

United States
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Agency

Region VIII
1860 Lincoln Street
Denver, Colorado 80295

JULY 1982

Solid Waste



A TECHNICAL ASSISTANCE PROGRAM REPORT

**DETERMINATION OF COSTS, REVENUES
AND SOLID WASTE CHARACTERISTICS
IN LARIMER COUNTY, COLORADO**

A TECHNICAL ASSISTANCE PANELS PROGRAM REPORT:

**DETERMINATION OF COSTS, REVENUES AND SOLID WASTE
CHARACTERISTICS IN LARIMER COUNTY, COLORADO**

Prepared for:

U.S. Environmental Protection Agency
Region VIII

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ENVIROMENTAL PROTECTION AGENCY REGION VIII



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Technical assistance by personnel teams. 42 USC 6913

RESOURCE RECOVERY AND CONSERVATION PANELS

SEC. 2003. The Administrator shall provide teams of personnel, including Federal, State, and local employees or contractors (hereinafter referred to as "Resource Conservation and Recovery Panels") to provide States and local governments upon request with technical assistance on solid waste management, resource recovery, and resource conservation. Such teams shall include technical, marketing, financial, and institutional specialists, and the services of such teams shall be provided without charge to States or local governments.

This report has been reviewed by the Project Officer, EPA, and approved for publication. Approval does not signify that the contents necessarily reflect the views and policies of the Environmental Protection Agency, nor does mention of trade names or commercial products constitute endorsement or recommendation for use.

Project Officer: William Rothenmeyer

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I. BACKGROUND AND INTRODUCTION

The purpose of this report is to assess the solid waste management system in Larimer County, Colorado, from two main perspectives. First, the report describes the three landfills and two transfer stations operated by the County and estimates the 1981 costs and revenues accrued by each. Second, the report evaluates the current methods of cost, revenue and solid waste characteristics data collection.

Reference materials used in preparation of this report consisted of County financial records; specifically, the Solid Waste Department's 1981 Cost (expenditure) Summary, the 1981 Solid Waste Department personnel expenditure summary, the Solid Waste Department site collections ledger and other miscellaneous financial documents. Larimer County officials were extensively interviewed to provide necessary background and unrecorded information.

This assessment is an adjunct of a Technical Assistance Panels (T.A. Panels) report which evaluated the feasibility of including a solid waste incineration facility which could produce a useable energy product in the solid waste management system. The T.A. Panels program was established by Section 2003 of the Resource Conservation and Recovery Act of 1976. It required the Environmental Protection Agency (EPA) to provide technical assistance to State and local governments on "solid waste management, resource recovery and resource conservation."

Fred C. Hart Associates (FCHA), as the EPA's Region VIII T.A. Panels contractor conducted a waste-to-energy feasibility study for Larimer County. The evaluation of waste-to-energy feasibility consisted of comparing current disposal costs and non-monetary benefits and effects with projected costs, benefits and effects of an incinerator facility. The preliminary findings of the study clearly demonstrated that waste-to-energy is not currently feasible. The major reasons for this are:

- 1) lack of suitable energy consumers,
- 2) high capital and operating costs of incineration facilities,

- 3) relatively low local energy costs,
- 4) the existence of a well-run and relatively low cost solid waste management system.

The development of the resource recovery study emphasized several difficulties involved in conducting a detailed solid waste system assessment. Basic information such as solid waste volumes, densities, sources, composition and costs of disposal had to be estimated or constructed from unitemized data. Administrative and operations personnel supplied much invaluable information regarding these variables yet the data were not being systematically recorded and tabulated to provide a historical record.

As a result, the Larimer County Resource Recovery Task Force, which assisted in the initial feasibility study, concluded that remaining project funds were to be utilized to conduct a general assessment of the solid waste data management system with a specific look at costs and revenues for 1981.

The scope of work called for the following items.

- o Descriptions of each of the County's five solid waste disposal operations - Chapter 2.
- o 1981 itemized costs for labor and benefits, equipment, capital costs and maintenance, fuel, land and administration for each of the five sites - Chapter 3.
- o Determination of 1981 revenues for each of the five sites - Chapter 3.
- o Comparison of costs of disposal with charges for disposal - Chapter 3.
- o Assessment of current solid waste data collection methods - Chapter 4.
- o Development of an accounting system for use by the County in collecting the necessary solid waste data - Chapter 4.

