SOUTHEAST TENNESSEE MUNICIPAL SOLID WASTE REGION

SEQUATCHIE COUNTY

SOLID WASTE NEEDS ASSESSMENT

Prepared
by

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INTRODUCTION

The Solid Waste Management Act of 1991 (SWMA) was written to avert extreme financial hardships that could have occurred if small local governments were suddenly required to upgrade landfills to meet Resource Conservation and Recovery Act (Subtitle D) regulations. Rules were promulgated by the Tennessee Department of Environment & Conservation to implement Subtitle D included provisions requiring landfill operators to line facilities with impermeable clay and synthetic materials; install leachate collection systems and monitoring wells; and provide thirty years of post-closure care. These were, at the time, extremely expensive changes in the development and operation of disposal facilities, and there was fear in the legislature that some counties would not have a disposal option.

In order to ensure that local governments were protected from high costs and lack of disposal capacity, the SWMA promoted regional landfills, an attempt to guide small counties into alliances with other counties. Theoretically, small counties would form a regional board that would then settle on a disposal site, and each local government would share in the cost of operation. The law even has a provision that would allow local governments to require all entities within their respective jurisdictions to dispose of their waste at the regional landfill. The premise behind the latter concept proved to be unconstitutional (see Carbone vs ClarksCity, U.S. Supreme Court, May 1994). While acknowledging that the flow control provision existed, no county in the State was willing to pledge public funds to facilities that may not receive enough waste to garner the tipping fees needed to meet costs.

During the same period in the early 1990s, the Tennessee Valley Authority was exploring ways to integrate solid waste into fuel supply systems at power plants that had the existing technology to properly combust waste material. One of these plants was located in Kingston, and local officials became interested in combining their respective waste streams, closing most of their landfills, and hauling everything to a waste-to-energy facility.

Engineers working with TVA had prepared studies for other power plants and suggested the Watts Bar site as an alternative because two moth-balled fossil fuel plants are located there. The engineers recommended installing a companion boiler system that would utilize existing infrastructure and reduce the haul distance for all southeast Tennessee counties. Other infrastructure planned for the site included a materials recovery facility (MRF), which would have diverted enough material to meet the SWMA waste reduction goal. This situation was the catalyst for the formation of the Southeast Tennessee Municipal Solid Waste Planning Region, which included all of the counties within the Southeast Tennessee Development District[1].

[1] The Southeast Tenn. Municipal Solid Waste Planning Board is composed of Sequatchie, Bradley, Grundy, Hamilton, Marion, McMinn, Meigs, Polk, Marion, and Sequatchie Counties.

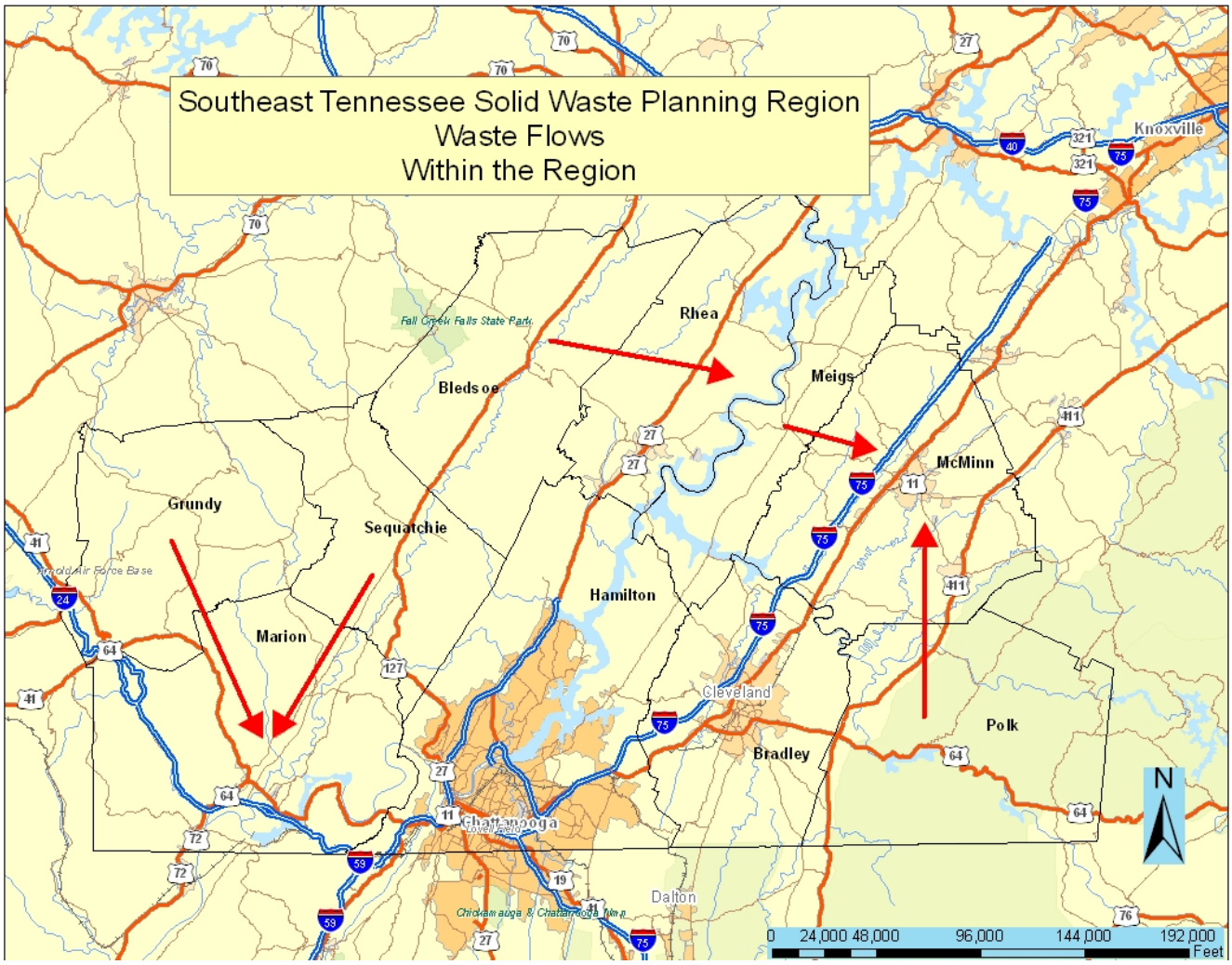
Without the flow control provision, commitments from all counties and cities were vital in bringing this project to fruition.

After the completion of studies funded by TVA, the utility lost interest in the project. No official reason was ever conveyed, but the decision was probably based on the fact that any emissions from the proposed plant would have a potential impact on the Cherokee National Forest and the Smokey Mountain National Park. TVA's involvement in the project was crucial because the utility had existing infrastructure and would have bought the steam produced by the plant. Tipping fees would have been a reasonable $35 per ton, including MRF operations. Without TVA, the Board could not finance a stand-alone facility because tipping fees would have reached $100 or more, far above existing landfill disposal costs.

The failure to implement the waste-to-energy project did not deter the Board from remaining a regional planning entity. Board members were comfortable with the situation and wished to remain together in the event that other regional opportunities arose.

Saving landfill space was a primary goal of the SWMA. Many experts believed early on that the cost per ton of garbage would be in the $40 - $90/ton range at Class I facilities. Consequently, recycling, waste diversion, and saving landfill space became paramount goals. High tipping fees failed to materialize, however, as competition and economies of scale drove down development costs. Subsequently, many cities and counties found themselves with expensive recycling and waste diversion programs. Studies by several jurisdictions showed costs of $280+ to recycle a ton of waste material versus $25-$28 dollars to simply dump it in the landfill. It is no surprise that many cities dropped their recycling programs (they weren't required by law to have one in any case) and shifted most of the burden to county governments, which were required to meet SWMA goals. There was no crises, no shortage of landfill space, and most of the landfill operators were marketing their space to any and all, inside of Tennessee or out, in the region or not. The more waste coming into the landfill, the more money is made for the operators. Few landfill operators were (or are) working diligently to save space; they are generally selling as much space as possible for the best price.

In Southeast Tennessee there are six (6) operating Class I Landfills. SANTEK Environmental, Inc. operates two of these facilities for Bradley and Marion Counties respectively. SANTEK can generally landfill all of the waste that it can attract to either landfill, some of it from Georgia. In return, the counties get reduced or no disposal costs, income from disposal operations, and assistance with programs, including the State's Household Hazardous Waste collection events.



Meadow Branch, a private landfill located in McMinn County, provides disposal for several counties in East Tennessee, including several outside of the region. McMinn County receives a host fee for Meadow Branch, and operates its own landfill, which also accepts waste from outside the region.

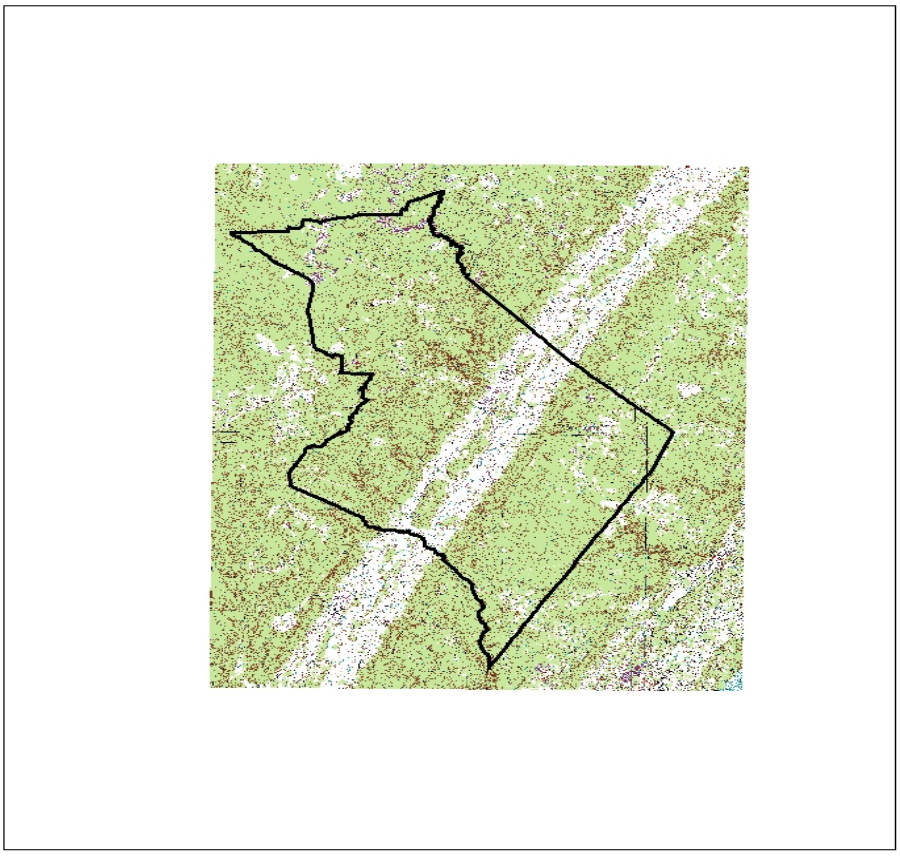
Marion County's landfill is operated by an Authority. Like the other landfills, waste is accepted from any source. In the past, landfill operators have received waste from Dade County, Georgia, Jackson County, Alabama, and both Hamilton and Franklin Counties in Tennessee. The landfill routinely accepts all of Grundy and Sequatchie County's waste.

