in our project focuses on communities internalizing jobs derived from the waste stream. The approach of creating jobs and community benefits through the reuse of society's castoffs (waste) is well established. For decades charities have taken donated and discarded clothing, redistributing it to needy member of the community. What differs in our approach is the creation of job generating, self-sufficient businesses based on the value-added reuse and remanufacturing of waste into value-added products and services to meet specific niches in the marketplace.

We have developed a unique approach to Sustainable Community Development within economically distressed rural communities and urban neighborhoods: The job creation through waste-based economic development within Community Development Corporations (CDCs) and other non-profit Community-Based Organizations (CBOs). We believe that waste-based business enterprises can be linked with affordable housing

and land and water conservation programs to the benefit of the community and environment. The approach seeks to integrate and leverage jobs, housing and conservation resources for the benefit of all. This a true Sustainable Community Development strategy.

Our Sustainable Community Development approach places CDCs and CBOs at the center of effort to establish long-term jobs, affordable housing and conservation programs within their community. . CDC/CBOs have long known that affordable housing alone is an inadequate response to the low-income needs of a community. Job creation is also needed to provide rungs on the economic ladder to assure community vitality. Likewise, without affordable housing, low income populations cannot take advantage of many job opportunities. Similarly, conservation interests have come to appreciate the need for viable economies and communities to ensure long-term environmental health. To address these issues, locally generated stable employment is needed to foster environmental and community health. The basic building block, then, to sustainable communities is jobs.

The source and nature of jobs is, of course, a central issue, since the need is to create jobs that provide livable wages, add value to the community and protect the environment. This approach focuses on CDCs/CBOs internalizing jobs derived from the waste stream. The approach of creating jobs and community benefits through the reuse of societies castoffs (waste) is well established. For decades charities have taken donated and discarded clothing, redistributing it to needy members of the community. What differs in our approach is the creation of job generating, self-sufficient businesses based on the value-added reuse and remanufacturing of solid, industrial waste or (agricultural/forestry waste) into value-added products and services to meet specific niches in the marketplace.

Local and regional waste streams offer numerous opportunities for CDCs/CBOs to access materials that can be turned into viable products. Many of these sources are very familiar to the thrift industry, such as clothing, housewares, bedding and appliances. For numerous reasons the private sector has in the last two decades ignored this source of waste as potential marketable products. This is largely due to the high cost of acquiring goods from curbside pickup, the traditional manner for thrifts to acquire goods. Curbside pickup creates high labor costs, and in highly urbanized areas curbside access to remove appliances and other hardgoods has made it difficult to access the materials for the use by thrifts. Yet the need and opportunity to reuse and recycle these items has not diminished. Rather, as the thrift system has abandoned collection of these goods, municipal waste systems have become, by default, the recipients of the materials. This huge waste results in a significant opportunity to collect materials from the waste systems which can be turned into marketable products and services.

3. BACKGROUND ON JOSEPHINE AND JACKSON COUNTY

A. Unemployment, Underemployment and Welfare Reform.

The region suffers from a very high unemployment rate of about 30% in the Illinois Valley with an unemployment rate for 1997 at about 8.8% in Josephine County and 7.6% in Jackson County. These figures are high compared with the State of Oregon's jobless rate which is projected at 5.4%.

There is also high underemployment, although the rate has not been documented. Recently passed welfare reform legislation may make the current employment situation more difficult, given that former recipients will now have to find employment to maintain their benefits.

B. The Need for Community Cohesion in the Development of Waste-Based Enterprise Development

To the researchers there appears to be little agreement as to the direction the local economy should move or the types and size of businesses the community wants to establish in the area. Divergent views on each of these issues appears strong. In no other community in which the researchers have worked have we experienced the level of personal acrimony for new ideas or proposals as we did in the Illinois Valley. The lack of cohesion may make it difficult to develop an economic development strategy based on closed-loop business opportunities. Until some level of consensus can be reached, expanding or stimulating new waste-based businesses in this area may be limited.

On the other hand, if the community can resolve its differences, waste-based enterprises can make a significant contribution to expanded employment and entrepreneurial opportunities in the area due to the fact that they are labor intensive. For example, just processing and sorting recyclable materials sustains 10 times more jobs on a per-ton basis than landfilling or incineration. Making new products from the old offers the largest economic development benefits in the recycling loop. Waste-based manufacturers can create more than 20 times more jobs than disposal; these jobs often represent high-paying, skilled industrial jobs. About 20% of the nation's municipal solid waste consists of reusable items. Some waste-based operations create 200 jobs for every one job at a disposal facility. Thus, waste-based economic development can be a significant employment growth sector for the Lower Rogue/Illinois Valley if the community could agree on the direction it wants to take.

4. RECYCLING AND WASTE MANAGEMENT IN JOSEPHINE AND JACKSON COUNTY

In 1991, the Oregon Legislature set a statewide 50% material recovery goal by the year 2000 and individual county recycling goals for the year 1995. The goals for Jackson and Josephine Counties in 1995 were 25%. This goal was exceeded by both counties in 1995 and 1996. The 1996 recovery rates show Jackson County exceeded its goal by 9% and Josephine County exceeded its goal by 13%. Jackson County has the sixth highest recovery rate in the state of Oregon and Josephine County has the third highest recovery rate.

County Population Total Annual Garbage Generated (in tons) Recovery Goal Recovery Rate

Jackson County 168,609 115,011 25% 34%

Josephine County 72,182 35,873 25% 38%

*Population estimates are based on U.S. Bureau of the Census 1996 census data. Annual tons generated, recovery goal and rate are based on 1996 data compiled by the Oregon Department of Environmental Quality and presented in draft copies of the 1996 Oregon Material Recovery Survey.

· Sanitation. There are a total of four hauling companies in the Jackson/Josephine County areas. Within Josephine County there are two garbage/recycling haulers. The one county-franchised hauler is Southern Oregon Sanitation. The City of Grants Pass (which is located in Josephine County) franchises with Grants Pass Sanitation. However, these two companies do have some overlap in their service areas. For instance, Southern Oregon Sanitation picks up some sites within the City of Grants Pass and Grants Pass Sanitation picks up a few sites outside the city limits.

Three haulers service customers in Jackson County. The main franchised hauler for the county is Rogue Waste Systems. The City of Ashland franchises with Ashland Sanitation and Southern Oregon Sanitation services a few rural residents within Jackson County.

Josephine County manages the closed landfill sites and oversees the franchised hauler. The City of Grants Pass has a solid waste engineer who oversees the state recycling requirements, curbside recycling program and the drop-off sites for recycling. The recyclable materials the haulers are required to pick up curbside are: glass (clear, brown and green), cardboard, newspaper, clear HDPE (#2 milk jugs), and oil. They do not offer tin can recycling at this time because Schnitzer Steel takes it and is convenient enough for the community. Additionally, the City has tried to implement the program slowly by adding one material at a time.

Jackson County's franchised hauler also owns and manages the landfill. The County oversees the hauler and the recycling program. The recyclable materials the haulers are required to pick up are the same as for Josephine County except in for plastics. In Jackson County the haulers are required to pick plastics #1-7.