- o Collection of one month's data on the accounting system at two specified sites - Chapter 4.
- o Recommendations on improvements needed in data collection/utilization and on solid waste disposal practices - Chapter 5.

II. THE SOLID WASTE MANAGEMENT SYSTEM IN LARIMER COUNTY

The solid waste system in Larimer County is managed by the County government through the Department of Public Works. Public Works is comprised of seven sub-departments, all of which have a Director and distinct areas of responsibility. Three of the seven departments are of interest in this study because they participate to some extent in solid waste management.

The Solid Waste Department has primary responsibility for solid waste management in the County. This department operates five solid waste management sites. However, the Solid Waste Department and the Department of Roads and Bridges, also in the Public Works Department, are closely associated in terms of personnel, equipment and functions. For example, one Director and Administrative Coordinator oversee both departments. There has been fairly regular use of Roads and Bridges personnel and equipment for Solid Waste operations.

The Fleet Management Department is the third Public Works Department which is associated with solid waste management. This department was organized in April, 1982 to manage and maintain all the equipment and vehicles used by the Roads and Bridges and Solid Waste Departments.

The purpose of this chapter is to provide an overview of the solid waste management system in Larimer County, Colorado. The following five solid waste disposal facilities are maintained at various locations (see Figure 1):

1. Berthoud Transfer Station
2. Estes Park Landfill
3. Fort Collins-Loveland Landfill
4. Red Feather Lakes Transfer Station
5. Wellington Landfill

LOCATION OF THE FIVE SOLID WASTE MANAGEMENT FACILITIES IN LARIMER COUNTY



Tables 1 through 5 present brief descriptions of each of the waste management facilities listed above. The descriptions are organized into 13 categories which were necessary to provide a basic understanding of the purpose of the site within the waste management system. The categories chosen also provide all the factors considered to affect cost computations later in this report. The categories included on Tables 1 through 5 and their importance in assessment of a solid waste management system are briefly described below.

1. Location. A description of the route to the site is provided rather than an address, as the sites are all rural. The location of a solid waste management facility relative to the user population and other solid waste facilities is a significant factor affecting costs. Isolated sites generally result in increased management costs for employee's travel time, equipment wear, fuel and maintenance. On the other hand, closing rural sites in favor of centralized, regional facilities may result in increased costs for prevention of and enforcement against illegal dumping.
2. Service Area. The term "service area" refers to the general area and population which use a particular site for disposal. The boundaries of the service areas are imprecise due to a lack of information necessary to define them.
3. Solid Waste Volumes and Specifics. Solid waste volume is an important variable in solid waste management. Incoming solid waste volumes affect the lifetime and size of disposal facilities such as landfills and incinerators. Solid waste in Larimer County is charged for on a volume basis (i.e. per cubic yard). Waste densities can vary widely, however. Uncompacted, loose household wastes range from 100 - 300 lbs/yd³. Compactor units pack solid wastes to densities of 400-800 lbs/yd³. Compaction at the landfill site may yield in-place densities of 800-1,500 lbs/yd³. Therefore, some estimate of the solid waste source (e.g. individually delivered, commercial hauler, etc.) is necessary to convert waste volumes to tonnage. Because it is standardized, tonnage is more useful in comparing solid waste operation costs.

4. Operating Schedule. This category provides the hours and days the site is open for receiving wastes.
5. Land. This category provides ownership, purchase, and/or leasing arrangements for the lands utilized in the solid waste management system. In some parts of the country and in Colorado land costs may be prohibitive when finding a new landfill site becomes necessary. Until now, land costs have been fairly low in Larimer County. However, costs are bound to rise and the price of land around the present Ft. Collins - Loveland landfill has risen greatly (see Table 5) in the last two decades.

The actual cost of land to the local population can be viewed from several perspectives. This study distributes the land costs evenly over a 20 year design life. Some studies have suggested that to assess the true costs of solid waste disposal, costs must be assigned to account for closure of the disposal site. Closure refers to the steps which must be taken to secure the landfill area and prevent leachate, methane and settling hazards. Some sites may be unuseable for many years following closure. Other sites with proper controls may be available for virtually any type of land use.