Chattanooga operates the sixth landfill in the region. It is a facility that originally belonged to Hamilton County, but when the city's Summitt Landfill was closing, the city and county came to an agreement that allowed Chattanooga to own and operate the Birchwood landfill. This landfill could accept waste from other areas, but there are currently no other customers. A large proportion of the Chattanooga/Hamilton County waste stream, over 200,000 tons annually, goes to an Allied Waste landfill located in northern Alabama.

The original solid waste assessment for the entire region advocated sub-regions composed of natural “waste sheds.” In reality, these sub-regions have occurred, essentially as predicted, based on the economics of waste generation, hauling distance, etc. As the previous map indicates, these sub-regions consist of county groupings as follows: Bledsoe-Rhea; Meigs-McMinn-Polk; Bradley County; Hamilton County; and Marion-Grundy-Sequatchie.

The following is a detailed description of Sequatchie County’s waste collection, diversion, and disposal system and how these programs function in relation to other parts of the Region. Every attempt has been made to provide an objective assessment of the County’s infrastructure and program needs based on the legal requirements of the SWMA.

Sequatchie County
Topographic Relief



SECTION 1: DEMOGRAPHIC INFORMATION

Provide a table and chart showing the region's population for the last ten (10) years with a projection for the next five (5) years. Provide a breakdown by sub- table and sub-chart, or some similar method to detail all county and municipality populations. Discuss projected trends and how it will affect solid waste infrastructure needs over the next five (5) years.

Sequatchie County's population has shown a robust growth trend from mid-century through the current period.

Table 1.1 Historic Population

Year	Population	Increase	Percent Increase
1950	5,685	647	11.4%
1960	5,915	230	3.9%
1970	6,331	416	6.6%
1980	8,605	2,274	26.4%
1990	8,863	258	2.9%
2000	11,370	2,507	22.0%
2007	13,369	1,999	15.0%

Source: U. S. Census Bureau data and population estimates, and The National Bureau of Economic Research, *Decennial County Population Data, 1900-1990*, April 25, 2007.

Table 1.2 Sequatchie Workforce

Total	4,805
Worked in state	4,622
Worked in county	2,384
Worked outside county	2,238
Worked outside state	183

Travel time to work: Total	4,768
Less than 30 minutes	2,604
30 to 44 minutes	692
45 to 59 minutes	1,004
60 or more minutes	468

Source: 2000 U.S. Census

No updates to population counts have occurred since the 2000 Census. However, property records indicate that 506 houses were constructed between 2000 and 2007 and the total

number of residential units increased by 1,176. There are no data sources to provide information on the number of houses demolished, burned or otherwise compromised as human habitations, but one can assume that at least 350 owner occupied houses were added to the county's inventory (providing for undocumented homes). This also assumes that rental properties remain relatively constant, which is consistent with a rural population base. At 2.5 persons per household (the accepted average) that amounts to a population increase of 875 persons or 13,242 persons in 2008. This, of course, does not account for births, deaths, and migration.

Table 1.3 Population Projections

		Population		
	Year	**Total County**	**Dunlap**	**Non-municipal**
1	1997	12,349	1,771	10,578
2	1998	12,352	1,779	10,573
3	2000	12,367	1,781	10,586
4	2001	12,502	1,785	10,717
5	2002	12,498	1,788	10,710
6	2003	12,595	1,805	10,790
7	2004	12,785	1,822	10,963
8	2005	12,902	1,838	11,064
9	2006	13,030	1,855	11,175
10	2007	13,122	1,872	11,250
11	2008	13,218	1,888	11,330
12	2009	13,322	1,905	11,417
13	2010	13,425	1,921	11,504
14	2011	13,487	1,938	11,549
15	2012	13,565	1,955	11,610
16	2013	13,698	1,964	11,734
17	2014	14,011	1,972	12,039
18	2015	14,220	1,980	12,240

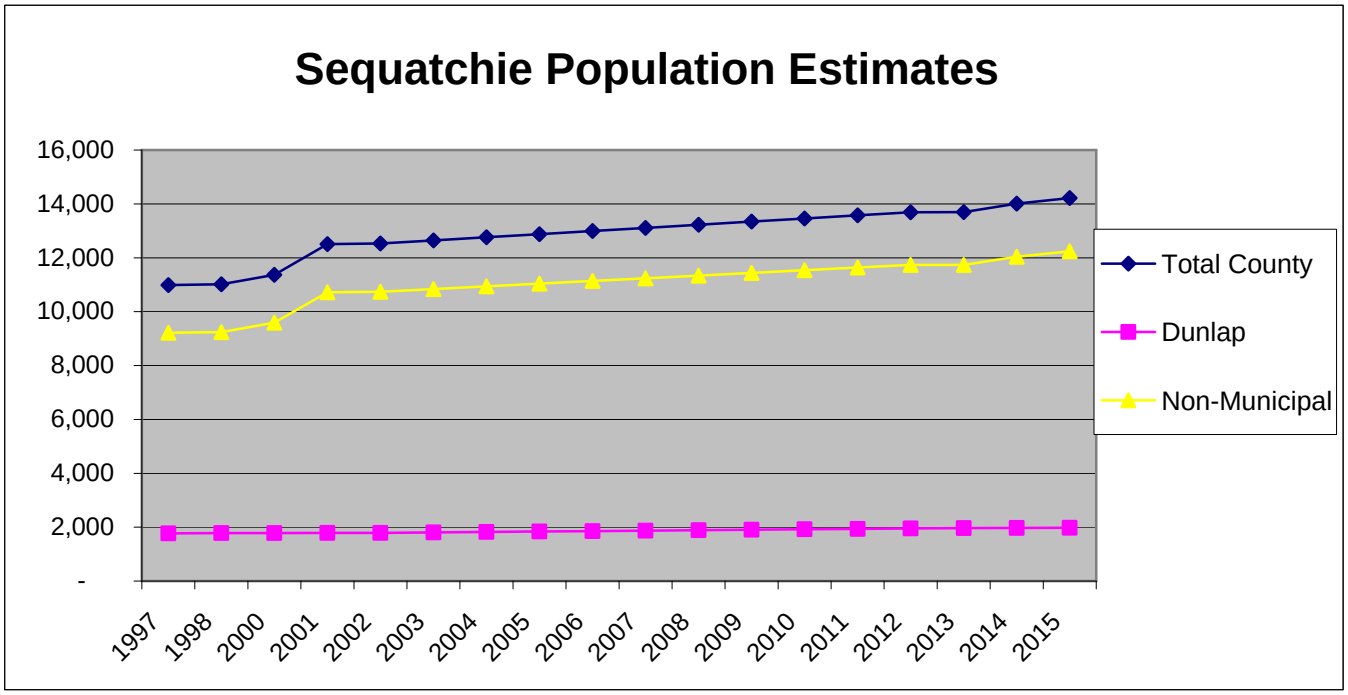
Sources: **Historic statistics are derived from U.S. Census Bureau data.**
Projections are derived from a least squares model of population growth.

The mathematical model to project the current and future population provides a 2008 population of 13,218, which is very near to the 13,242 figure assumed from housing data. Consequently, one can be reasonably sure that the current population is very near the projected number.

Currently, the U.S. economy is apparently sliding toward a recession. Should this economic downturn become severe, Sequatchie County's economy would suffer greater stresses than urban areas that have a more diverse employment base. This situation could be exacerbated (or even the result of) high fuel costs, which is having a pronounced negative impact on the large number of commuters that comprise the Sequatchie County workforce. Should this

situation continue, the county's population will likely stagnate and the trend lines on the following chart will become flat by 2012.

Figure 1.1



Over the past several years, many retired people have found that southeast Tennessee is a great retirement area. Those who moved from northern states to Florida have become increasingly concerned about high insurance rates associated with Florida's location in the tropical storm belt, and they miss the change of seasons. This area is ideal because the climate is temperate, taxes are low, and people moving into the area can get much more for their housing dollar. All southeast Tennessee counties have benefited from the so called "half-back" immigrants: People who move from northern, snow-belt states to Florida and then move half way back.

Problems in the housing market are likely to change this trend significantly. People who own homes are finding it difficult to sell because there are so many houses on the market. As the South Florida Sun-Sentinel reported on April 3, 2008, "*Florida foreclosure activity grew by more than 63 percent in February from the previous month, giving it the nation's third-highest state foreclosure rate with one foreclosure filing for every 382 households".* With this many homes on the market, anyone wishing to sell and move to a different locality will probably be unable to do so. The foreclosure rate has continued to increase, and the market has not reached the bottom. Until then, a large proportion of "half-backs" will not be financially able to relocate, and there is little likelihood that this particular population will impact growth in the region.

SECTION 2: ECONOMIC PROFILE

Provide a table and chart showing the region's economic profile for all county and municipalities for the last ten (10) years with a projection for the next five (5) years. This can be accomplished by using the following economic indicators.

Sequatchie County's economy is heavily dependent on surrounding areas since almost forty-seven percent (47%) of the workforce is employed outside the county. In the last year, Tecumseh Manufacturing and Seymour Tubing closed, taking with them most of the local employment. Since then, nothing has replaced the loss and unemployment has remained relatively high compared to the State average of about 5 percent.

Table 2.1 Economic Profile

Year	Labor Force	Employed	Unemployed	Percent Unemployed	Per Capita Income ($)	Retail Sales ($1,000s)	Bank Deposits ($1,000s)
1997	4,690	4,360	330	7.0%	16,854	56,068	59,893
1998	4,820	4,540	280	5.8%	17,339	64,090	69,050
1999	4,980	4,780	200	4.0%	18,272	70,827	76,670
2000	5,370	5,160	210	3.9%	19,176	72,296	81,887
2001	5,400	5,130	260	4.8%	20,172	73,683	92,155
2002	5,440	5,170	280	5.1%	20,032	73,284	95,067
2003	5,510	5,220	290	5.3%	20,807	78,524	104,108
2004	5,630	5,330	310	5.5%	22,470	86,336	108,522
2005	5,820	5,490	330	5.7%	23,747	91,419	112,246
2006	6,060	5,790	270	4.5%	24,934	95,240	130,642
2007	6,080	5,780	300	4.9%	25,689	118,174	139,121
2008	6,260	5,480	790	12.6%	26,735	119,448	151,995
2009	6,478	5,675	803	12.4%	27,781	126,455	153,985
2010	6,634	5,820	814	12.3%	27,692	127,446	153,000
2011	6,791	5,965	826	12.2%	27,680	130,437	153,100
2012	6,948	6,100	848	12.2%	28,049	130,482	153,421
2013	7,105	6,300	805	11.3%	29,230	142,727	154,612
2014	7,219	6,415	804	11.1%	30,040	152,890	155,110
2015	7,404	6,600	804	10.9%	31,076	155,233	158,072