· Landfill Situation. There is one landfill in Josephine County. It is the Merlin landfill which is targeted to close between the years 2000 and 2003 because it has reached its capacity. Previously the land was leased from the Bureau of Land Management, but now it is the City of Grants Pass' responsibility. The tipping fees are around \$75.00 per ton. This money pays for the City's Solid Waste Engineer and the future closure of the landfill. Currently, there are two landfills in Jackson County: the South Stage and Dry Creek landfills. The South Stage will be closed by the end of 1998 for not only capacity reasons, but for minimal environmental concerns, as well. That leaves Dry Creek landfill as the only facility in the area for garbage disposal. Rogue Waste Systems owns and operates this landfill and is constructing a new lined cell which has a 60-100 year life

expectancy. The tipping fee at Dry Creek is considerably less than at the Merlin landfill. It costs around \$30.00 per ton for disposal.

5. OVERVIEW OF EXISTING CLOSED-LOOP ECONOMIC DEVELOPMENT PROGRAMS.

Closed-loop activities are taking place in the Illinois/lower Rogue River region. The following descriptions are representative of the activity in reuse and recycling:

- J & R Reduction. Presently, J & R Reduction processes and shreds tires for transport to Yreka, California. Owners of J & R Reduction are working cooperatively with the City of Yreka to utilize the municipal solid waste (MSW) generated in the area to blend it with the shredded tires from J & R to produce a very strong material that can be manufactured into products such as floor tiles, sea walls, and sound deflection walls. It also has the potential to be manufactured into more products, but has to pass extensive strength testing first. The MSW, which is 92% fiber, is first cleaned and deodorized. The tires are ground down to dust and become the binding agent for the MSW. The two are blended into phluff (which comprises 80% MSW and 20% tire) and put into a compression chamber. The result is what they call a carbonizer block. J & R Reduction's owner claims they will be able to collect 75-80% of all tires in Southern Oregon and 60% of all tires in the state of Oregon when all the plants are up and running.

- SPARC Enterprises. SPARC is a nonprofit organization that employs people with developmental disabilities. The mission of SPARC is to provide services to the community to enrich the lives of the people that work for them. Among other services SPARC provides, it operates a facility that receives recyclable materials for cleaning, baling and shipping to various mills around the state. Additionally, it provides, free of charge, office paper pick-up services; confidential paper shredding services and pick-up; and drop-off sites for newspaper recycling to businesses in the Grants Pass and Cave Junction areas. Further, SPARC contracts with two main sanitation companies to pick up milk jugs and cardboard from businesses and residents around the county. SPARC estimates that they capture 1,518 tons of newspaper (which is 35% of DEQ reported tonnage for newspaper), 323 tons of ledger paper (30%), 37 tons of milk jugs (24%), and 2,186 tons of cardboard (15%) each year.

- Biomass One. Biomass One is a wood fired cogeneration plant which converts wood waste into energy. Specifically, it converts the waste into electricity and steam. The electricity is sold to Pacific Power to supply over 20,000 homes with power and the steam is sold locally for the drying of lumber and veneer. It receives various kinds of wood debris including land clearing material, demolition waste, pallets, tree trimmings and slash. Annually, Biomass One recovers 355,000 tons of wood waste from the area. The process is a clean alternative for wood waste disposal in southern Oregon and Biomass has made a commitment to being a good neighbor.

- Illinois Valley High School. The Illinois Valley High School is pro-active in the community in regards to recycling. They provide drop-off sites to the community of

Cave Junction for three recyclable materials (office paper, magazines and newspaper). In the past they have tried to include cardboard, steel "tin," plastic bottles and glass. However, they have not been successful in finding a company that will pick-up and recycle these materials for them. At one point the high school collected hundreds of plastic milk jugs and flattened tin cans which were stored in the school barn, but because no company would take the materials they were disposed of with the garbage. Currently, they have a whole barn full of cardboard waiting for someone who will recycle it. They recycle 24-36 tons of magazines and newspaper and twenty 55 gallon drums of office paper each month. Southern Oregon Sanitation takes the magazines and newspaper and SPARC takes the office paper.

- NaturTech Composting Systems. NaturTech manufactures easy-to-use, containerized, in-vessel composters that can handle all types of solid waste, even biosolids. The system involves low capital outlay, low operating costs, and leachate prevention. A 4-ton per day composting system package includes software, computer, license, air management system, wiring, operations manual, four composting containers, biofilters, delivery, installation, and staff training. Customized recipes and electronic scales are used to obtain a proper mix of materials, moisture level, and porosity.

- Schnitzer Steel. Schnitzer Steel offers recycling of ferrous and nonferrous metals which includes metals such as appliances, copper, brass, stainless steel, steel, aluminum, tin cans, compressors, electric motors, automobiles, tanks and so on. Schnitzer is capturing around 40-45% of all nonferrous metals in the area and believes about 90% is captured overall by smaller metal recyclers who either bring the metals to Schnitzer or drive them to Portland or south for better prices. Of the ferrous metals they believe they are capturing about 85% in the area. They offer a drop box service to larger industrial customers and drop-off availability for smaller generators.

The following factors are also important in the development of reuse and recycling strategies:

- Illinois Valley Community Response Team. In 1985, the Illinois Valley Community Response Team was developed as a result of the federal government's plan to stimulate economies in areas of high poverty level. There are two community response areas of interest: the Suny Wolf team which focuses development in and around Merlin and the Illinois Valley team which focuses its efforts in the Cave Junction area. A list of strategies and action plans have been determined as part of the Response Teams Strategic Plan for Community Development. The categories that have been targeted for community development include business development, education, environment, families and youth, health, housing, and public infrastructure.

- Rendata Corporation. Rendata Corporation owns a large industrial park in Merlin, Oregon and currently have four commercial tenants. Formerly, this was the site of a saw mill and Rendata purchased the land and buildings in May of 1996 for rehabilitating. Rendata will renovate the buildings for any new company coming in. There is room for one million square feet of building space and presently 330,000 square feet is under

cover. They encourage businesses that utilize recycled or reused materials to locate at the industrial park.

6. WASTE STREAMS NOT BEING RECOVERED OR BEING MINIMALLY RECOVERED.

This list was compiled by the individuals CWCH researchers interviewed. The researchers believe that more materials are being recovered at some level. However, compared to other communities in which we have worked, we found it very difficult to obtain good information on the quantities, types or qualities of recycled materials:

Appliances: Currently, Schnitzer Steel is handling appliances. They strongly recommend professional freon removal and a certificate of removal. If a person does not remove the freon, Schnitzer will charge a \$15.00 fee and remove it themselves. Schnitzer believes 90% of all freon in appliances is removed properly. They believe they are capturing almost all of the appliances generated in the area since the landfill will not take them anymore.

China cups, plates, bowls: There is no market for broken china and no estimation of quantities landfilled.

Construction and Deconstruction waste: Biomass One takes construction debris at the cogeneration plant. We do not know the percentage Biomass thinks they are capturing.