Closure costs were not included in the cost analysis presented in this report. Information necessary to justify estimates of closure costs is subjective at the present time.

6. Buildings. Buildings and associated facilities such as docks located at each site are identified and listed.
7. Operating History. This section briefly describes the past, present, and expected future use of the site as a solid waste management operation.
8. Equipment. A list of equipment used at each site is included here.

9. Personnel. This section identifies the number and work status (i.e. part-time or full-time) of the employees at each site.
10. Operations. This is a catch-all category which provides a description of any special arrangements, contracts or operations performed at each site which contribute to the costs and/or revenues of solid waste disposal. This category contains no information if the routine operation of the site is fully described by the other categories.
11. Data Management. This section identifies the methods of data management utilized for each site. Data management has been standardized throughout the County for solid waste data categories such as volumes, price charged, composition, etc. However, costs were not yet being isolated per site at the time of the study.
12. Roads and Bridges Department Contributions. Because of the close association of the Solid Waste Department and the Roads and Bridges Department in Larimer County, this section is meant to identify any regular or typical solid waste operations actually performed by the Roads and Bridges Department.
13. Revenues. The final category presents revenue figures on site collections and charges per month if these are available. Accurate figures are available for the two largest landfill sites but bank deposits and charges are not regularly kept for the smaller (i.e. lower-volume) sites. However, since site collections at the three smaller facilities (Berthoud, Red Feather, and Wellington) were relatively low, accurate estimates were possible.

TABLE 1
DESCRIPTION OF THE BERTHOUD TRANSFER STATION

1. Location. From the town of Berthoud, travel east on Highway 56, turn right on the road just past the Larimer/Weld County Line (sign), turn left at the first road. This leads directly to the transfer station.
2. Service Area. Serves the Town of Berthoud (pop'n. = 2,500) and surrounding rural areas.
3. Solid Waste Volume and Specifics. The county pays the hauling contractor at a rate of \$2.70/yd³. In 1981, the county paid out \$19,644 which means they hauled 7,276 yd³. Compactor units are not allowed to use the transfer station, only private individuals with loose, household waste so a reasonable density figure is 300 lbs/yd³. Converting yardage to tonnage yields a 1981 solid waste tonnage estimate of 1,090 tons (TPY).
4. Operating Schedule. Wednesday 10 - 4
Saturday 10 - 4
5. Land. The property is a former dump which is owned by the Town of Berthoud. 4.2 acres were purchased many years ago (1973 evaluation = \$1,000) 1.5 acres were purchased in 1973 (evaluation \$1,500). The land was leased to Larimer County in April 1975 for \$10 for 20 years.
6. Buildings and Associated Facilities. A gatehouse and dock were constructed in 1975 at a cost of \$50,000.
7. Operating History. The transfer station went into use in 1975. No projection of useful life. This is the same site as the former landfill site.
8. Equipment. There are four roll-off containers of 30 yd³ and 40 yd³ volumes owned by the hauling contractor.

TABLE 1 (cont.)
DESCRIPTION OF THE BERTHOUD TRANSFER STATION

9. **Personnel.** The site employs one part-time Solid Waste Department employee. There is an occasional substitute employee.
10. **Operations.** The County has a contract with a commercial waste hauler to haul roll-off containers to the County Landfill. The County pays at a rate of \$2.70/yd³. This comes out of the "Hauling Contracts" line item (11-23) on Solid Waste Department Cost Summary (See Appendix A).
11. **Data Management.**

Solid Waste Characteristics: The gatekeeper estimates and records volumes and category (loose, compacted, tires, uncovered) for each load on dump tickets.

Costs: Costs are not being directly recorded although new data management procedures will allow specific cost accounting.

Revenues: The price charged for each load and the method of payment are also recorded on the dump tickets.

The administrative coordinator tallies the dump tickets and records the subtotals on a ledger sheet.
12. **Roads and Bridges Contributions.** Minor road work is performed by the Roads and Bridges Department.