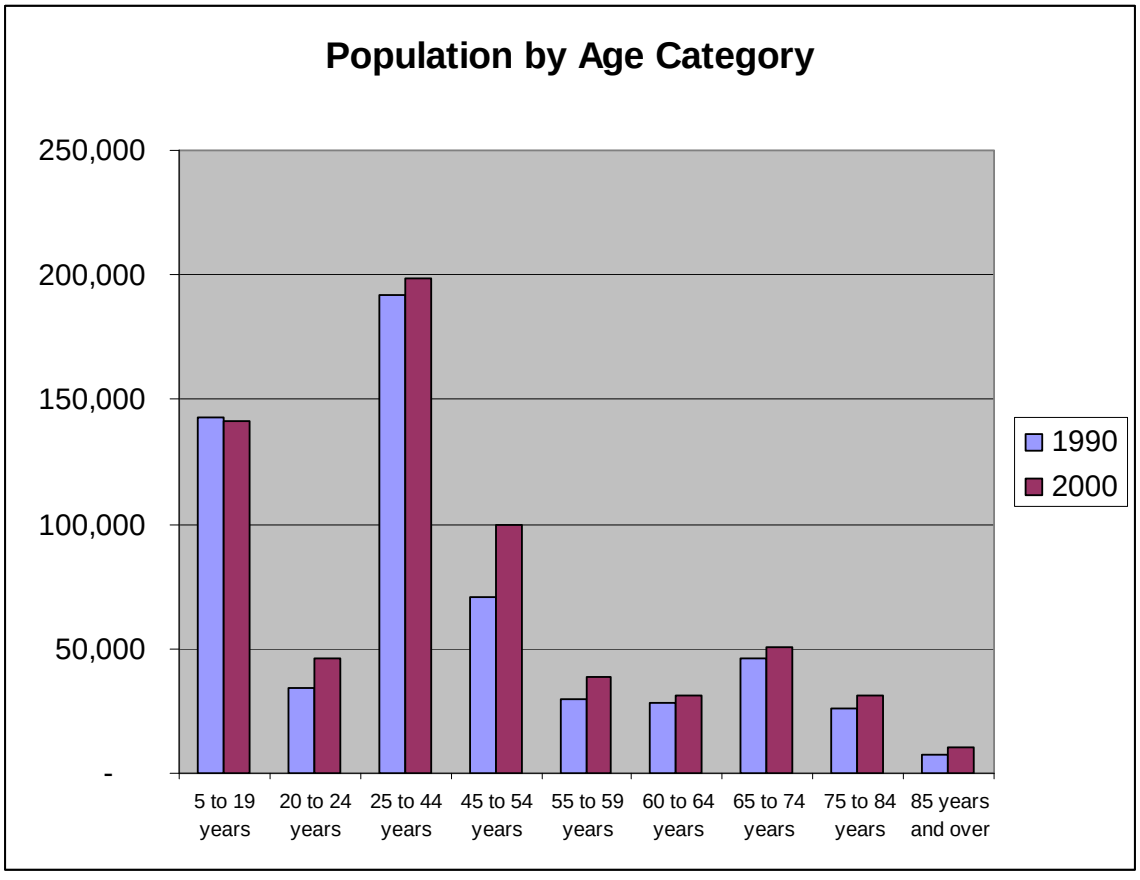
Sources: Historic employment data, U. S. Dept. of Labor; Per capita income data, U.S. Bureau of Economic Analysis; Retail data, Tenn. Dept. of Revenue; Bank deposits, FDIC. (http://www2.fdic.gov/SOD/SODSumReport.asp) All state and local area dollar estimates are in current dollars (not adjusted for inflation). Projections: SETDD staff, Dec. 2008.

Nouriel Roubini, a professor of Economics and International Business at New York University, has an impressive record of anticipating economic events. Professor Roubini has been a long-time consultant to the World Bank, the International Monetary Fund and other private and public institutions. His assessment of the current economic downturn is that a recovery will begin by the end of 2009, but it will be an anemic recovery that could lapse into a double dip recession. Due to the large, unresolved debt situation – from both U.S. government spending and household debt – the eventual recovery is likely to take years.

Optimistic projections of employment from 2008 to 2015 assume a slow economic recovery, but not a full return to pre-2008 employment levels. The unemployment rate is likely to continue an upward trend through 2009 as the available workforce expands and jobs are created to fill the gaps left by companies that failed at the height of the recession. This assessment is entirely dependent on follow-through by companies such as Volkswagen that plans on opening an auto manufacturing plant in nearby Chattanooga. Should these plans be delayed, the outlook for economic growth is limited.

Much of the workforce expansion will depend on the number of retirement-aged workers who opt to continue working rather than retire to a fixed income that may not support their families. One of the biggest issues facing potential retirees is health care: Can they afford to pay premiums on health insurance if they do not have assistance through an employer? In many cases, the answer is no, and the worker remains on the job simply to obtain necessary health coverage. As the following chart indicates, the retirement-aged population will be significant as the 45-54 age group moves from the year 2000 to 2010. Should this age group choose to retire, the unemployment rate may moderate, all other things being equal. Current legislation in the U.S. Congress (America's Affordable Health Choices Act of 2009) may have an impact on these issues, but at this juncture it is not possible to make an informed estimate.

Figure 2.1



Source: U.S. Census Bureau, 2008.

Future prospects for industrial development are somewhat better due to the announcement by Volkswagen AG that it will locate a manufacturing facility in Chattanooga. The City of Dunlap has available buildings and land in its industrial park for any company that is looking for a location to provide parts and services to the Volkswagen plant. Prospects for such a location are relatively good, but the Volkswagen plant will not be in operation for at least three years.

As the following table indicates, the total number of jobs has not rebounded from the high experienced in 2002. New jobs are generally in the service industry, which does not provide the level of pay or the benefits that manufacturing employees are accustomed to. This may change, but projections are based on the previous performance of the local economy.

Table 2.2 shows the grim economic facts: at least 322 high-paying manufacturing jobs were lost, and that does not include other job losses that occurred in 2009. The economic problems extended to the *Trade, Transportation, & Utilities* sector, which dropped back to 2006 levels. There are currently few bright spots in the economic picture.

Table 2.2 Employment by Occupation

Employment by Industry

Year:	2008*	2007	2006	2005	2004	2003	2002
All Industries	2,442	2,935	2,763	2,687	2,806	2,661	2,461
Goods Producing	512	907	987	962	1,116	1,045	922
Natural Resources & Mining	0	67	64	55	54	58	57
Construction	106	112	112	101	105	136	119
Manufacturing	406	728	811	804	956	850	745
Service Providing	1,930	2,028	1,775	1,725	1,690	1,616	1,547
Trade, Transportation, & Utilities	621	761	620	586	588	555	518
Information	6	6	5	7	6	5	5
Financial Services	171	163	151	148	139	127	111
Professional & Business Services	52	106	87	77	74	67	58
Education & Health	576	495	477	465	453	441	471
Leisure & Hospitality	272	286	229	244	235	205	200
Other Services	46	28	32	34	30	38	33
Public Administration	186	180	171	160	162	174	146

*4th Quarter of 2008

Source: U.S. Dept. of Labor (http://www.sourcetn.org/mappages/cnty.asp?session=areadetail)

Over the last decade, Sequatchie County residents have steadily increased incomes to become more competitive with other, similar counties in the State. As the following table indicates, the percent difference in 2006 between Sequatchie County and the average of all other non-metropolitan sections of the State was only 1.9, which is a 7.1 percentage point increase over the 1997 figures. This can be accounted for by the development of the Dunlap Industrial Park to accommodate Seymour Tubing, a large automotive parts manufacturer.

Unfortunately, that company was forced to downsize and subsequently close due to the economic downturn. Future per capita income figures are likely to be considerably lower.

Table 2.3 Per Capita Income Comparison

Year	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Tennessee	22,676	23,989	24,898	26,095	26,833	27,435	28,257	29,539	30,827	32,17
Sequatchie	16,854	17,399	18,272	19,176	20,172	20,032	20,807	22,470	23,747	24,93
Tennessee Nonmetropolitan Portion	18,521	19,265	19,961	20,886	21,385	21,868	22,833	23,639	24,649	25,42
Difference, Sequatchie/Nonmetro.	1,667	1,866	1,689	1,710	1,213	1,836	2,026	1,169	902	48
Percent Difference	9.0%	9.7%	8.5%	8.2%	5.7%	8.4%	8.9%	5.0%	3.7%	1.9%

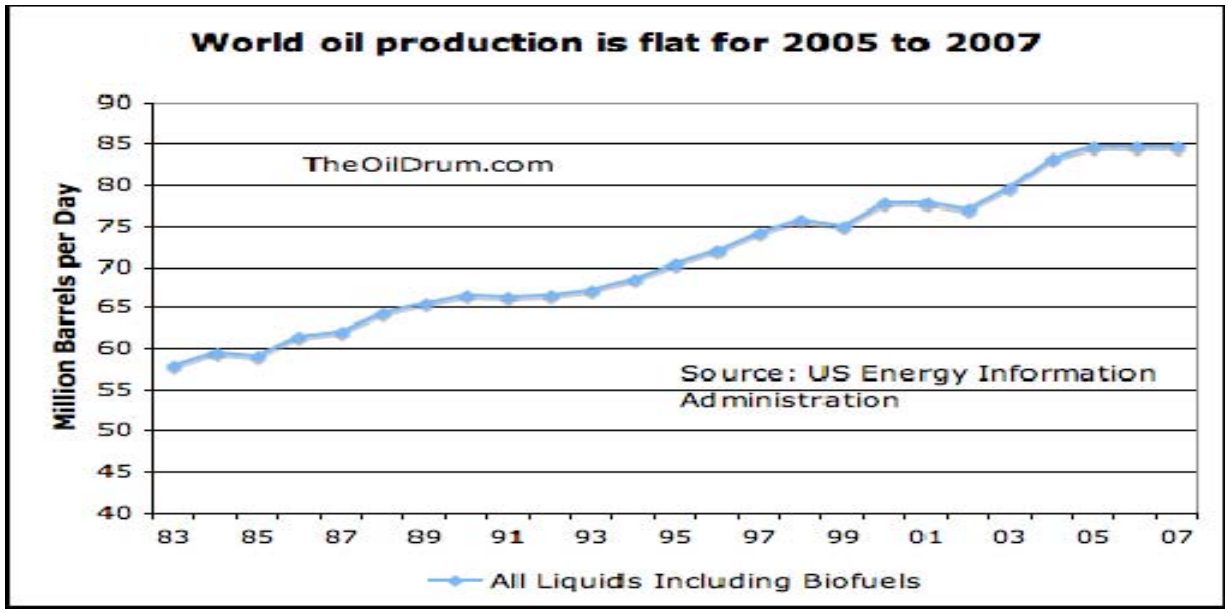
The primary economic problems on the horizon are disruptions in the home mortgage markets and energy supplies. As previously discussed, the home mortgage problems will likely curtail near-term investment in new homes, especially by retirees moving into the region. Recent newspaper articles report that some large, upscale residential developments are in bankruptcy.

More problematic (and at a basic level, related) is the increasing cost of energy. It is becoming more apparent that liquid fuels production is not keeping pace with world-wide demand. Oil depletion is the primary culprit as some of the largest oil fields in the world begin to decline. Statistics published by the International Energy Agency (EU), the Energy Information Agency (US), and the BP Statistical Abstract indicate that crude oil production has not increased above mid-2005 levels. This reflects decline rates in several oil provinces such as the North Sea oil fields (UK and Norway) which are experiencing a 15-18% loss in production annually. Larger declines of more than 30 percent annually are occurring at the giant Cantarell oil field in Mexico. This was the second largest oil field in the world and a primary source of supply for the U.S., but oil volumes are falling fast and the Mexican oil company PEMEX estimates that exports of oil could cease within five years.

Even OPEC, previously the final arbiter of world oil prices, has lost production capacity in the last few years. Although large volumes of oil will remain available on the world market, there does not seem to be enough to maintain current production levels.[2] This will result in significant dislocations and have pronounced impact on waste generation levels.