Fish Waste: There is potential for processing fish waste into liquid fertilizer for farms in Southern Oregon. There is an estimated 100 million pounds of fish waste generated on the Oregon coast and less than 1% is being utilized. There are possibly other products that could be made out of this fish waste. For example, methane gas is a bi-product of fish waste. Additionally, it was indicated that there are other chemicals that can be extracted from it.

Food waste: DEQ indicated there is nothing being done about food waste locally. However, nearer to the coast some pig farmers have collected restaurant waste to be used as feed.

Furniture/carpet/mattresses: This is a problem area, but it is not known how much is generated or disposed of in the area.

Glass: This is a highly problematic material to recycle. For glass that does not have any value (mostly the green and brown glass) DEQ has allowed recyclers to store it at the landfill and use it as road bed.

Hazardous Materials: There is no reported quantities in DEQ's material recovery survey for the Lower Rogue River region. Residents can save household hazardous wastes to recycle on a specified day in May.

Landclearing materials: Biomass One takes landclearing materials at the cogeneration plant. The quantities are not known.

Low quality fabric: 62.8 tons of textiles are being recovered in Jackson and Josephine counties per year.

Plastics: Only Jackson County offers recycling for plastics #1-7, but since only 732 tons (most of it from #1 PET beverage containers) are recycled each year in Jackson and Josephine Counties there is probably room to recover more. However, it is not estimated what percentage is generated in the area.

Plastic wrap (visquin): Currently, there is no market for plastic wrap and it is not included in the Oregon Material Recovery Survey.

Porcelain: The only county in Oregon recovering porcelain was Jackson County. In 1996 they recovered 8.9 tons (.108 lbs per capita) of porcelain.

Tires: J & R Reduction, Rendata Corporation and Scott Burns are recovering tires in the Lower Rogue River region. The 1996 Oregon Material Recovery Survey estimates that in Jackson and Josephine counties 3,506 ½ tons of tires were recovered.

Yard debris: Jo-Gro and Biomulch in Kerby accept used lumber and clean yard debris such as grass clippings, leaves, branches, etc. Biomass One collects yard debris, as well.

7. POTENTIAL OPPORTUNITIES TO ESTABLISH OR EXPAND CLOSED-LOOP ECONOMIC DEVELOPMENT

A. POTENTIAL BUSINESS ENTERPRISES FROM SOLID WASTE MATERIALS

The research team focused on categories where (1) an existing business can be expanded, (2) a new business can be attracted, and (3) infrastructure changes could reduce business or government operating costs. We found that there were a number of potential projects in each of these three categories.

We also found that the greatest potential for expanded waste-based enterprise development was not with DEQ-mandated materials, but with yard debris and wood pallets; and we found that the best option for these materials was local use, rather than increased collection of mandated materials and shipment to the Portland Metro area for marketing.

Likewise, the research team found that local uses of glass are superior to shipping to traditional markets in Portland. Traditional markets pay very little for glass and all local haulers are losing money in their mandated glass programs. The research team is currently gathering data from various jurisdictions which have used glass as a road bed material.

B. NEW BUSINESS ENTERPRISES

We have identified real companies in each of the fields below. However, to protect their confidentiality, the companies are listed simply by representational letters.

HDPE Plastic Market Coop and/or Manufacturing Plant

Regional markets for HDPE (milk and water jugs) have been discovered by recyclers in other parts of Oregon. For example, a hauler in Hood River assembles truckloads of this plastic and ships it to a Portland processor, which in turn ships the material to the Garten Foundation in Salem. The materials are sorted in Salem and shipped to processors and end-users in California or to the Pacific Rim.

The key to this hauler's ability to market HDPE at prices that provide a profit margin is quality control. The shipments to Portland do not have to be re-packed because of the consistently high quality and absence of contaminants. About 100 tons of material are shipped annually.

Two potential enterprises are based on this information:

(1) Franchised haulers in the Illinois/Lower Rogue area could form a cooperative marketing arrangement to ship their HDPE materials. Alternatively, a hauler can develop their own operation, and accept high quality loads from the other franchised haulers and ship them to the Garten Foundation or the Portland metro area.

(2) An HDPE processing and manufacturing plant could be attracted to the region. Company A is one such company that has been operating at a profit from a rural location in Spickard, Missouri. The company imports baled, post-consumer HDPE bottles (milk and water jugs).

Company A uses a system that efficiently grinds the plastic into flakes, washes and dries them, and then stores the flakes for later use or for sale to other manufacturers. End-products are made using one of three technologies: (1) vacuum forming, (2) extrusion, and (3) rotational molding. These products are sheets of plastic that are used as a substitute for wood in pallets and a variety of building applications.

Company A also extrudes plastic profiles in the sizes 1" x 2" and 2" x 4," with varying lengths. It also fabricates these profiles into a variety of products, including furniture. With its rotational molding equipment, Company A has the capacity to produce over 30 products, including gas tanks, water reservoirs, animal feeders, dog houses, buckets, helicopter seats, pans, 18-gallon curbside containers, and 2-cubic yard dumpsters.

Company A needs between 500-1,000 tons per year of baled post-consumer HDPE to operate at a profit. The Josephine County areas may generate about 150 tons per year of this material. However, additional supplies could be obtained from the Jackson county area. According to conversations with solid waste officials in Portland and with the Garten Foundation of Salem, ample materials would be available for a plant in the target region. Alternatively, a plant in another region of the state would support an expanded recovery of the material in the area.

Capitalization for the construction of Company A's plant is estimated at \$750,000, not including land and building costs. About 30,000 square feet under roof and another two acres for outside operations would be needed. Company A would make its technology available and provide start-up, management and market development assistance to an enterprise if there were a local partner to invest in this plant. Approximately 8-10 semi-skilled and skilled machine operator positions would be created.

Below is a profile of Company A.

Company A

Feedstock Used HDPE (milk and water jugs)

Amount of Feedstock Used 500-1,000 tons per year

Feedstock Cost 21-22 cents per lb.

Location of Facilities Midwest

Sales (current year) \$2 million

Maximum Capacity (1 plant/1 shift/1 year) 750 tons

Minimum Capacity for Positive Economics 500 tons

Capital Investment (w/o lot and buildings) \$800,000

Operating Expenses N/A

Number of Jobs per Facility 10-12

Types of Products sheeting, molded products, vacuum formed products

Prices of Product Sold \$1-2 per lb. of recycled plastic

Expansion Plans Interested in new rural sites

Small-Scale Paper Pulping

High- and low-grade papers are being recycled in the southern Oregon, northern California area. and are routinely handled by area haulers. This material is valued from \$20 to \$125 per ton, minus the cost of transportation to markets. Company B of New Orleans offers a new technology that pulps 30 tons of material per day into 25 tons of market pulp. Current market prices for pulp are \$525-800 per ton, providing sufficient margins to accommodate transportation costs. The unit costs \$5 million outright, but can be purchased through a lease with a \$1.5 million up-front investment. It requires three acres to operate. Company B, which sells the technology but does not operate plants, provides the following services for their clients:

- facility permitting assistance,
- business planning assistance, and
- market development, including trials of pulp with potential purchasers, obtaining letters of interest from cellulose insulation, molded products, fiber board prior to investment in the plant. In other words, the pulp would be pre-sold pending development of the plant.