TABLE 1 (cont.)
DESCRIPTION OF THE BERTHOUD TRANSFER STATION

13. Revenues.

1981

January	\$ 475.90
February	640.75
March	441.60
April	583.40
May	385.50
June	814.75
July	656.15
August	770.15
September	618.15
October	580.85
November	742.15
December	<u>580.85</u>
TOTAL	\$7,290.20

TABLE 2
DESCRIPTION OF THE ESTES PARK LANDFILL

1. Location. From the Town of Estes Park, travel west on Highway 36, turn right at "M" Road.
2. Service Area. The landfill serves the Town of Estes Park and surrounding residential areas, Rocky Mountain National Park and Roosevelt National Forest areas.
3. Solid Waste Volume and Specifics. Solid waste handled by the landfill is estimated to be 15,000 tons per year (TPY).
4. Operating Schedule.

Winter: Tuesday 9 - 4	Summer: Monday --> Saturday 8 - 4
Thursday 9 - 4	Sunday 9 - 4
Saturday 9 - 4	
5. Land. The property is owned by the City of Estes Park which purchased part of the site in the 1920's for \$1,800. No leasing fee is paid by the County. The area consists of 25 acres, only a portion of which is used as a landfill.
6. Buildings and Associated Facilities. A gatehouse was constructed for an original cost of \$28,000.
7. Operating History. The site has been used as a landfill since the early 1900's. The town purchased part of the area in the 20's for \$1,800. The capacity of the area will be reached very shortly (within 1-2 years) and an alternate site or method will need to be found. In addition to the problem of limited space, a lack of cover material and severe high winds also create operating difficulties.

TABLE 2 (cont.)
DESCRIPTION OF THE ESTES PARK LANDFILL

8. Equipment. A loader is used full-time at the landfill. It was purchased in 1980 at a cost of \$108,770.
9. Personnel. The site employs two full-time Solid Waste Department employees, two substitute part-time Solid Waste Department employees and one full-time Roads and Bridges employee who works regular overtime at the site during the summer.
10. Operations. Because of a severe cover material shortage, the Roads and Bridges Department periodically performs cover material acquisition and stockpiling operations. In 1981, the Roads and Bridges Department conducted two major dredging and stockpiling programs and recorded these as Solid Waste Department operations on their new computer budget system. The Roads and Bridges Department expended approximately \$83,895 on these tasks.
11. Data Management.

Solid Waste Characteristics: A computerized cash register system was installed February 1, 1982. Solid waste volumes and category (loose, compacted, septic, tires, animals, junk cars, or roll-offs) are entered on this and automatically tallied, daily.

Costs: Costs are not being directly recorded although new data management procedures will allow specific cost accounting.

Revenues: The price charged for each load and the method of payment are entered on the cash register.

The administrative coordinator records cash register subtotals on ledger sheets.

TABLE 2 (cont.)
DESCRIPTION OF THE ESTES PARK LANDFILL

12. **Roads and Bridges Contributions.** The Roads and Bridges Department performs cover material operations (see #10, above) and a full-time Roads and Bridges employee works approximately 36 hours/month of overtime at the site June through September.

13. **Revenues.**

January	2,718.75
February	1,693.50
March	2,492.00
April	2,175.75
May	1,958.00
June	3,132.25
July	7,497.50
August	4,571.05
September	3,779.25
October	3,442.50
November	1,431.50
December	<u>2,623.75</u>
TOTAL	37,515.80

TABLE 3
DESCRIPTION OF THE FT. COLLINS-LOVELAND LANDFILL

1. **Location.** From Ft. Collins, travel south on College Avenue. At Harmony Road, turn right (west), and continue along it until reaching Taft Hill Road. Turn left (south) and the landfill will be on the right.
2. **Service Area.** The landfill serves essentially the entire county except the town and area of Wellington and the Estes Park-Rocky Mountain National Park area. It serves a population of 148,000.
3. **Solid Waste Volume and Specifics.** The landfill receives an estimated 134,685 tons per year (TPY), a little over half of which is delivered by commercial haulers.
4. **Operating Schedule.** Monday --> Saturday 8 - 4
Sunday 9 - 3:30
5. **Land.** Ft. Collins purchased the original 320 acres in 1962 for \$30,000. In 1967 1/4 of the property was deeded to Loveland and 1/4 was deeded to Larimer County. In 1979, 160 additional acres were purchased by County. Payment will be completed in 1983 at a total cost of \$185,600.
6. **Buildings and Associated Facilities.** The gatehouse was built in 1965. The replacement value is estimated to be \$2,500.
7. **Operating History.** The landfill is expected to remain functional until the year 2000.
8. **Equipment.** The full list is on the cost and revenue summary (Table 8).
9. **Personnel.** There are six full-time Solid Waste Department employees, two part-time Solid Waste Department employees, and one or two occasional substitute Solid Waste Department employees.