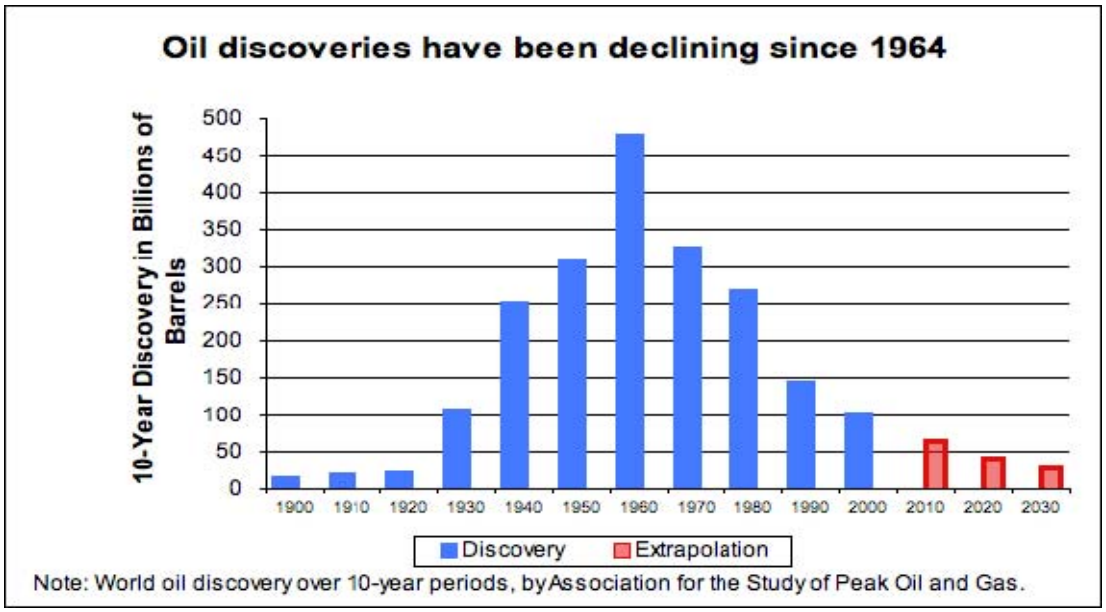
[2] Hirsch, R.L., Bezdek, R.H, Wendling, R.M. *Peaking of World Oil Production: Impacts, Mitigation and Risk Management*. DOE NETL. February 2005.

Figure 2.2



As the previous graph illustrates, the current production is at a plateau, which may become permanent. No large oil fields have been discovered since the 1970's, and promising geological structures are in areas that present significant difficulties for recovery. For example, Chevron Oil's last major attempt at adding reserves – the "Jack" well – is located 27,000 feet below the surface of the Gulf of Mexico. Bringing oil to production at such depths has never been attempted and will require new technology to deal with extreme pressures and heat. This project will also require investments in the billions of dollars. The basic message that projects like this convey is that the cheap oil has been found; from now on we have to contend with much higher energy costs.

Figure 2.3



The impact of high energy costs has amcurrently being felt by most local governments. Fuel for school buses, road paving, and of course, garbage collection, will likely require more funding. These increased costs will have a negative impact on all county operations, especially in rural counties that do not have a resilient tax base.

SECTION 3: SOLID WASTE STREAM

Elaborate on the entire region's solid waste stream. Compare today's waste stream with anticipated waste stream over the next five (5) years. How will the total waste stream be handled in the next five (5) years? Include in this discussion how problem wastes like waste tires, used oil, latex paint, electronics and other problem wastes are currently handled and are projected to be handled in the next five (5) years. What other waste types generated in this region require special attention? Discuss disposal options and management of these waste streams as well as how these waste streams will be handled in the future. Include in this discussion how commercial or industrial wastes are managed. Also provide an analysis noting source and amounts of any wastes entering or leaving out of the region.

Several waste characterization studies conducted in various parts of the country may be used to estimate waste stream components in the southeast Tennessee region. There are no known contemporary studies that were performed in Tennessee but studies from other states should provide a reasonable source for extrapolating waste generation attributes to local populations. The following table provides a comparison of some studies in relatively comparable states as well as the nationwide EPA estimate.

Table 3.1

Waste Characterization Studies

Material	Georgia 2004	Iowa 2005	Ohio 2005	EPA 2006
Paper	38.7	33	41	33.9
Plastics	15.8	14.9	16	11.7
Metals	5.3	4.7	4	7.6
Glass	3.7	1.7	5	5.3
Yard Waste		1.6	9	12.9
Food Waste		10.6	15	12.4
Wood		8		5.5
C & D	5.9	5.5		
Durable		5.1		
Textiles & Leathers		4.9	6	7.3
Diapers		2.4	4	
Rubber		0.5		
HHMS		0.4		
Other		6.8		3.3
Organics	27.2			
Inorganic	3.4			
Total:	100	100.1	100	99.9

As is obvious from the table, different states use different definitions for the material types.

From observation of the Sequatchie County waste stream, the Iowa percentages appear to be more representative because they mirror a predominately rural landscape. The Environmental Protection Agency's numbers are generally accepted for most areas in the U.S., but they tend to be heavily weighted toward large metropolitan areas because that is where most of the population lives and where most of the waste is produced. As the following table illustrates, Iowa and Tennessee have a similar urban/rural mix, which is considerably different from U.S., Georgia, and Ohio percentages.

Table 3.2

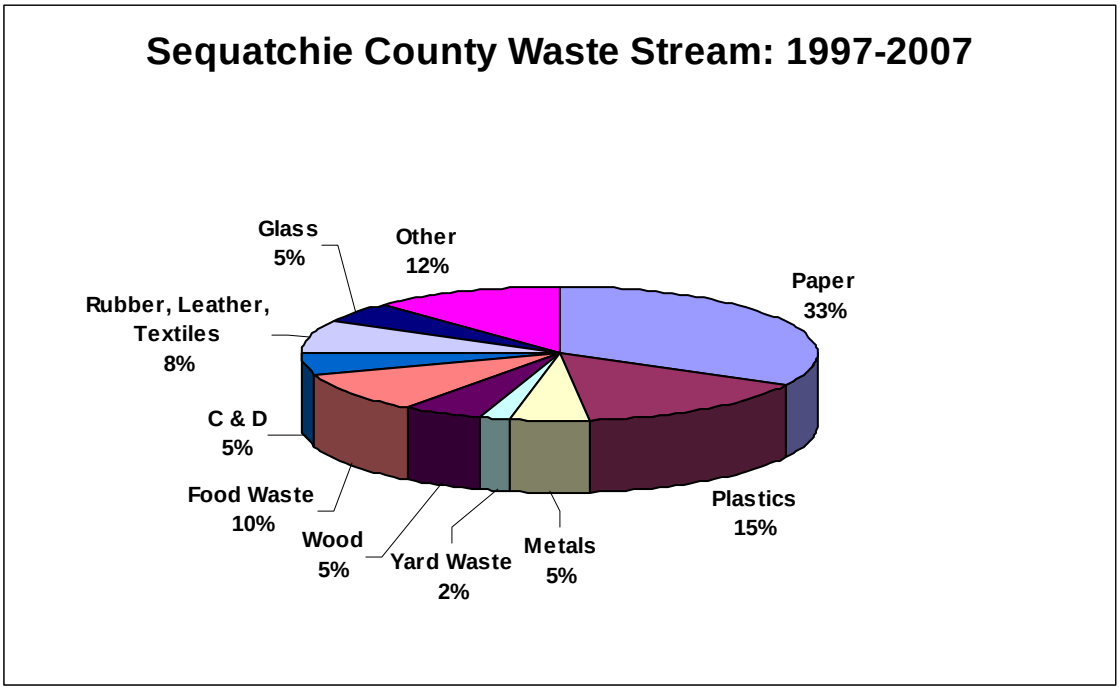
Population Comparison

	Georgia	Iowa	Ohio	Tennessee	United States
Total:	8,186,453	2,926,324	11,353,140	5,689,283	281,421,906
Urban:	5,864,163	1,787,432	8,782,329	3,620,018	222,360,539
Rural	2,322,290	1,138,892	2,570,811	2,069,265	59,061,367
Urban Percent	72%	61%	77%	64%	79%
Rural Percent	28%	39%	23%	36%	21%

U.S. Census Bureau
Census 2000

Using composite percentages based on random observation of the waste stream, the following chart provides a rough illustration of waste volumes by type of material. Waste generation does not necessarily mean that these materials enter the waste collection system. In rural counties like Sequatchie, much of the wood waste, construction and demolition (C & D), and food wastes are disposed of on private property. Very little change is expected in waste stream composition over the next five (5) years.

Figure 3.3



Last year, a manufacturer reported large volumes of recycling that were not previously captured in waste reports. This produced a spike in the quantity of metals recycled, skewing the materials analysis if taken strictly at face value.

Table 3.4

Jurisdiction/ Sector	Collection	Disposal Options	Current Problem Waste Handling	Future Problem Waste Handling	Other Problem Waste
Sequatchie County	Five county convenience centers. Available to all residents, including those within the City of Dunlap.	All waste collected at convenience centers is taken to the Marion County Class I landfill near Jasper, TN.	**Waste Tires**: Mac Tire, Inc. contract **Automotive Fluids**: **Used Oil:** **Latex Paint**: None **Electronics**: None	**Waste Tires**: Continue contracting. Assistance from RMCET to collect and market	HHW collected at mobile collection event.
City of Dunlap	Curbside collection provided by the City to all residents through a contract with Allied Waste Disposal	Waste is hauled to the Marion County Class I landfill located near Jasper, TN	Provided by Sequatchie County	Provided by Sequatchie County	Provided by Sequatchie County
Business	Contracts with private haulers and self-service by business/industry.		In-house programs and contractors	In-house programs and contractors.	Commercial generation of hazardous waste is regulated by TDEC.

Currently, there are no programs available to handle electronics.

SECTION 4: REGIONAL COLLECTION SYSTEMS

Describe in detail the waste collection system of the region and every county and municipality. Provide a narrative of the life cycle of solid waste from the moment it becomes waste (loses value) until it ceases to be a waste by becoming a useful product, residual landfill material or an emission to air or water. Label all major steps in this cycle noting all locations where wastes are collected, stored or processed along with the name of operators and transporters for these sites.

Sequatchie County has five convenience centers strategically located to maximize access to all residents (see attached map). The centers are located as follows:

Lewis Chapel Road of SR 111, Walden's Ridge
Cagle on SR 111, Cumberland Plateau
Dunlap near the County Garage, about 3-4 blocks from Main St. (SR 28)
Dunlap South, at the County Recreational Park off SR 28
Signal Mountain on U.S. 127

Convenience centers are open from 7:30 a.m. to 4:30 p.m., Monday, Wednesday, Friday, and Saturday. All of the centers collect paper and metals for recycling. Tires are collected in Dunlap on SR 28.

The minimum number of convenience centers required is calculated using the formula that determines a reasonable number by land area rather than population. This method was chosen because population densities are low and the county is relatively large. With a current population of about 13,218, the minimum required number of centers would be only one (1) using the TDEC formula of dividing the population by 12,000. This would not adequately serve the rural population so the following method was deemed more appropriate.

Table 4.1

Minimum Collection Required

	Total Sq. Miles	Service Provided	Difference	Required Centers	Existing Centers
Sequatchie	265.9				
Dunlap		8.6	257.3	1.43	5

The above formula subtracts the area where municipal service is provided and the resulting figure is divided by 180 square miles (TDEC formula) to arrive at a reasonable waste-shed area. This area includes State forest areas that are not populated and could be deducted from the total square miles of potential service area. Although the formula suggests that one center would be adequate, five (5) centers were constructed to serve separate sections of the county, which is divided by the Sequatchie Valley into three distinct topographic areas: Walden's Ridge, the Valley, and Cumberland Plateau.