The plant would eventually create 8-10 skilled jobs. Pulp manufacturing has a very high multiplier impact of 10-15. This means that the 8-10 jobs in the plant could impact from 80-150 indirect jobs in the immediate area of the plant.

An entrepreneur in the Hood River area is pursuing the development of the small scale paper pulping business in the Columbia Gorge. This individual was successful in obtaining a grant to complete market business feasibility studies. However, Company B has voiced an interest in establishing another plant in Northern California. It is possible that a southern Oregon location close to the I-5 corridor would do.

Below is a profile of Company B:

Company B

Feedstock Used all grades of paper

Amount of Feedstock Used 30 tons per day

Feedstock Cost \$5-80 per ton

Location of Facilities Mid West, South East

Sales (first year) n/a

Maximum Capacity (1 plant/1 shift/1 year) 30 tons per day, can build multiple units

Minimum Capacity for Positive Economics 30 tons per day

Capital Investment (without lot and buildings) \$5 million

Operating Expenses n/a

Number of Jobs per Facility 8 10

Types of Products paper pulp

Prices of Product Sold \$400 - \$750 per ton

Expansion Plans interested in plants throughout the US

Asphalt Roofing Recycling

Company C recycles asphalt roofing. This company has a facility in the Willamette Valley and has voiced interest in expanding and opening a collection and transfer station in the Grants Pass area. Company C collects used asphalt roofing shingles and recycles the material for use as roadbed substrate and other uses. They need a population base of roughly 50,000 to be profitable, which the Grants Pass/Medford area would provide. They would need 3-5 acres located near I-5 to make the site cost effective. There would be no materials processing at their site, just collection and transfer.

Company C needs a grant or low interest loan of \$10,000 to \$25,000 to open a collection site. These funds would be used to lease and prepare the facilities, for the purchase of a trailer and front end loader, and for market plan development. At least one full time person would be hired at approximately \$12 an hour or \$2,500 a month to operate and manage the site, handle accounts and collection etc.

This enterprise would benefit the community by diverting a large amount of roofing construction material from local landfills and provide at least one well paid full time job.

Wood Pallets

A number of companies can be located in the area that would add value to the abundant supply of wood pallets. In 1994, a nonprofit local development corporation created Company D, a for-profit reclaimed wood manufacturing business. Company D receives discarded wood shipping containers and pallets, reclaims and remills them, and makes new solid wood products. The enterprise has three operating divisions: (1) pallet making, (2) reclaimed lumber sales and distribution, and (3) furniture, flooring, and specialty building materials manufacturing.

Company D has pioneered a unique system to produce high value-added products from wood pallets: flooring, butcherblock tables, bookshelves, and other furniture. Its flooring gives the raw material a market value equivalent to \$1,200/ton; its furniture gives the raw material a market value of \$6,000/ton. In contrast, a ton of wood ground into chips and used in fiberboard brings only \$30/ton.

In addition to producing goods from reclaimed wood, Company D aims to advance the mission-driven values of its parent organization: (1) attract private capital to the community, (2) create blue-collar jobs and training opportunities, (3) help local business and government reduce disposal costs, (4) divert waste from landfills and incinerators, (5) conserve forest and timberland, and (6) protect the environment. The parent organization is working to meet these goals by operating a woodworking job training program, providing participants with basic environmental and recycling education and preparing them for entry-level jobs in the local wood products manufacturing industry. In its first year, 22 training program graduates were placed. In addition, every 100,000 ft² of flooring produced by Company D saves local businesses \$35,000 in waste disposal costs, diverts 135 tons of waste from disposal, creates 7,300 hours of work for its employees, and, based on the use of virgin materials, conserves one billion BTUs of energy and 22 acres of forest.

The Process

Company D receives discarded pallets from local businesses. Many of the pallets received each year are refurbished and sold back to these businesses. This part of the operation—representing closed-loop recycling—uses conventional pallet repair techniques.

Company D's distinction in the field, however, lies in its pallet remanufacturing process, which upgrades discarded pallets into high value-added products. In response to the wide range of incoming wood and the variety of finished products, the system is designed to be flexible; it is labor intensive, optimizing the quantity and quality of the reclaimed wood, and minimizing the capital equipment cost.

Using conventional equipment and techniques in a proprietary manner, the system denails, joins, planes, sorts, grades, reclaims, remills, and dries the discarded wood to make finished products from oak, maple, pine, cherry, mahogany, and other types of wood.

Other Information

Company D is soliciting expressions of interest and qualifications from companies interested in licensing its system. The license privilege includes access to Company D's know-how through technical assistance, feasibility analysis, business plan preparation, and a managerial training program. Prospective licensees must have business experience with at least one of the following:

- (1) recycling, reprocessing, or remanufacturing operations
- (2) sale, distribution, or manufacturing of pallets; or
- (3) sale, distribution, or manufacturing of flooring, furniture, or wood products.

Below is a profile of Company D:

Company D

Feedstock Wood pallets of any size; also chokes, skids and crates

Amount of Feedstock Used 180,000 pallets/year (3,600 tons/year)

Feedstock Cost Suppliers pay a service fee averaging \$0.75/pallet. If they repurchase pallet after repair, the fee is waived.

Collection Strategy Most pallets are delivered to sites, occasionally Company F will pick up loads

Service Area 50 mile radius for pallet repair operation, value-added products have national market

Location of Facilities 2 sites in Bronx, NY

Years in Business Since May 1994

Sales \$1,000,000 (within three years)

Capital Investment \$1.5 million in initial capital; 30,000 ft² building with exterior yard space

Operating Expenses n/a

Number of Jobs 20 (includes production and management)

Operating Schedule 1 shift/day, 52 weeks/year

Products Rebuilt pallets, furniture, flooring and other value-added products

Price of Products Pallets ranges in price from \$2.50-6.00; Furniture ranges from small pieces, which wholesale for \$75, to large pieces, which sell under contract for \$2,000; Flooring sells to contractors for \$1.50-1.85 per ft²

Company E is a wood waste recycling and disposal company that started in 1984. It primarily processes wood pallets, crates, and housing debris. The majority of its wood comes from commercial facilities, such as warehouses and manufacturing operations. The company also accepts bale cardboard and bale plastic, which is then sent out for further processing and recycling. It processes 18 tons of steel per week, which is then resold.

Company E accepts 600 tons per week of waste materials. Most of the waste is picked up by truck; however, some wood waste is dropped off on-site. A tipping fee of \$4.50 per cubic yard is charged for this service. Company E does not handle very much construction & demolition debris because the area landfill price for this material (\$25-

28/ton) is not high enough to generate any incentive for companies to seek alternative disposal methods.

Company E processes all of its wood waste on-site. It converts the wood waste into rebuilt pallets, and grounds all remaining wood for sale as boiler fuel. The company does not generate any waste streams. Their facility is located on a 7-acre site.

Company E is very interested in expanding their operations. Replicating their current facility would cost approximately \$1.5 million (including operating expenses). First year sales should exceed \$1 million, and the plant would employ 30 people.