TABLE 3 (cont.)
DESCRIPTION OF THE FT. COLLINS-LOVELAND LANDFILL

10. Operations. No additional information.

11. Data Management.

Solid Waste Characteristics: A computerized cash register system was installed February 1, 1982. Solid waste volumes and category (loose, compacted, septic, tires, animals, junk cars, or roll-offs) are entered on this and automatically tallied, daily.

Cost: Costs are not being directly recorded although new data management procedures will allow specific cost accounting.

Revenues: The price charged for each load and the method of payment are entered on the cash register.

The administrative coordinator records cash register subtotals on ledger sheets.

12. Roads and Bridges Contributions. None.

TABLE 3 (cont.)
DESCRIPTION OF THE FT. COLLINS-LOVELAND LANDFILL

13. Revenues.

January	32,808.00
February	17,432.80
March	35,488.35
April	29,291.70
May	34,040.60
June	30,364.85
July	36,354.55
August	44,670.70
September	31,234.05
October	26,999.55
November	33,991.25
December	<u>17,625.65</u>
	370,302.05
	<u>- 8,200.00</u>
TOTAL	362,102.05

These figures actually include Red Feather Lakes and Wellington receipts which are estimated to total 8,200 for 1981, so this amount is subtracted from the total.

TABLE 4
DESCRIPTION OF THE RED FEATHER LAKES TRANSFER STATION

1. **Location.** From the City of Ft. Collins, travel north on Highway 287. Turn left (west) on highway 74 just past LaPorte and stay on this road until you arrive at Parvin Lake. The transfer station is just off the road in this area.
2. **Service Area.** The transfer station serves the Red Feather Lakes area and other surrounding Roosevelt National Forest areas.
3. **Solid Waste Volume and Specifics.** Solid waste handled by the transfer station is estimated to be 260 tons per year (TPY). No compactor units are allowed to use the transfer stations.
4. **Operating Schedule.** Saturdays 9 - 4.
5. **Land.** The property is leased from the Colorado Fish and Game Department for \$1/99 yr.
6. **Buildings and Associated Facilities.** A gatehouse and a dock originally (1978) cost the County \$50,000.
7. **Operating History.** The transfer station was opened 3-4 years ago. Until 1982 the gatekeeper also drove the truck to the Ft. Collins-Loveland land-fill for disposal. At present, the Solid Waste Department is using a contractor to haul the garbage on a trial basis.
8. **Equipment.** In 1981 a 1970 tandem truck was used at the transfer station for collection and hauling.
10. **Personnel.** A gate keeper who is a part-time Solid Waste Department employee, works at the transfer station.
11. **Operations.** No additional information.

TABLE 4 (cont.)
DESCRIPTION OF THE RED FEATHER LAKES TRANSFER STATION

11. Data Management.

Solid Waste Characteristics: The gatekeeper estimates and records volumes and category (loose, compacted, tires, uncovered) for each load on dump tickets.

Costs: Costs are not being directly recorded although new data management procedures will allow specific cost accounting.

Revenues: The price charged for each load and the method of payment are also recorded on the dump tickets.

The administrative coordinator tallies the dump tickets and records the subtotals on a ledger sheet.

12. Revenues. Records are not always kept for the Red Feather Site, specifically. Revenues for 1981 were estimated to be approximately \$1,200.