Geology/Topography

Over millions of years, the Sequatchie River has carved a deep valley in the Cumberland Plateau that stretches from Cumberland County to Alabama. The valley is several miles wide but narrows enough for a visitor to observe vertical cliffs to the east (Walden's Ridge) and west (Cumberland Plateau proper) of the valley floor. These escarpments range from 1,000 to 1,800 feet. Scenery in and around the valley is some of the most spectacular in the State, but transportation routes up and down the escarpment are difficult.

In the mid-1990s, a limited access highway was completed between U.S. 27 near Chattanooga and the City of Dunlap. Easy access to the Sequatchie Valley became possible for the first time, and this resulted in immediate benefits. Low-cost property, low taxes, and few building restrictions meant that many people from the Chattanooga metropolitan area could move to Sequatchie County, and many county residents that would have moved for jobs opted to stay at home because they could now reach places of employment with relative ease. This, of course, meant that it was necessary to deal with increasing quantities of solid waste.

Alternative Collection/Disposal Systems

An evaluation of alternative systems includes a transfer station centrally located in Dunlap. Hauling waste from the convenience centers on the mountains (Cagle, Lewis Chapel, and Signal Mountain) and consolidating them at a facility in Dunlap would net a savings of about 27 miles one-way. If each of the convenience centers has one pull per week for 52 weeks that translates to 27 miles X 2 for the round trip X 52 weeks for an annual savings of 2,808 miles.

A roll-off truck generally gets about 8 miles per gallon of diesel fuel, so the county would save about 351 gallons of fuel annually. Additional maintenance costs are not included, but those costs are some fraction of the amount that would be spent whether the additional mileage was incurred or not. At $2.50 per gallon for the diesel fuel (approximate current cost), the transfer station would save the county about $880.

Transfer station construction and operation costs were taken from Shaw Environmental, Inc. workshop materials prepared for the Iowa Department of Natural Resources in June 2005 (attached). The total construction cost for a new facility without a scale, scale house or loading equipment, and without contingency costs amounts to $426,206. Add in a $250,000 front-end loader and the price goes to $676,206. Assuming that the county can borrow these funds using a Rural Development 80/20 loan/grant package at 5.5%, the original amount would be $540,965 with monthly payments of $3,071.54 over 30 years. This does not include operation costs and construction cost increases above 2005 estimates.

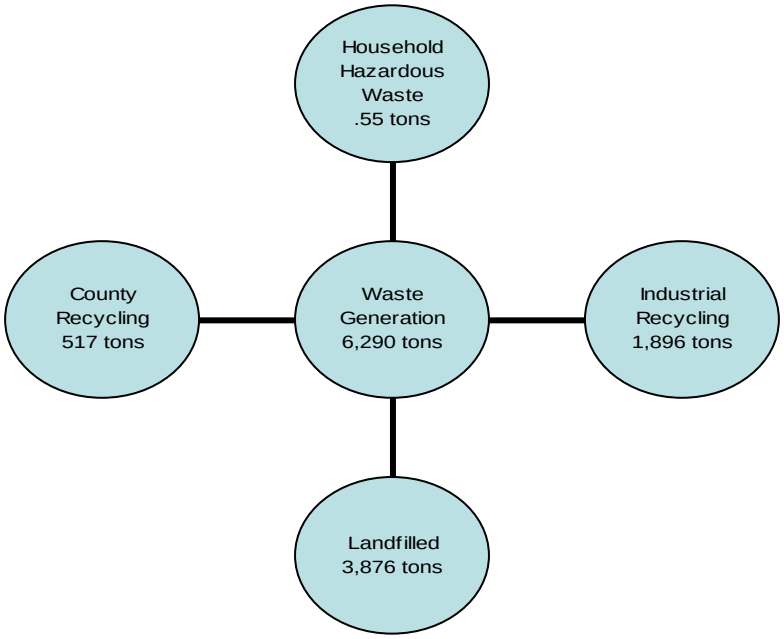
There are no municipal or industrial customers with waste volumes sufficient to offset the high cost of transfer station construction and operation through tipping fees. From this brief analysis, it is obvious that savings from the construction of a transfer station would only be about 51 percent of the debt service cost. It is therefore apparent that a transfer station is cost-prohibitive and that the current convenience center system is the only viable option for the immediate future.

Regional Solid Waste Flow and Life-Cycle

The following chart represents data collected for the 2008 Annual Report for the Southeast Tennessee region. As is apparent, there are no data available on waste reduction or diversion

because it is very difficult to document waste diversion in a rural county. Most of the yard waste is disposed on site by burning (a permitted option) or hauled to a remote location. All wood waste from sawmills and other commercial operations is generally used for livestock bedding and/or as a soil additive. In an urban county, this data would likely be captured and counted toward waste reduction/re-use efforts, but most of the local commercial operations are small, family-owned businesses, and collecting sufficient information to make an estimate of waste volumes is extremely difficult.

Table 4.2 Waste Generation



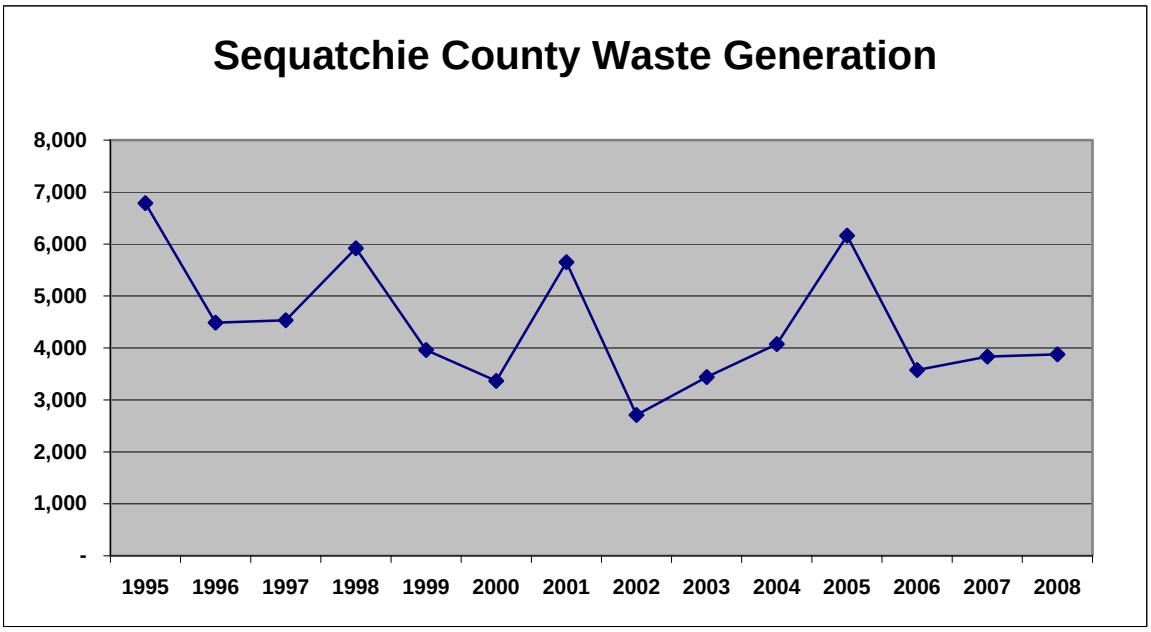
SECTION 5: WASTE REDUCTION

The Solid Waste Management Act of 1991 states that all regions must reduce the amount of waste going into Class I landfills by 25%. Amendments to the Act allow for consideration of economic growth, and a "qualitative" method in which the reduction rate is compared on a yearly basis with the amount of Class I disposal. Provide a table showing reduction rate by each goal calculation methodology. Discuss how the region made the goal by each methodology or why they did not. If the Region did not met the 25% waste reduction goal, what steps or infrastructure improvements should be taken to attain the goal and to sustain this goal into the future.

Table 5.1

County	Compared to Base Year	Qualitative-Real Time
Sequatchie County	78%	38.37%
25% Waste Reduction Goal Achieved	Yes	Yes

The base year per capita waste generation rate was 1.33 tons as indicated in a May 26, 1994 letter from Paul Evan Davis (TDEC) to Jack Marcellis, past chairman of the Southeast Tennessee Municipal Solid Waste Region. Assuming a 2008 population of 13,218 Sequatchie County's waste generation rate was 0.29 tons per person annually (3,876/13,218). That amounts to a 78% reduction in per capita waste from the base year figure.



According to the 1995 Annual Progress Report, Sequatchie County had population of approximately 9,026 and produced about 6,788 tons of waste, for a waste generation rate of about 0.75 per capita, far less than the 1.33 rate established in the previous year. This was at a time when all of the county's waste was disposed of at the Bledsoe-Sequatchie County landfill, which did not have scales until 1995. The obvious conclusion to be derived from these large waste reduction numbers is that original waste generation figures were artificially high because they were based on estimates of volume, not verifiable scales data. Recycling and other waste reduction numbers do not support a reduction of this magnitude.

Waste generation figures for the fifteen year period cluster around the 4,000 ton level. Omitting the 1995 figure, attributed to the lack scales data, the years 1998, 2001, 2002, and 2005 stand out as anomalies. A brief recession following the 2001 World Trade Center

terrorist attack probably explains the significant waste reduction that occurred in 2002. Additional waste generated in the other three years was probably due to construction since all demolition waste goes to the Class I landfill and there was considerable growth occurring in the county during this period.

Without industrial recycling, Sequatchie County only achieves an 11.78% reduction in "real time" waste in 2008. Adding 1,896 tons of material recycled at a local industry increases that reduction to more than 38%. Since 1995, the population has increased by about 4,192 people while the nominal waste generation has decreased by 2,912 tons, excluding industrial recycling that was not part of the original waste stream.

Waste volumes are low enough to infer that publicly operated waste collection facilities are only receiving a portion of the waste produced by the population. The county has more collection facilities than are required by the SWMA, and there are few roadside dumping areas. So, the explanation for the anomaly in the waste stream volumes must be one or more of the following:

1. The local population generates less than national, state, and regional averages.
2. Alternate disposal opportunities (e.g. burn barrels) are widespread.
3. Waste is hauled out of the county, and the origin is attributed to another county.

Observations of local practices indicate that the first and second explanations are the most likely; there have been no consistent complaints from other counties about waste from other counties. Despite having more collection facilities than required by the Solid Waste Management Act, there are a few areas that do not have easy access to disposal facilities.

SECTION 6: COLLECTION AND DISPOSAL CAPACITY

A. *Provide a chart indicating current collection and disposal capacity by facility site and the maximum capacity the current infrastructure can handle at maximum through put. Provide this for both Class I and Class III/IV disposal and recycled materials. Identify and discuss any potential shortfalls in materials management capacity whether these are at the collection or processor level.*

There are no operating landfills in Sequatchie County. Bledsoe County, Sequatchie County, the City of Dunlap, and the Town of Pikeville jointly owned an operated a landfill in southern Bledsoe County that is now closed. Closure costs are allocated by jurisdiction and these costs appear in the respective budgets.

Table 6.1: Regional Landfills

Site Name(s)	Annual Tons Sequatchie County	Permit Number	Current Capacity	Maximum Capacity	Projected Life of Facility
Marion County Landfill	3,800	SNL580000197	Capacity not determined	Capacity not determined	20 years

Note: Capacity limits have not been explored. Landfills are capable of handling all local waste plus large volumes of waste hauled from other counties.

All waste collected at Sequatchie County convenience centers is hauled to the regional landfill in Marion County near Jasper. Allied Waste collects all waste in the City of Dunlap and hauls it to the same landfill. There are no Class III/IV landfills within a reasonable haul distance of Sequatchie County waste collection facilities.