Below is a profile of Company E:

Company E

Feedstock Wood pallets, crates, housing debris (other materials including steel, cardboard, plastic)

Amount of Feedstock Used 600 tons/week

Cost for Feedstock Charge a tipping fee of \$4.50/yd³

Collection Strategy Pick up loads with truck, some materials dropped off on-site

Location of Facilities 7 acres site in West Point, VA

Products Produced Rebuilt pallets, boiler fuel

Capital Investment \$1.5 million (included operating expenses)

Jobs Created 30

Revenues \$1 million/year (first years sales)

Re-Use Enterprise

Re-use of commodities has a far greater beneficial impact on the waste stream than traditional recycling of glass, metal, or paper, which must be processed into new products. The reusable portion of the waste stream is bulky, and occupies an estimated 5% of landfill space. Furniture, construction materials, appliances, computers, bicycles and motors are parts of this re-use stream.

Re-used commodities are recaptured at their highest value. They may have to be repaired, but do not have to be broken down and re-manufactured. Small businesses and do-it-yourself repair projects benefit greatly from re-use enterprises as they can obtain commodities in good condition at a fraction of their original cost. Often commodities no longer available in the market place are available through the re-use enterprise.

Re-use enterprises can either be for-profit or not-for-profits. They train and employ workers and provide skills training allowing for increased wages. Research by the Self-Reliance, Inc. has identified nearly 100 re-use operations nation-wide. Most are non-profit enterprises which, for start-up costs, need financing from foundations or government grants.

Company F is one of the for-profit enterprises. It is a private company based in a large metropolitan area in California, and is a pioneer in the field with 25 years of experience in the collection and marketing of used commodities.

The company has incentive packages for employees providing for (1) base wage rates, (2) bonuses based on trading, and (3) a year-end bonus based on the company's overall performance. Further, the company has developed working relationships with local governments whereby it pays no rent for the use of public land, but pays a fixed percentage of its profits to the sponsoring local jurisdiction.

Recently, Company F has been engaged to design a re-use system for a community of 60,000 people. This population base is similar to that of the Josephine/Jackson county area.

Total capitalization is estimated at under \$100,000. This cost is based on arrangements for sites from the three counties in exchange for a share in future profits.

Below is a profile of Company F:

Company F

Feedstock Used used appliances, furniture, computers, building materials, tools, art, music, household and office furniture, bicycles...

Amount of Feedstock Used 5-10% of local waste stream

Feedstock Cost \$250,000 in purchasing; feedstock donated, traded and purchased

Location of Facilities California

Sales (current year) \$1.6 million

Maximum Capacity (1 plant/1 shift/1 year) n/a

Minimum Capacity for Positive Economics n/a

Capital Investment (without lot/buildings) under \$100,000

Operating Expenses up to \$1.6 million

Number of Jobs per Facility 26 FTE. Small, rural area facility to employ 4-5 people.

Indirect effects on employment

Types of Products Same as feedstock used above; clean and recycle broken glass, scrap and salvage to prevent landfilling of these materials add value

Prices of Product Sold varies

Expansion Plans Currently doing site planning for facilities to serve populations of approximately 60,000; wants to expand to many more sites.

Company G is a non-profit community development corporation located in the Willamette Valley that operates very sophisticated reuse operations. They operate thrift stores as well as recycling and remanufacturing operations (refrigerators, washers, dryers, glass and other commodities). Company G has voiced interest in providing technical assistance to a local non-profit in the Illinois Valley/Lower Rogue that wishes to establish a reuse operation or other waste-based businesses.

Garnetting Factory

A garnetting factory reprocesses post consumer textile waste or their by-products (discarded second hand clothing and other products that consumers no longer need and decide to discard due to wear, damage etc.) into the original product stream or into new useful end uses. Because the production of nonwoven fabrics require less fiber, labor, equipment, time and money that the production of woven or knitted fabrics, most reclaimed fabrics are used in nonwovens rather than reconstructed into woven or knitted products. Textile companies have found nonwovens to be a profitable way of reusing used fiber.

Company H contracted for a feasibility study on the potential of establishing a garnetting factory. Their intention was to establish their own company somewhere in the Willamette Valley. The study found that the current markets for recycled fibers are just beginning to blossom and the increased public awareness of environmental issues and conservation of resources is certain to increase the interest in and value of the use of recycled materials for many products.

The Company H feasibility study identified five product areas that they consider suitable for application of the secondary fibers that Company H has access to: carpet cushions, home insulation, polyester stuffing for pet products, clean-up products and mattress pads. The study recommended that due to the characteristics of the recycled fibers and the current market, it is better to use the secondary fibers in a variety of fiber applications rather than focusing on a single product. After the materials are collected and transported to the factory, the clothing is shredded and used in any of these five products.

To operate a garnetting factory profitably, it is important to have a reliable and efficient collection and transportation system, and to operate the factory in a systematic and organized manner. Due to the nature of their business and long history of success in the collection and reprocessing/reuse/recycling of products from across the west, these are attributes that Company H provides extremely well.

A complete garnetting plant would cost between \$2 to \$3 million, depending on the type of equipment purchases etc., and create 15-20 jobs.

At this point however, Company H is not interested in operating this facility. They are therefore willing to partner with or sell the business proposal to a non-profit organization or a local entrepreneur in exchange for the following:

- a. Company H is hired to provide the consulting services needed to aid in the set up. This includes an initial feasibility study to determine the likely success of a garnetting facility in the Illinois/Lower Rogue Area, the number of jobs it would create, a land/facilities site assessment etc. Company H would prepare the information for the community to review before moving forward with full-blown business planning. Costs for this will be \$10,000 to \$12,000. These funds could be secured through a grant or other source.

b. Company H would have the right of first refusal to supply the raw material for the plant.

c. Company H would have the right of first refusal to be able to contract for the rights to distribute the end products and to use the materials in their own stores and housing operations.

C. INFRASTRUCTURE IMPROVEMENTS

Companies I, J and K. Some operations would improve the infrastructure of the current solid waste management system while at the same time paving the way for ongoing enterprises. One operation involves using a crusher to process mixed glass. The processed glass can be used as an aggregate for construction building materials and road beds. Also, Deschutes County, Oregon is experimenting with processing glass into a fine sand and using it in the County's water treatment system. Contacts for using crushed glass as an aggregate are: Linda Hayes-Gorman, Oregon Department of Environmental and Deschutes County, and Justin Browson, Babcock Bros. Construction Company.

Company I provides businesses, communities, and governments with the technical expertise to establish a scrap tire recycling program. The program outlines the use of whole tires or shredded tire pieces integrated with concrete to manufacture building products used in civil engineering applications, including dams, prisons, and other major facilities. The program incorporates the principles of local ownership, economic development, environmentally sound manufacturing practices and materials efficiency.

The patented recycling technology is linked to the customer by a licensing agreement. The benefits are patented building products of economic value and a comprehensive recycling program that may create jobs, job training, and may establish a community resource conservation program.

Below is a profile of Company I:

Company I

Feedstock Used scrap tire or tire pieces

Amount of Feedstock Used 1 ton (120 tires) for each standard block

Feedstock Cost The company receives money to dispose of material from the state.

Location of Facilities Facilities not necessary. Machinery is very mobile; tires baled on site of where tires are located and construction site.