TABLE 5
DESCRIPTION OF THE WELLINGTON LANDFILL

DESCRIPTION OF THE WELLINGTON LANDFILL

1. **Location.** Travel north on Interstate Highway 25 from Fort Collins. Exit at Owl Canyon Road and travel west for 1 mile.
2. **Service Area.** The landfill serves the Town of Wellington and the surrounding rural area.
3. **Solid Waste Volume and Specifics.** The landfill handles an estimated 2,600 tons per year (TPY) of uncompacted garbage. Only one very small commercial collection company with a compactor unit is permitted to use the landfill.
4. **Operating Schedule.** Open: Wednesday 12 - 4 Saturday 10 - 4
Friday 12 - 4 Sunday 10 - 4
5. **Land.** The property is owned by Larimer County. A County gravel mining operation is also located on the site.
6. **Buildings and Associated Facilities.** A gatehouse was constructed in 1978 at an original cost of \$2,980.
7. **Operating History.** The site has been used for waste disposal for many years.
8. **Equipment.** No equipment is used exclusively for the landfill. A Roads and Bridges Department bulldozer used for the gravel mining operation is used 4 hours/week for the landfill.
9. **Personnel.** The site employs one part-time Solid Waste Department employee.
10. **Operations.** The Wellington Landfill is operated in the excavated area of a Larimer County-owned gravel mining operation. Cover material utilized at the site is actually the overburden removed from the site. The Roads and Bridges Department operates the gravel pit with a Roads and Bridges owned

2. Service Area. The landfill serves the Town of Wellington and the surrounding rural area.

3. **Solid Waste Volume and Specifics.** The landfill handles an estimated 2,600 tons per yer (TPY) of uncompacted garbage. Only one very small commercial collection company with a compactor unit is permitted to use the landfill.

4. **Operating Schedule.** Open: Wednesday 12 - 4 Saturday 10 - 4
Friday 12 - 4 Sunday 10 - 4

- Friday 12 - 4 Sunday 10 - 4

5. Land. The property is owned by Larimer County. A County gravel mining operation is also located on the site.

6. **Buildings and Associated Facilities.** A gatehouse was constructed in 1978 at an original cost of \$2,980.

7. Operating History. The site has been used for waste disposal for many years.

8. Equipment. No equipment is used exclusively for the landfill. A Roads and Bridges Department bulldozer used for the gravel mining operation is used 4 hours/week for the landfill.

9. Personnel. The site employs one part-time Solid Waste Department employee.

10. Operations. The Wellington Landfill is operated in the excavated area of a Larimer County-owned gravel mining operation. Cover material utilized at the site is actually the overburden removed from the site. The Roads and Bridges Department operates the gravel pit with a Roads and Bridges owned

TABLE 5 (cont.)
DESCRIPTION OF THE WELLINGTON LANDFILL

bulldozer. The bulldozer is estimated to spend 4 hours/week on Solid Waste Department landfill activities for which the Department estimated it expended \$15,000 in 1981.

11. Data Management.

Solid Waste Characteristics: The gatekeeper records solid waste volumes and category (loose, compacted, tires, uncovered) for each load dumped on the dump tickets.

Costs: Costs are not being directly recorded although new data management procedures will allow specific cost accounting.

Revenues: The price charged for each load and the method of payment are also recorded on the dump tickets.

The administrative coordinator tallies the dump ticket and records the subtotals on a ledger sheet.

12. Roads and Bridges Contributions. See #10.

13. Revenues. Records are not always kept for the Wellington Landfill site, specifically. Revenues for 1981 were estimated to be approximately \$7,000.

III. 1981 ITEMIZED COST AND REVENUE ANALYSIS

This chapter presents cost and revenue data for each of the five sites in Tables 6 through 10. The project was meant to provide the actual 1981 costs of solid waste operations for the following items: 1. Labor, 2. Equipment, Capital Costs and Maintenance, 3. Fuel, 4. Land, 5. Buildings, 6. Other Operating Costs, and 7. Administration. Total costs for each solid waste management site and the management system as a whole were then calculated within the limits of accuracy allowed by the available data. The process of determining the costs, and the assumptions and estimates necessary to do so led to an understanding of the adjustments needed within the Solid Waste Department data management system and within the Public Works Department to facilitate precise cost accounting.

There were two fundamental problems in itemizing the costs of solid waste management in Larimer County. The first was an absence of records or absence of site-specific records which were itemized in a useful manner. For example, records concerning construction of buildings and costs of construction were either unavailable or inaccessible. Also, expenditures for such things as equipment maintenance, fuel and revenues were not identified by site. There are practical reasons for this as the solid waste operations are extremely vital to the County and the primary management objective is to keep them running smoothly. However, these practices make a determination of real costs very difficult.