B. Provide a chart or other graphical representation showing public and private collection service provider area coverage within the county and municipalities. Include provider's name, area of service, population served by provider, frequency of collection, yearly tons collected, and the type of service provided.

Table 6.2: Regional Collection Systems

Provider of Service	Service Area	Population Total Under This Service	Frequency of Service (Weekly, Bi-weekly, on call, etc.)	Annual Tonnage Capacity	Type Service (Curbside, Convenience Center, Green Box)
Sequatchie County	County-wide drop-off	11,200	As Needed	4,000	Convenience Center
City of Dunlap	City Limits	1,800	Weekly	1,140	Curbside

Outside of Dunlap, there are no known curbside waste collection programs. All residents use the convenience center system.

SECTION 7: FINANCIAL NEEDS

Complete the chart below and discuss unmet financial needs to maintain current level of service. Provide a cost summary for current year expenditures and projected increased costs for unmet needs.

The City of Dunlap contracts with Allied Waste (formerly BFI) for waste collection, but no recycling or waste reduction services are provided. All of those services are supported by Sequatchie County.

Table 7.1 Expenditures

Description	Present Need	Unmet Needs	Total Needs	Explanation
EXPENDITURES	($/year)			
Salary and Benefits	$ 145,818	$ 50,000	$ 195,818	$50,000 salary/benefits for solid waste director
Transportation/Hauling	36,767		36,767	Includes in collection & disposal systems
Collection and Disposal Systems	18,000		18,000	Contracted services
Equipment		32,504	32,504	$27,504 in annual payments for a new roll-off truck plus $5,000 in new roll-off containers (1 purchase annually)
Sites			-	
Convenience Center	6,988	-	-	
Transfer Station	-	-	-	
Recycling Center	-	-	-	
MRF	-	-	-	
Landfills	117,000	-	117,000	Post-closure costs
Site	-	-	-	
Operation	-	-	-	
Closure	-	-	-	
Post Closure Care	9,401	-	9,401	Bledsoe/Sequatchie Landfill
Administration (supplies, communication costs, etc.)	26,226	-	26,226	Website construction
Education	29,032		29,032	
Public		5,000	5,000	Ed. Materials and website maintenance
Continuing Ed.	-	-	-	
Capital Projects	-	-	-	
Total:	$ 389,232	$ 87,504	$ 476,736	

As the previous table indicates, one of the primary unmet needs is a solid waste director to handle the day-to-day operations of the county system. The county also needs additional containers to handle recycling, including paint containers, and a new roll-off truck to handle the continuous work-load of hauling waste to the landfill and recycling to end users. Paint containers (~$18,000) will be a one-time cost, possible purchased through a grant program.

In addition to specific solid waste equipment, county officials are interested in purchasing equipment that will allow them to process cooking oil to use in place of diesel in county trucks. This would reduce fuel expenditures considerably because the oil can be produced for around $0.80/gallon as opposed to the $1.40-$1.50 per gallon diesel price.

Table 7.2 Revenues

REVENUE	Last Fiscal Year Budget	Unmet Need	Total
Host Agreement Fee	-	-	-
Tipping Fees	-	-	-
Property Taxes	348,845	82,504	431,349
Sales Taxes			-
Surcharges	-	-	-
Disposal Fees	-	-	-
Collection Charges	-	-	-
Industrial or Commercial Charges	-	-	-
Residential Charges	-	-	-
Convenience Center Charges	-	-	-
Transfer Station Charges	-	-	-
Sale of Methane Gas	-	-	-
Other Sources (Grants, Bonds, Interest, Sales, etc.)	77,177	5,000	82,177
Transfer from Fund Balance			-
Total:	$ 426,022	$ 87,504	513,526

Additional funding for website development is needed because this is a primary medium for disseminating information about the waste collection and recycling program. Funding is also needed for manpower and printed materials to augment those already in circulation.

SECTION 8: ORGANIZATION, STAFFING AND FACILITIES

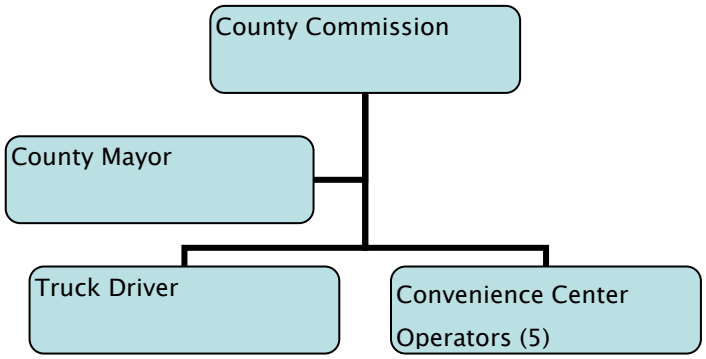
Provide organizational charts of each county and municipality's solid waste program and staff arrangement. Indentify needed positions, facilities, and equipment that a fully integrated solid waste system would have to provide at a full level of service. Provide a scale county level map indicating location of all facilities including convenience centers, transfer stations, recycling centers, waste tire drop-off sites, used oil collection sites, paint recycling centers, all landfills, etc. Identify any short comings in service and note what might be needed to fill this need.

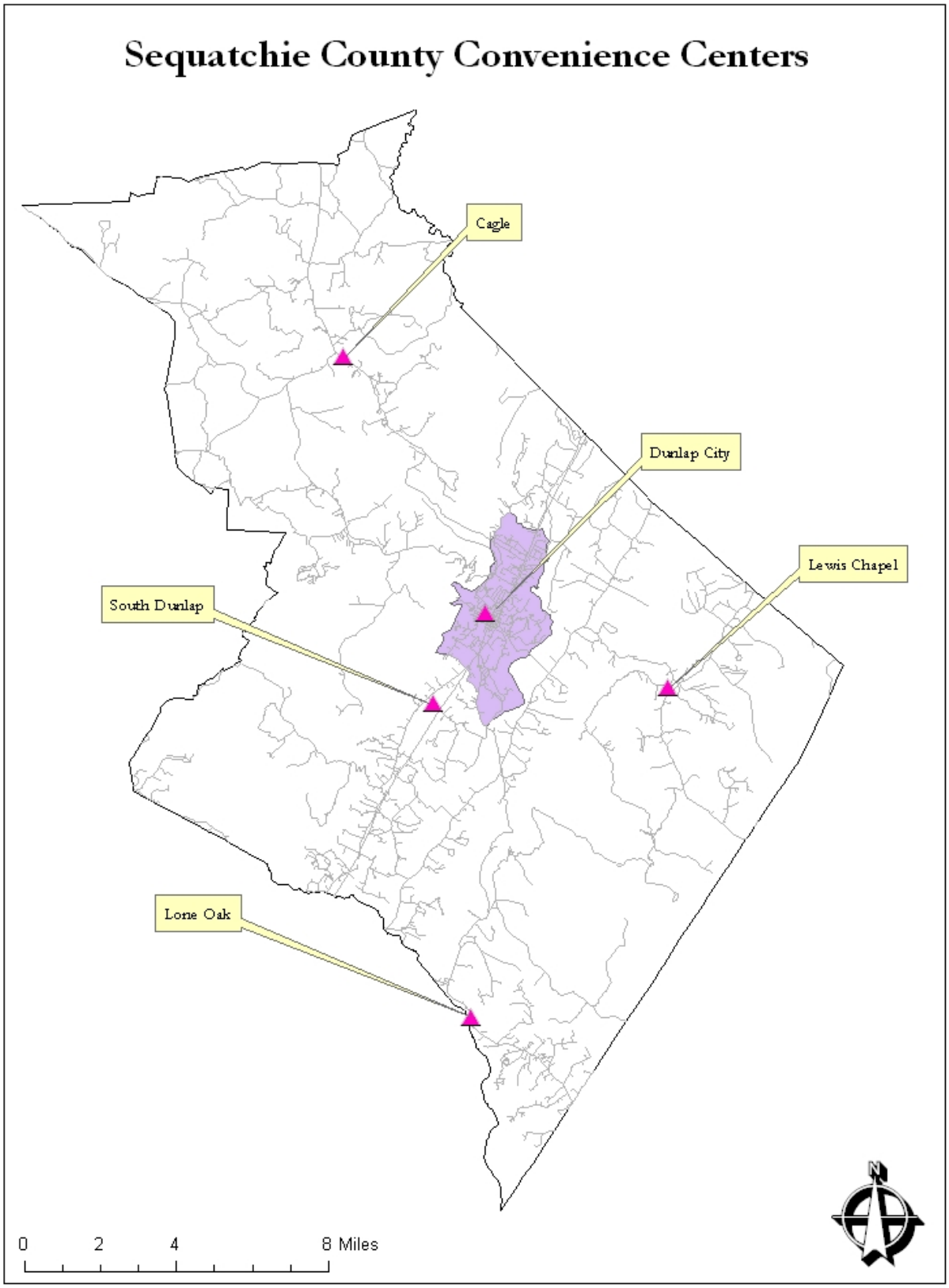
Solid Waste Staffing

Dunlap is the only municipality in Sequatchie County, and it does not have a full-time waste collection system. The City contracts with Allied Waste for all residential waste collection and disposal. City workers collect some brush, but there is no recycling program, composting operation, or other diversion activity.

Like many small counties, Sequatchie provides a full service waste collection program, including recycling, as efficiently as possible. Funding for new positions is in short supply, but the county would benefit from having a full-time director to handle solid waste. Currently, the County Mayor is in charge of waste collection and recycling operations. It is a very lean operation due to the lack of revenue to fund extensive operations.

The organization chart for Sequatchie County's waste collection and disposal system is as follows:





The county's convenience centers provide a full range of service. Each is equipped with a 4 yd^3 compactor feeding into a 40 yd^3 receiving container; a 40 yd^3 open top roll-off container for

bulky items; a 40 yd^3 container for metals; and a 35 yd^3 paper recycling container. The primary center is located near the center of Dunlap.

Lone Oak, Signal Mountain, Highway 127 Convenience Center

South Dunlap Convenience Center

The South Dunlap center is located on the periphery of the county recreation park. Recently, the county received a recycling grant from the Solid Waste Management Fund to purchase an additional compactor that will be used to collect cardboard.

Dunlap Convenience Center

The Dunlap center has a compactor dedicated to cardboard located in the rear of the facility.

Cagle (SR 111) Convenience Center

Lewis Chapel Convenience Center

SECTION 9: REVENUE

Identify all current revenue sources by county and municipality that are used for materials and solid waste management. Project future revenue needs from these categories and discuss how this need will be met in the future.

Most of the revenue for solid waste operations is derived from property taxes (see Table 7.2 Revenues) to the Solid Waste fund. The county also receives an annual waste tire grant, an occasional recycling grant, and another annual grant from the Department of Transportation for litter control and education. Like most rural counties, there are no waste collection fees levied at convenience centers. The sale of material for recycling – primarily cardboard – brings in a small amount of income although transportation costs are relatively high since the material must be transported more than 40 miles to market.

Tax revenues are not expected to increase substantially over the next five years. Current year sales state-wide have decreased enough to have a substantial negative impact on the state budget. This situation shows no signs of reversing in the five year planning period.

SECTION 10: EDUCATION

Describe current attitudes of the region and its citizens towards recycling, waste diversion, and waste disposal in general. Where recycling is provided, discuss participation within the region. Indicate current and on going education measures to curb apathy or negative attitude towards waste reduction. Are additional measures needed to change citizen's behaviors? If so, what specific behaviors need to be targeted and by what means?