Sales (first year) approximately \$6 million

Maximum Capacity (1 plant/1 shift/1 year) n/a

Minimum Capacity for Positive Economics n/a

Capital Investment (without lot and buildings) approximately \$100,000

Operating Expenses

Number of Jobs per Facility 3 per shift for baler

Types of Products concrete building material used civil eng. applications

Prices of Product Sold based on region and application; distance of material from project
Expansion Plans interested in leasing its technology nation-wide

4. AGRICULTURAL AND FORESTRY WASTE MATERIALS

A. FORESTRY WASTE

Established in 1984, Company J produces fuel oil primarily from wood waste. The company operates three facilities, one in Manitowac, Wisconsin (Red Arrow Products, Ltd), and two smaller plants in Ontario. The Manitowac facility uses Company J's patented Rapid Thermal Processing technology to process approximately 8,000 dry tons of waste wood per year (16,500 wet tons per year) into 1,200,000 gallons of Bio-Oil (comparable to fuel oils). In fact, the primary product from Red Arrow is hydroxyacetaldehyde, a food flavoring agent, and the bio-oil is used to power to the facility.

Rapid Thermal Processing (RTP) heats the dry waste wood to between 400° and 900° Celsius for about a half second at ordinary atmospheric pressure with no oxygen. The rapid heating of the biomass causes fragmentation of the chemical structure ("cracking" the chemical bonds) thus producing the liquid Bio-Oil. Rapid cooling prevents the completing of chemical reactions, therefore preserving the liquid state. There is no waste stream generated with this process. Approximately 74 percent of the resulting product is liquid Bio-Oil, 15 percent is char (which can be processed into activated carbon), and 11 percent is gas. Bio-Oil is comprised primarily of water, depolymerized lignin, carbonyls, and smaller amounts of carboxylic acid, carbohydrates, phenolics, and alcohol.

A minimum-capacity plant, producing only fuel products, would transform 36,300 dry tons of waste into 5.3 million gallons of bio-oil each year, and would cost approximately \$4.5 million. Nine direct jobs would be created. A maximum-capacity plant would transform 90,940 dry tons of waste into 13.3 million gallons of bio-oil each year; data on capital investment and jobs created are not available at this time. Company J does not pay for any of the feedstocks, nor does it charge a tipping fee. Generally, Bio-Oil has half the heating value of light oil but is still considered to be competitive with petroleum fuels on the basis of equivalent energy. For example, a 100 ton/day plant could generate 7 to 8 megawatts of electricity in a direct-fired turbine-enough power to meet annual needs of 400-500 homes.

Liquid biomass fuels, such as Company J's Bio-Oil, have several logistical advantages over solid biomass fuel sources. Generally, they are easier and less costly to transport than solid fuels. Liquid heating oils are the primary source of energy for turbines and diesel generators, and therefore biologically-derived liquid fuels have a vast potential market. According to Company J, current fuel oil-burning generators can be easily modified to use Bio-Oil.

Company J is very interested in expanding their operations into communities with large amounts of wood waste.

Below is a profile of Company J:

Company J

Feedstocks waste wood, sawdust, cardboard, newsprint, ag wastes, pulp sludge, other fibers

Amount of Feedstock Used WI Plant: 8,000 dry tons/year (16,500 wet) yields 1.2 million gallons of Bio-Oil

Cost for Feedstock \$0/ton; no tipping fee

Location of Facilities Manitowac, WI; also 2 plants in Ontario

Years in Business Since 1984

Revenues n/a

Minimum Capacity 36,300 dry tons/year = 5.3 mil gal Bio-Oil

Maximum Capacity 90,940 dry tons/year = 13.3 mil gal Bio-Oil

Capital Investment Minimum capacity plant = \$4.5 million

Operating Expenses n/a

Number of Jobs 9 for a minimum capacity plant

Product Bio-Oil, comparable in heating value to No. 2 Fuel Oil

Price of Product (based on \$/BTU)* Bio-Oil = \$0.27/gal (75,000 BTU/gal) No. 2 Fuel Oil = \$0.48/gal (135,000 BTU/gal)

* These figures are estimates based on the average composition of wood waste.

Company J has expanded into the Southeast. The Southeast Regional Biomass Energy Program (SERBEP), Environmental Resource Services (ERS) of Oklahoma City, and Company J have joined forces to build a plant in Anniston, Alabama to manufacture Bio-Fuel and other value-added products from wood wastes. Wood waste from the surrounding area, including the Anniston Army Depot and Fort McClellan will be processed and the fuel sold back to the Army and other energy consumers to replace fossil fuel. The plant is expected to process 100 tons per day of feedstock. In addition to construction jobs, the new plant will create 30-40 permanent jobs, indirectly create 65-90 additional jobs, and generate over \$300,000 in tax revenues per year.

In addition to saving landfill space, this project can also solve disposal problems for area wood waste generators. The current tipping fee for private landfills in the Anniston area is \$24/ton vs. \$12.50/ton for wood wastes delivered to the city's wood recycling center. Another benefit is the reduction of 1,700 tons of sulfur and 689,000 tons of carbon dioxide emissions from fossil fuel combustion, expected over the lifetime of the plant. In addition, the bio-fuel manufactured in the Anniston area is expected to displace 1.4 million barrels of imported oil in 20 years of the plant's operation. Markets exist in the Anniston area for the fuel, however the Presidential Mandate for federal government installations (including military bases) to utilize more renewable energy is expected to increase the demand for the Bio-Fuel.

Company K uses old pallets, crates, forestry waste, and other sources of dry, relatively clean, wood to produce wallforms. Mineralized wood waste and cement are combined (a patented mix of 91% waste wood and 9% cement) to produce construction forms (8" high, 16" wide, and 8.25" deep, the same dimensions as conventional concrete blocks).

These permanent forms interlock without mortar, and reinforced concrete is poured into the cores. These blocks have a four-hour fire rating and are "practically non-combustible." Because of this, insurance premiums are low for structures using this system. The product is quite "breathable" compared to construction techniques using vapor barriers, thus improving indoor air quality. The wallforms are also a good sound barrier, and is lighter, yet sturdier, than normal concrete blocks.

R values, which measure of the insulation quality of a material, for this product range from 11 to 24, but can be increased by using a slightly thicker block (12" instead of 8.25"), and by placing insulation materials in the subsequent 3" holes in the blocks. The company currently uses extruded foam product insulation containing some post-consumer recycled material; however, because it would like to switch to "greener" products, the company is investigating the use of 92% recycled content mineral wool/fiberglass.

The unit price of the blocks is currently higher than conventional concrete blocks, but the company estimates that the life-cycle savings are 10% in overall costs and 20% in construction costs. Overall costs are determined by energy savings, insurance premium reductions, and construction cost savings. Construction costs are reduced because the product is lighter and easier to work with than traditional poured-concrete foundations and walls, and requires no supplemental insulation material.

At this time, the company utilizes urban wood waste, which is relatively clean and dry (lumber mill residues can also be utilized). According to company officials, two truckloads of pallets and crates can build one modestly-sized home. Cotton residues have also been tested for use as the cellulosic component of this product, but the greatest success has been with waste wood.