The second problem encountered in itemizing the costs of solid waste management in Larimer County was the existence of 'hidden costs.' An attempt was made throughout the process of compiling and calculating cost figures to identify 'hidden costs' which are defined as costs of solid waste management that were actually charged to some entity other than the Solid Waste Department. For example, cover material acquisition for the Estes Park and Wellington landfills was performed by the Roads and Bridges Department and resultingly the costs for cover material acquisition appear within the Roads and Bridges Department budget. For this analysis the costs associated with cover material acquisition were tallied as part of the Solid Waste Department's operating budgets for the Estes Park and Wellington landfills. This is an example of a hidden cost.

On the other hand, the land on which the Red Feather Lakes transfer station is located is owned by the Colorado Fish and Game Department and leased to Larimer County for a charge of \$1.00 for 99 years. If the County had to purchase or lease this land from a private owner the costs would be substantially higher. In effect, the County's operation is being subsidized by the Fish and Game Department. Costs such as this example are not identified as hidden costs and are excluded from this cost analysis because the land does not represent a current expense to the Fish and Game Department.

The 1981 cost and revenue tables which follow also provide information on what department or governmental agency pays those costs. This is placed in parentheses. Costs that were directly accounted for on the 1981 Solid Waste Cost Summary (see Appendix A) are referenced to that document by line-item number in the following manner. For example, the cost item was \$6,280.00 for groundwater monitoring at the Ft. Collins-Loveland landfill (See Table 8, #6). This figure is followed in the table by the reference ... (SWDCS 11-32). The parenthesis is the symbol which informs the reader that this is the agency which pays this particular cost. The initials SWDCS stand for Solid Waste Department Cost Summary which is located in Appendix A, and 11-32 is the line item under which this expense is tracked. Costs which were not actually paid out of the Solid Waste Department budget in 1981, but which are actually costs of operation (such as building costs) were attributed to the Solid Waste Department or the appropriate agency.

Calculations of cost figures which had to be estimated or extrapolated are presented in the appendices. Reference to the appropriate appendix necessary to check a particular estimate appears in brackets within the tables.

The descriptions of the solid waste management sites and the appendices complement the cost/revenue summaries. The descriptions provide the background information necessary to understand the assumptions, estimates and calculations in the appendices which resulted in the final cost figures.

The seven cost categories used to itemize costs at each site are briefly described below and Table 6-1981 Cost and Revenue Summary for the Berthoud Transfer Station-is used as an example to illustrate the methods used.

1. Labor and Benefits. Personnel employed at each site were identified and the yearly costs of their salaries and benefits were ascertained from County records. These costs are highly specific and very accurate. Calculations were required to apply the costs of benefits to the salaries and are presented in Appendix B.

Berthoud: There is one gatekeeper at the Berthoud Transfer Station who is a part-time County employee and a substitute gatekeeper. These employees are paid by the Solid Waste Department and the salaries are accounted for on the Solid Waste Department Cost Summary line item 01-04 (SWDCS--01-04). Their salaries plus extras paid to all employees which includes social security, workman's compensation and unemployment insurance amounted to approximately \$5,190 in 1981. To check the calculations one would turn to Appendix B.

2. Equipment, Capital Costs and Maintenance. Equipment utilized at each site was identified and the year, purchase price and purchaser were determined if possible. Capital costs of equipment were distributed over a 10-year period through use of the following formula.

$$\text{Yearly Charge} = \frac{\text{Total Cost} \times .8^*}{10 \text{ years}}$$

* It is assumed that 20 per cent of the original cost will be recovered from sale of the used equipment.

All equipment was considered in determining the maintenance costs per site. Equipment that was owned by the County for more than ten years was not accounted for in terms of a yearly charge on its capital costs (See formula above). Since site- or equipment-specific maintenance costs were not kept, total maintenance costs reported for the Solid Waste Department Cost Summary were equally apportioned among all pieces of equipment utilized by the Solid Waste Department. Full calculations demonstrating the method used in apportioning maintenance costs are presented in Appendix C.

Berthoud: No County-owned equipment is at the site. Turning to Appendix C, it is illustrated that \$500 was assumed as a general maintenance charge per site. Then the remainder of the maintenance money was equally split among all major pieces of equipment used for solid waste operations. Therefore, the 1981 charge was only estimated to be \$500 which was accounted for on the Solid Waste Department Cost Summary (see Appendix A) line items 11-21 and 11-22 (SWDCS 11-21, 11-22).