Sequatchie County has been in the forefront of efforts to promote the programs that will keep the county competitive with other parts of the state. Sequatchie was one of the first counties to attain *Three Star* status, a program designed and promoted by the Department of Economic and Community Development to assist local governments in their efforts to develop the programs and infrastructure that provide the basis for sustained economic growth. Citizens are heavily involved in this process, which includes roadside cleanup efforts, community beautification, and other environmental programs.

In addition to the Three Star Program, the county participates in the Tennessee Department of Transportation Litter Grant Program. Funds from that source are used for roadside cleanup and providing educational materials to the general public in the form of brochures and on-going promotions in the schools.

The Sequatchie County school system has a recycling program that is operated in conjunction with the county's waste collection program: the schools collect materials and the county hauls them to market. All proceeds from the sale of recycled materials are returned to the schools.

This provides an incentive for teachers and students to promote and participate in the program.

The county mayor's office has reported an increase in the number of requests for additional recycling capacity. Over the past decade, the county has experienced an increase in population, generally from people moving into the area from more urban parts of the region. These people tend to expect more services from local governments and that includes more recycling opportunities.

Over the last 15 years, waste disposal in Sequatchie County has been transformed from unattended, burned-out green boxes surrounded by blowing litter to clean, well-maintained convenience centers. Illegal garbage dumps were common as was roadside litter. Today, roadside litter is still a constant problem, but the illegal dumps have diminished to the point that they are rarely noticed. This transformation is a cultural shift that is probably the result of concerted efforts to influence the behavior of school-age children who have now become adults.

SECTION 11: PLANNING

Discuss this region's plan for managing their solid waste management system for the next five (5) years. Identify any deficiencies and suggest recommendations to eliminate deficiencies and provide sustainability of the system for the next five (5) years. Show how the region's plan supports the Statewide Solid Waste Management Plan.

There are sufficient waste disposal facilities, and they are well maintained. Marion County provides waste disposal capacity at a permitted disposal facilities, but other landfills are available in Hamilton and Rhea Counties should a capacity interruption occur. The recycling program is operated in an efficient manner, and the largest center is located in Dunlap where most of the waste is produced and most of the recyclable material is collected.

One problem likely to occur in the future is associated with the maintenance of existing facilities and equipment as revenues decrease. The loss of sales and property taxes is highly likely, and there are no mechanisms available to Tennessee counties that would ameliorate these conditions.

The second problem is high fuel prices that have ameliorated in the past year but are likely to be a long-term problem: studies should be undertaken in the near future to devise the most cost-effective methods for the collection and transport of waste materials and recycling. This might include joint ventures with other counties, such as Bledsoe. In the past, these counties have worked together in the development and operation of a landfill. A jointly operated transfer station may be the most economical way to deal with higher costs and lower incomes in both counties.

The county is also interested in producing fuel for its diesel engines from used vegetable oil. Oil can be processed for about $0.80 per gallon, reducing fuel costs significantly. As an added bonus, oil that often ends up at the sewage treatment plant (where it is a significant problem) is used for beneficial purposes and reduces the amount of solids that the plant must dispose in a landfill.

As energy costs increase, the City of Dunlap will probably grow as residents move closer to jobs, commercial establishments, and other amenities. There will be increased pressure on the City to provide additional services while the cost of these services will require the City to carefully prioritize needs as they relate to statutory requirements.

The third problem is educating the public about waste reduction, recycling, litter control, and other waste issues. More internet-related advertising should be incorporated into the education program. In addition, radio and television advertisements should be provided while maintaining an educational presence in the K-12 schools.

Recommendations

Education

Recommendation: Much of today's information is disseminated through the internet. Consequently, it is imperative that the county and City of Dunlap develop and maintain their website to provide all of the basic details of county programs and services, including solid waste and recycling.

> **Action Item:** Request assistance from the County Technical Advisory Service and the Southeast Tennessee Development District in developing and maintaining a website.

Facilities and Programs

Recommendation 1: Upgrades will be required at all convenience centers to maintain and enhance existing operations.

Action Items: Replace waste compactors and receiving boxes at all convenience centers. Develop an annual replacement or refurbishment schedule.

Funding Source: Local funds or a Community Facilities grant through the USDA Rural Development grant/loan program.

Recommendation 2: All convenience centers need waste paint collection containers.

Action Item: Apply for grant funds to purchase waste paint collection containers.

Funding Source: Solid Waste Management Fund

Recommendation 3: Prepare a feasibility study of waste transportation options for the county, including a transfer station alternative.

Action Item: SETDD to meet with local officials to determine if there is support for a study.

Funding Source: SETDD would perform the study as part of TDEC contract.

Recommendation 4: Increased collaboration between the county and the City of Dunlap in the development and maintenance of recycling and waste reduction programs.

Action Item: Establish a planning committee as part of the Joint Economic & Community Development Board.

Funding Source: N/A

Conclusion

In general, Sequatchie County has all of the facilities and programs in place to meet statutory requirements. Some improvements are possible, but the county has made a good faith effort to provide its residents with recycling options using the most cost-effective methods available. The recycling program was recently expanded with the purchase of a new compactor for cardboard that was installed at the South Dunlap Convenience Center. Other centers will be improved with new equipment as the demand increases for additional recycling.

Opportunities that should be explored may include joint ventures with the other counties and the City of Dunlap. Sharing haul expenses for waste and recycling may result in more efficient operations than the existing system can provide.

ATTACHMENT

IOWA DNR WORKSHOP #2 HANDOUT
TRANSFER STATION ECONOMICS

The full cost of a transfer station consists of the sum of the construction and operating costs, the transportation cost to deliver waste from the transfer station to a permitted landfill and the disposal cost at the landfill. Shaw Environmental, Inc. (Shaw) has developed a cost model to estimate the construction and operating costs for a transfer station designed to handle 30 tons per day (tpd) of waste. The assumptions used to derive these costs are based on regulatory requirements, design features of existing transfer stations of similar size and Shaw's knowledge of and experience with the design and operation of transfer stations across the country. The assumptions have been reviewed and accepted by the Iowa DNR as representative of a "typical" facility. Actual facility costs will differ based on specific site conditions, the final design of the facility and operating costs specific to each planning area.

Shaw has also provided information that planning areas can utilize to calculate the transportation and disposal costs associated with the development of a transfer station.

Transfer Station Construction and Operating Cost Estimates

Cost estimates were prepared for the construction and operation of transfer stations developed in one of two manners: 1) a retrofit of an existing building, and 2) a new facility. For each type of transfer station two cost estimates were developed, resulting in a range of costs which may be expected with either development scenario. For the retrofit of an existing building, the two options considered were 1) top-load of transfer trailers at grade within the building, and 2) truck-to-truck transfer. For the construction of a new facility, the two cost estimates developed were based on 1) RS Means cost estimates for building construction, and 2) square foot cost for building construction based on the actual cost of construction for an approximately 30 tpd transfer station in Iowa.

The following assumptions / parameters summarize key elements of the cost estimates. Specific costs are outlined in Tables 1 through 4 at the back of this handout. (Note: Per ton costs indicated in Tables 1 through 4 are calculated assuming that landfills increase their current tipping fees by $17.10 (low landfill increment) to $21.54 (high landfill increment) per ton for an 18-month period prior to construction of either a new landfill cell or transfer station. This increased fee would be placed in a construction reserve fund to allow landfill cell construction to be performed without financing the construction costs, based on incremental cost increases calculated in Workshop #1. If the planning area opts to develop a transfer station instead, the reserve fund is assumed to be applied directly to the capital investment for the transfer station and the remainder of the capital investment will be financed for 15 years at a rate of 5%.)

General Assumptions / Parameters

Average throughput of 30 tpd of waste materials
Did not assume additional costs for stormwater management, local approvals, land acquisition or permitting
Personnel include 3 full-time staff, consisting of a supervisor / equipment operator, a scalehouse clerk and a general laborer
All equipment will be purchased new (other options would include leasing equipment or purchasing used equipment)

Shaw®

Retrofit of an Existing Building with Top-Load of Transfer Trailers (Table 1)

Existing conditions / preliminary requirements:

Building dimensions must be a minimum of 60 feet deep and 60 feet wide
The building must have a clear-span height of 30 feet
No center columns are present within the building
The building has an existing concrete floor with a minimum thickness of 6 inches
A scale and scalehouse are in place and available for the facility's use
Tipping floor access doors are of minimum dimensions of 24 feet high by 15 feet wide for collection vehicle access and 16 feet high by 12 feet wide for passenger vehicle / self-haul access
All necessary utilities are present on-site and are connected to the building, including electric, water, telephone, gas and sanitary sewer
Fencing has been previously installed around the facility perimeter
No site grading or placement of gravel for vehicle maneuvering areas is required

Modifications:

Floor will be modified by pouring an overlay of the existing floor consisting of 6 inches of reinforced concrete
A concrete pushwall consisting of concrete gravity blocks will be installed along the rear and side wall of the building to a height of 8 feet
A 500-gallon washwater storage tank will be installed and the existing floor drain(s) will be connected to the tank to prevent discharge of washwater to the sanitary sewer system or septic system / pond

Equipment requirements:

A front-end wheel loader of sufficient size to top-load a trailer at grade

Retrofit of an Existing Building with Truck-to-Truck Transfer (Table 2)

Existing conditions / preliminary requirements:

Building dimensions must be a minimum of 90 feet deep and 30 feet wide
The building must have a clear-span height of 30 feet
No center columns are present within the building
Access is available from both ends of the building
A scale and scalehouse are in place and available for the facility's use
Access doors are of minimum dimensions of 24 feet high by 15 feet wide
All necessary utilities are present on-site and are connected to the building, including electric, water, telephone, gas and sanitary sewer
Adequate space is available on-site for development of a citizen convenience center
Fencing has been previously installed around the facility perimeter
No site grading or placement of gravel for vehicle maneuvering areas is required

Modifications:

Loading ramp will be constructed within the building for collection vehicles to back to the level of the trailer bed (approximately 4 feet high)
A citizen convenience center consisting of roll-off boxes and signs indicating operating procedures will be developed adjacent to the building
A 500-gallon washwater storage tank will be installed and the existing floor drain(s) will be connected to the tank to prevent discharge of washwater to the sanitary sewer system or septic system / pond

Equipment requirements:

A small wheel loader to collect spilled refuse, should that occur, and capable of maneuvering into the transfer trailer to move small amounts of waste
Two transfer trailers designed for truck-to-truck transfer

Construction of a New Facility (Tables 3 and 4)

Site requirements:

Minimum site size of approximately 1.25 acres
All necessary utilities are available from the property line, including electric, water, telephone, gas and sanitary sewer
All vehicle maneuvering areas and access roads within the facility will be gravel
Scale and scalehouse must be constructed
Site is level, requiring minimal grading or excavation

Building requirements:

Building dimensions must be a minimum of 60 feet deep and 60 feet wide
The building must have a clear-span height of 30 feet
No center columns are present within the building
Tipping floor access doors are of minimum dimensions of 24 feet high by 15 feet wide for collection vehicle access and 16 feet high by 12 feet wide for passenger vehicle / self-haul access
The tipping floor will consist of 12 inches of reinforced concrete
Reinforced concrete pushwalls will be constructed along rear and side of the building to a height of 8 feet
A depressed loading bay with a ramp grade of 7% will be constructed along one side of building to a depth of 6 feet to facilitate trailer loading
Floor drains will be installed within the building to capture washwater and convey it to a 500-gallon washwater storage tank

Equipment requirements:

A front-end wheel loader of sufficient size to top-load a trailer at 6 feet below grade

Calculation of Total Transfer Station Costs

When evaluating the development of a transfer station, the construction and operating costs are only one component of the total cost of the facility. The cost estimates contained in Tables 1 through 4 of this handout do not include a cost for transportation or disposal of the waste delivered to the transfer station.