Company K's Iowa facility has been operational for about 2 years, and is capable of producing 80,000 to 100,000 square feet of material per month (thickness based on 8.50" x 12" thick wall section). Current production levels are at half capacity. This plant employs approximately 17 people. The Midwest facility licenses the technology from Company K, and takes these stabilized fibers, combines them with concrete, and produces wall forms.

Company K owns the patent and licensing rights to a process which transforms chips into stabilized fibers, known as the K-XÔ Process. In this process, scrap wood chips are hammermilled to the pinch size needed for a particular product (short for roof tiles, medium for wallforms, and coarse for panels). The pinchips are then processed with two mineral solutions to the point where the minerals have penetrated into the fine pores of the wood fiber. The treated pinchips are no longer susceptible to rot or decay because the elements of the wood that cause rot and decay (polysaccharides, resins, oils, and tannic acid) have been sealed within the pores or bound to the minerals. The wood fibers don't lose their positive characteristics including thermal insulating ability, light weight, and workability, but are now in a form that allows them to combine with cement to gain additional important qualities such as fire and pest resistance. The pinchips, now in this

"free aggregate" form can generally be used in the same way as any gravel based aggregate (blocks, slabs, etc.), but due to its light weight, K-X aggregate can also be manufactured into many other products for which heavy aggregate mixtures are ill-suited, such as roofing tiles, sound absorption panels, and insulation panels. The minimum capital investment for this step of the process is approximately \$204,000 for equipment. Approximately 20 jobs are created.

Ideally, if an existing concrete products' manufacturer was interested in expanding their product offering, an investment in the K-X process and new molds could create production capacity for the wallforms. If an existing concrete products manufacturing facility could not be found, an additional \$372,000 would be required for this type of processing equipment. Company officials also estimate approximately \$424,000 in working capital (including inventory), license fees, PR, advertising, and consulting fees are needed. Company K is very interested in funding a new plant by raising equity, not loans, and relying on investors to become shareholders in the company. Currently, K-X Arkansas, Inc. is processing industrial waste wood to K-X aggregate, and is selling this to concrete block plants in the south.

Below is a profile of Company K:

Company K

Feedstock Used Pallets, crates, other wood sources

Amount of Feedstock Used 1996: 50,000 tons in 4 plants

Feedstock Cost \$30-40/ton processed K-X aggregate is \$29.50/y³

Location of Facilities Ottumwa, IA; Little Rock, AR; Austin, TX

Sales (first year) 750,000 f² - 1,200,000 f² of wallforms (2 plants)

Maximum Capacity (1 plant/1 shift/1 year) 2,000,000 f² (2 plants)

Minimum Capacity for Positive Economics 450,000 f²/year (per plant)

Capital Investment (without lot and buildings) K-X plant: \$300,000 wallform plant: \$1,000,000

Operating Expenses \$150,000-450,000 (project dependent)

Number of Jobs per Facility 8-17 per shift (includes sales + support staff)

Types of Products permanent concrete forms, sound absorption and insulation panels

Prices of Product Sold 1 ft² wallform: 8.5" = \$2.20 whsl/\$2.65 retail;

12" = \$2.60 whsl/\$2.95 retail

Expansion Plans Company L is seeking licensees and joint venture partners for new manufacturing facilities for K-X aggregate and wallform products

Company L. An English company with a successful 40 year track record makes and markets a construction product made from wheat straw in Europe and Australia, especially in areas where timber supplies are limited. The company is also a licensor to Company L, which is developing U.S. manufacturing capability at this time and has aggressive expansion plans for the next five years. A facility in Rupert, Idaho began producing the product in fall 1997. In addition, Pierce International is currently working with communities in Utah, North Dakota, Nebraska, Washington and Virginia to site plants. The Virginia facility came on-line in the spring of 1998.

The construction product is intended for non-structural (non load-bearing) applications. Produced in 4' x 8' x 2-1/4" panels weighing approximately 125 pounds and serves as a substitute for interior 2" x 4" and drywall walls. The panels have a 1 hour fire rating, an R value of 9 (which is slightly higher than most interior panels/drywall), and good acoustical properties.

Currently the product is marketed as an interior wall substitution material and as a core for office partitions. An emerging market is flooring. It is currently used as flooring in Europe and is being certified for this application in the United States. Another emerging market is modular home producers. There is a modular home manufacturer who is considering locating next door to the Virginia plant to have a steady, local supply of interior wall material. Mobile home manufacturers are also very interested in using the product, especially since noise is a primary concern among owners. Also, traditional mobile homes have a total fire rating of about 15 minutes, while these panels last four times as long.

The potential for offshoot industries is also very high with these products. Most recently, the archery industry is looking into using the product as targets. Door manufacturers are also looking into the product because of the increased burn time compared to particleboard when used as the core.

A 4' x 8' panel costs \$20.00 to \$25.00, less than or equal to the combined price of normal drywall and 2" x 4" walls. Traditional wall systems cost approximately \$11.00 for the drywall (4' x 8' of drywall at \$5.50 times 2), plus \$13.00 for the 2 x 4s (4 studs times \$3.25 each), for a total of \$24.00. This does not include labor costs, which are much higher for applying drywall than putting a 4' x 8' panel into place. One contractor that uses the product estimates a 25 to 32 percent savings over conventional construction practices. Additional savings arise because the product is more durable than the drywall or veneer paneling thereby reducing replacement costs. The product's flame retardancy can lower insurance costs for some types of homes. There is also savings potential from re-use of the product. To remodel a home you only need to strip the nails and screws from the panel and fill the holes and it can be re-used instead of landfilled.

The product is a heat compressed straw board, using no other resin or adhesive besides the natural lignin. Company L's planned facilities will acquire wheat straw through straw brokers. The facility will use 15 tons of straw per shift per day, at a cost of \$30 to \$35 per ton delivered (potentially rising to \$40 per ton). Again, note that there are custom baling operations available in your region.

A typical plant will cost \$4.0 to \$4.4 million, and will initially employ 35 people. Approximately \$2.4 million of this total is for processing equipment. Company L hopes to reach production levels of five million square feet of the product per year within two years. Thus far, funders for these projects have primarily been private investors and some cooperatives, which also provide straw for production.

Company L licenses an updated technology for the production of the material. In addition, Company M and its parent company offer a complete package of support for 3 to 5 years, including equipment acquisition, training, marketing, technical support, and spare parts. They can provide your community with letters of "intent to purchase" from major construction material suppliers, as well as identifying markets within a 500 mile radius.

Below is a profile of Company L:

Company L

Feedstock Used wheat straw

Amount of Feedstock Used 15 tons of straw per shift per day

Feedstock Cost \$30 \$35 ton delivered

Location of Facilities Iowa, Idaho, and Virginia

Sales (first year) n/a

Maximum Capacity (1 plant/1 shift/1 year) n/a

Minimum Capacity for Positive Economics n/a

Capital Investment (without lot and buildings) \$4 - \$4.4 Million

Operating Expenses n/a

Number of Jobs per Facility 35

Types of Products panels for interior walls.