Transportation costs are dependent on several factors: 1) the number of hours of round-trip travel, calculated by knowing the distance to the landfill and the average travel speed to access the landfill, 2) the cost to operate a transfer trailer vehicle, typically expressed at an hourly rate, and 3) the payload of the transfer trailer. A per ton transportation cost may be calculated by the following formula:

$$Transportation\ Cost\ per\ Ton = \frac{(Trailer\ Cost\ per\ Hour) \times (Number\ of\ Hours)}{(Tons\ per\ Load)}$$

Disposal costs will vary depending on the landfill selected. Negotiating with multiple landfills will result in a planning area obtaining the lowest per ton disposal cost the marketplace will allow. Small, local landfills may be willing to offer a lower disposal fee to other planning areas because the increased tonnage going into the landfill will reduce the landfill's costs on a per ton basis. Additionally, the selected landfill may not be the nearest landfill, as some larger, regional landfills may be able to offer a lower disposal fee than a smaller, local landfill because their per ton costs have been reduced by being distributed across a larger wasteshed (the increased transportation cost to access these landfills may be offset by the lower disposal cost).

The total cost of a transfer station may be calculated when each of the component costs have been identified. The cost may be calculated by the following formula:

$$Cost\ per\ Ton = (Construction/Operating\ Cost\ per\ Ton) + (Transportation\ Cost\ per\ Ton) + (Disposal\ Cost\ per\ Ton)$$

TABLE 1. TRANSFER STATION COST SUMMARY:
RETROFIT OF AN EXISTING BUILDING WITH TOP-LOAD OF TRANSFER TRAILERS

	# Units	Unit	Unit Cost	Total Cost	Cost / Ton
Capital Costs					
Development Costs					
Tipping floor	3,600	square feet	$10.11	$36,400	
Pushwalls	1	lump sum	$1,000.00	$1,000	
Washwater storage tank	1	each	$3,000.00	$3,000	
Equipment Costs					
Front-end loader	1	each	$250,000.00	$250,000	
Less, Location Factor				($6,500)	
Plus, Contingency				$5,100	
Subtotal				$289,000	
Less, Initial Reserve (Low Landfill Increment)				($220,077)	
Less, Initial Reserve (High Landfill Increment)				($277,220)	
Capital Costs to be Financed (Low Landfill Increment)				$68,923	
Capital Costs to be Financed (High Landfill Increment)				$11,780	
Amortized Cost (Low Landfill Increment)				$6,640	$0.77
Amortized Cost (High Landfill Increment)				$1,135	$0.13
Operating Costs					
Loader fuel and maintenance	572	hours	$27.00	$15,400	
Building / site maintenance	1	each	$8,600.00	$8,600	
Utilities	3,600	square feet	$0.50	$1,800	
Leachate removal	1,500	gallons	$0.10	$200	
Supervisor / loader operator	1	each	$50,000.00	$50,000	
Scalehouse clerk	1	each	$35,000.00	$35,000	
Laborer	1	each	$40,000.00	$40,000	
Subtotal				$151,000	$17.60
Total Annual Costs (Low Landfill Increment)				**$157,640**	**$18.37**
Total Annual Costs (High Landfill Increment)				**$152,135**	**$17.73**

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TABLE 2. TRANSFER STATION COST SUMMARY:
RETROFIT OF AN EXISTING BUILDING WITH TRUCK-TO-TRUCK TRANSFER

	# Units	Unit	Unit Cost	Total Cost	Cost / Ton
Capital Costs					
Development Costs					
Loading ramp	1	each	$800.00	$800	
Washwater storage tank	1	each	$3,000.00	$3,000	
Equipment Costs					
Roll-off containers	4	each	$2,200.00	$8,800	
Transfer trailers	2	each	$75,000.00	$150,000	
Wheel loader	1	each	$150,000.00	$150,000	
Less, Location Factor				($600)	
Plus, Contingency				$500	
Subtotal				$312,500	
Less, Initial Reserve (Low Landfill Increment)				($220,077)	
Less, Initial Reserve (High Landfill Increment)				($277,220)	
Capital Costs to be Financed (Low Landfill Increment)				$92,423	
Capital Costs to be Financed (High Landfill Increment)				$35,280	
Amortized Cost (Low Landfill Increment)				$8,902	$1.04
Amortized Cost (High Landfill Increment)				$3,396	$0.40
Operating Costs					
Loader fuel and maintenance	572	hours	$13.00	$7,400	
Transfer trailer maintenance	2	each	$1,500.00	$3,000	
Building / site maintenance	1	each	$8,600.00	$8,600	
Utilities	2,700	square feet	$0.50	$1,400	
Leachate removal	1,500	gallons	$0.10	$200	
Supervisor / loader operator	1	each	$50,000.00	$50,000	
Scalehouse clerk	1	each	$35,000.00	$35,000	
Laborer	1	each	$40,000.00	$40,000	
Subtotal				$145,600	$16.97
Total Annual Costs (Low Landfill Increment)				**$154,502**	**$18.01**
Total Annual Costs (High Landfill Increment)				**$148,996**	**$17.37**

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TABLE 3. TRANSFER STATION COST SUMMARY: CONSTRUCTION OF A NEW FACILITY (LOW ESTIMATE)					
	# Units	Unit	Unit Cost	Total Cost	Cost / Ton
Capital Costs					
Sitework costs					
Equipment mobilization	3	each	$207.00	$621	
Excavation	526	cubic yards	$10.00	$5,260	
Crushed rock backfill	143	cubic yards	$20.00	$2,860	
Gravel surface					
Strip 12" aggregate fill	1,597	cubic yards	$0.69	$1,102	
6" base course	4,790	sq. yards	$6.80	$32,572	
Fine grading	4,790	sq. yards	$0.80	$3,832	
Fencing	895	linear feet	$20.00	$17,900	
Gates	2	each	$2,500.00	$5,000	
Ground cover	6	m.s.f.	$380.00	$2,280	
Utilities	310	linear feet	$33.00	$10,230	
Lighting	3,870	square foot	$0.50	$1,935	
Signage	1	each	$1,000.00	$1,000	
Transfer building costs					
Slab on grade, 12" thick	3,600	square feet	$14.85	$53,460	
Strip footing	40	cubic yards	$214.00	$8,560	
Building shell	4,440	square feet	$18.00	$79,920	
Electrical	4,440	square feet	$6.00	$26,640	
Ventilation	4,440	square feet	$2.00	$8,880	
Trench drain	60	linear feet	$30.00	$1,800	
Bollards	4	each	$600.00	$2,400	
Overhead doors	2	each	$5,000.00	$10,000	
Concrete pushwalls (8' high)	90	linear feet	$360.00	$32,400	
Load out tunnel					
Exterior retaining wall	60	cubic yards	$576.00	$34,560	
Interior retaining wall	60	cubic yards	$360.00	$21,600	
Slab on grade, 8" thick	2,044	square feet	$10.77	$22,014	
Ramp retaining wall	86	cubic yards	$360.00	$30,960	
Overhead door	1	each	$5,000.00	$5,000	
Trench drain	14	linear feet	$30.00	$420	
Washwater storage tank	1	each	$3,000.00	$3,000	

TABLE 3. TRANSFER STATION COST SUMMARY: CONSTRUCTION OF A NEW FACILITY (LOW ESTIMATE)

	# Units	Unit	Unit Cost	Total Cost	Cost / Ton
Scale	1	each	$67,500.00	$67,500	
Scalehouse	270	square feet	$70.00	$18,900	
Equipment Costs					
Front-end loader	1	each	$250,000.00	$250,000	
Less, Location Factor				($82,000)	
Plus, Contingency				$64,600	
Subtotal				$745,206	
Less, Initial Reserve (Low Landfill Increment)				($220,077)	
Less, Initial Reserve (High Landfill Increment)				($277,220)	
Capital Costs to be Financed (Low Landfill Increment)				$525,129	
Capital Costs to be Financed (High Landfill Increment)				$467,986	
Amortized Cost (Low Landfill Increment)				$50,592	$5.90
Amortized Cost (High Landfill Increment)				$45,087	$5.25
Operating Costs					
Loader fuel and maintenance	572	hours	$27.00	$15,400	
Building / site maintenance	1	each	$8,600.00	$8,600	
Utilities	4,710	square feet	$0.50	$2,400	
Leachate removal	1,500	gallons	$0.10	$200	
Supervisor / loader operator	1	each	$50,000.00	$50,000	
Scalehouse clerk	1	each	$35,000.00	$35,000	
Laborer	1	each	$40,000.00	$40,000	
Subtotal				$151,600	$17.67
Total Annual Costs (Low Landfill Increment)				**$202,192**	**$23.57**
Total Annual Costs (High Landfill Increment)				**$196,687**	**$22.92**

TABLE 4. TRANSFER STATION COST SUMMARY: CONSTRUCTION OF A NEW FACILITY (HIGH ESTIMATE)

	# Units	Unit	Unit Cost	Total Cost	Cost / Ton
Capital Costs					
Sitework costs					
Equipment mobilization	3	each	$207.00	$621	
Excavation	526	cubic yards	$10.00	$5,260	
Crushed rock backfill	143	cubic yards	$20.00	$2,860	
Gravel surface					
Strip 12" aggregate fill	1,597	cubic yards	$0.69	$1,102	
6" base course	4,790	sq. yards	$6.80	$32,572	
Fine grading	4,790	sq. yards	$0.80	$3,832	
Fencing	895	linear feet	$20.00	$17,900	
Gates	2	each	$2,500.00	$5,000	
Ground cover	6	m.s.f.	$380.00	$2,280	
Utilities	310	linear feet	$33.00	$10,230	
Lighting	3,870	square foot	$0.50	$1,935	
Signage	1	each	$1,000.00	$1,000	
Transfer building costs	4,440	square foot	$33.65	$149,406	
Scale	1	each	$67,500.00	$67,500	
Scalehouse	270	square feet	$70.00	$18,900	
Equipment Costs					
Front-end loader	1	each	$250,000.00	$250,000	
Less, Location Factor				($27,400)	
Plus, Contingency				$43,900	
Subtotal				$586,898	
Less, Initial Reserve (Low Landfill Increment)				($220,077)	
Less, Initial Reserve (High Landfill Increment)				($277,220)	
Capital Costs to be Financed (Low Landfill Increment)				$366,821	
Capital Costs to be Financed (High Landfill Increment)				$309,678	
Amortized Cost (Low Landfill Increment)				$35,340	$4.12
Amortized Cost (High Landfill Increment)				$29,835	$3.48

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TABLE 4. TRANSFER STATION COST SUMMARY: CONSTRUCTION OF A NEW FACILITY (HIGH ESTIMATE)

	# Units	Unit	Unit Cost	Total Cost	Cost / Ton
Operating Costs					
Loader fuel and maintenance	572	hours	$27.00	$15,400	
Building / site maintenance	1	each	$4,700.00	$4,700	
Utilities	4,710	square feet	$0.50	$2,400	
Leachate removal	1,500	gallons	$0.10	$200	
Supervisor / loader operator	1	each	$50,000.00	$50,000	
Scalehouse clerk	1	each	$35,000.00	$35,000	
Laborer	1	each	$40,000.00	$40,000	
Subtotal				$147,700	$17.21
Total Annual Costs (Low Landfill Increment)				**$183,040**	**$21.33**
Total Annual Costs (High Landfill Increment)				**$177,535**	**$20.69**