Prices of Product Sold \$20 - \$25

Expansion Plans Is talking to people in Utah, North Dakota, Nebraska, Washington

7. USING TAX CREDITS TO STIMULATE ECONOMIC DEVELOPMENT

Recycling Tax Credit

The State of Oregon has three recycling tax credit programs that can possibly benefit those individuals and groups interested in establishing waste-based businesses. The Oregon Department of Environmental Quality has a Pollution Control Facility Tax Credit and a Reclaimed Plastics Tax Credit. The Oregon Department of Energy administers a Oregon Business Energy Tax Credit.

These programs differ in purpose, design and process but all provide credit against Oregon tax liability. The purpose is to encourage investment in recycling and enhance the development of the infrastructure for recycling in Oregon.

The Pollution Control Facility Tax Credit is available to owners or operators of equipment or facilities which take material which would otherwise be solid waste and reuse it or recycle it back into a product of real economic value. The amount of credit is based on the value of the eligible claimed equipment and the portion of the value the equipment which is allocable to recycling. Facilities and equipment certified under this program include small equipment such as cardboard balers in commercial locations and

collection bins for residential and commercial recycling. Large facilities which have received tax credits include paper mills, glass container plants, and a variety of large commercial recycling and processing facilities.

The purpose of the Reclaimed Plastics Tax Credit is to encourage the recycling of plastic and the manufacture of reclaimed plastic products. The program provides tax credits for Oregon taxpayers who invest in equipment used to collect, transport, or process scrap plastic for recycling or equipment used to manufacture a product from reclaimed plastic. Recycling equipment certified under this program includes small and medium-sized recycling transportation and processing equipment like trucks, bins, granulators, and washing systems. The tax credit is also available for equipment used to manufacture reclaimed plastic products, including plastic molding and extrusion equipment, molds for specific products, and other handling and manufacturing equipment.

The intent of the Oregon Business Energy Tax Credit program is to conserve energy by increasing recycling. The program provides tax credits for Oregon taxpayers who own specific types of equipment used to process recyclable material. Projects which develop new markets or recycle materials not required by law are eligible. Recycling equipment certified under this program includes small and medium-sized recycling transportation and processing equipment like trucks, balers, and bins. And large equipment associated with processing recyclable materials or manufacturing recycled products like paper, metal, glass, and plastic.

For more information on these tax credit, contact the appropriate state agencies for more information:

Maggie Vandehey
Tax Credit Coordinator
Oregon Department of Environmental Quality
811 SW 6th Ave
Portland, OR 97204
503-229-6878

Sylvia DeLaRosa
Tax Credit Program
Oregon Office of Energy
625 Marion St NE
Salem, OR 97310
503-378-6330

Low Income Housing Tax Credit

The Low Income Housing Tax Credit (LIHTC) was enacted by Congress and is administered, in Oregon, by the Oregon Housing and Community Services Department. It's purpose is to encourage new construction and rehabilitation of rental housing for low

income households. Congress recognized that developers may not receive enough rental income from a low income housing development to cover the costs of developing and operating the project and to provide a return to investors sufficient to attract equity investment needed for development. To spur investment, Congress authorized states, within specified limits, to allocate tax credits for qualifying housing projects. The credits may be shared among owners (equity investors), much as income and losses are shared among business partners for tax purposes.

The amount of the LIHTC that may be awarded is based on the cost of the building (acquiring, rehabilitating or constructing) and the portion of the project that low income households will occupy.

Once credits have been awarded to a developer, that developer typically sells the credit to private investors. The money that private investors pay for the credits is paid into the project as equity financing. The equity financing is used to fill the gap between the development cost of a project and the non-tax credit financing sources available, such as mortgages, that could be expected to be repaid from rental income. The private investors use the credits to offset taxes otherwise owed to the federal government.

Once a project receives a tax credit, the Housing and Community Services Department is responsible for monitoring that project for compliance with state and federal requirements concerning household income, rents, project habitability and resident services.

To apply for tax credits, a developer must submit a detailed proposal to the Housing and Community Services Department which includes, among other things: threshold criteria, sponsor characteristics, financial feasibility, site review, long-term affordability, resident services, and housing need and demand..

8. NEXT STEPS

Our hope that this final report is just the first step in a long-term effort to establish closed-loop economies in the Illinois/Lower Rogue area through waste-based economic development. We are certain to have missed many opportunities to stimulate closed-loop economic development. Hence, the report is intended as the start, not the end, of the process. It should be used to stimulate an on-going conversation and activity by the businesses, communities and residents of the area about how to create and expand closed-loop economic development.

To continue this effort, we recommend the following:

- Economic development agencies and governments should establish technical assistance programs to prioritize, assist and help finance waste-based businesses in reuse, recycling and bioproducts;

- Steering committees should be developed at the community, county, watershed and regional levels to help plan and implement closed-loop economic development;
- "Waste exchanges" should be developed within each community and/or area allowing local businesses, institutions and non-profits to identify and exchange waste materials;
- New policies should be developed at all levels of government to support waste-based business enterprises;
- Local news media should track and publicize not just recycling goals, but the amount of waste diverted, the quantity and cost savings of deferred use of virgin materials, increases in productivity and profitability, and the number of jobs generated through businesses in reuse, recycling and bioproducts;
- The Josephine and Jackson County Commissioners should partner with local governments, the Illinois Valley Community Response Team, Chambers of Commerce, business associations and citizen groups to hold a conference on opportunities for environmentally sound economic development through waste-based reuse/recycling and bioproduct businesses and other closed-loop steps.
- Local entrepreneurs should investigate small scale waste-based business enterprises by identifying waste streams that can be utilized by small operators and which have viable markets.

APPENDIX A

DEQ

Total Tons of each Material Recovered in
Jackson and Josephine Counties for 1996

Material	Tons Recovered	Population
#1 PET Beverage	420	240,791
#2 HDPE Milk Jugs	151.2	
#2 HDPE Other	53.3	
#3 Polyvinyl Chloride	.2	
#4 LDPE	107.4	
#5 Polypropylene	.7	
#6 Polystyrene	0	
Aluminum	1,323.9	
Animal Waste/Grease	871.7	
Antifreeze	N/A	
Cardboard/Kraft	14,208.9	
Composite Plastic	20.4	
Container Glass	2,888	
Fluorescent Lamps	N/A	

Glass Other 2.8
High Grade Paper 1,117.1
Lead Acid Batteries 29.7
Magazines 910.3
Mixed Plastic 6.1
Mixed Waste Paper 395.7
Newspaper 4,387.1
Paint N/A
Phone Books 129.9
Plastic Bottles N/A
Porcelain 5.0
Rubber Tire Buffings 183.4
Scrap Metal 556.9
Solvents N/A
Textiles 62.8
Tinned Cans 115.5
Tires 3,506.5
Used Motor Oil 2,970.1
Wood Waste 28,279.5
Yard Debris 17,877.4
TOTAL 81,329.4 240,791

Appendix A: Lower Rogue River Contact List

People we have contacted: People we have met with:

Mark Amerheim City of Grants Pass 101 NW 'A' Street Grants Pass, OR 97526 Tel: 541-474-6355
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UNDER CONSTRUCTION