3. Fuel, Oil and Antifreeze. Total fuel, oil and antifreeze for equipment usage was identified on the Solid Waste Department Cost Summary and apportioned equally among all vehicles used for solid waste operations. The average cost of these items per piece of equipment for 1981 was about \$4,740. Consequently, a facility that had only one piece of equipment was "charged" \$4,740 in fuel, oil and antifreeze costs for 1981 while a site with 10 pieces of equipment would be charged \$47,400.

Heating fuel was accounted for under a different line item on the Solid Waste Department Cost Summary. These costs were charged proportionate to the hours of operation of the various gatehouses. Calculations of costs for equipment fuel, oil and antifreeze and heating fuel are presented in Appendix D.

Berthoud: Since the Berthoud Transfer Station has no equipment the only fuel used is for heating. Checking Appendix D it is shown that Berthoud's hours of operation were approximately 11 percent of the total hours of operation for all the site gatehouses so it was assumed to have been responsible for using approximately 11 percent of the utilities budget. The funds were accounted for on the Solid Waste Department Cost Summary line item 11-30 (SWDCS--11-30).

4. Land. If land had been purchased by the County the purchase price was distributed over the design life of the facility which was assumed to be 20 years. Calculations are presented on the tables.

Berthoud: This is an example of a 'hidden cost' which was explained above. The property underlying the transfer station is owned by the Town of

Berthoud and leased to the County for the minimal fee of \$10/20 years. Use of the land is only costing the County \$.50 per year. However, the property actually is or was an expense to the City of Berthoud. Therefore, in an attempt to identify the actual costs of solid waste management, the cost to the City of Berthoud which is calculated to be \$75/year, is included in the cost accounting.

5. Buildings. Yearly costs of buildings and associated facilities were attributed using the same technique as that used for land costs. Calculations are provided on the tables.

Berthoud: The 1975 cost of the gatehouse and dock was \$50,000 which, under this system, will be considered to result in a yearly charge of \$2,500 until 1995 (end of assumed 20 year design life period). The construction of the gatehouse and dock was originally paid for by the Solid Waste Department.

6. Other Operating Costs. This category covers costs which did not appropriately fit into other cost categories such as hauling contracts and environmental monitoring.

Berthoud: The Solid Waste Department has a contract with a local commercial hauler to supply roll-off containers at the transfer station and to transport them to the Larimer County landfill for disposal. The Solid Waste Department pays for this service at a rate of \$2.70/yd³.

7. Administrative Costs. Total administrative costs were charged to the sites as a function of the waste volume handled. Full calculations to demonstrate these figures are presented in Appendix E.

Berthoud: The Berthoud site handled about 1,090 tons of solid waste in 1981 which represents about 7 percent of the total waste handled in the entire solid waste management system in Larimer County. Therefore, the site is assessed a charge of 7 percent of the total administrative costs or \$195 for 1981. Calculations apportioning these costs to the five sites appear in Appendix E and are accounted for under several line items in the Solid Waste Cost Summary which are noted in the Appendix.

8. Total Costs. This category simply totals categories 1 through 7 and yields the total cost in 1981 for the specific site. The average cost per ton of waste handled is also presented here. Calculating costs per ton is a standard procedure in solid waste management materials. Standardizing the cost figure provides an opportunity for comparing costs of solid waste management in different locales, for assessing the effects of economies of scale, comparing costs at different management sites, comparing costs to revenues and comparing costs to charges for disposal.

Berthoud: Total costs at Berthoud amounted to \$28,510 in 1981. To determine the average cost per ton, the Berthoud Transfer Station description can be consulted. Under #3 Solid Waste Volume and Specifics it can be calculated that the contractor hauled approximately 7,276 yd³ of uncompacted solid waste to the Fort Collins-Loveland landfill.

Using a density figure of 300 lbs./yd³ results in an estimated solid waste tonnage in 1981 of 1,090 tons. Therefore, the average cost per ton of solid waste handling at the Berthoud Transfer Station in 1981 was about \$26.20 per ton.

9. Revenues. Funds to operate the Solid Waste Department are all the result of site user fee collections. Revenues were not recorded for the Red Feather Transfer Station and the Wellington Landfill. Since revenues were quite low at these facilities, however, fairly accurate estimates are possible.

Berthoud: Revenues resulting from site collections at the Berthoud Transfer Station in 1981 totaled to \$7,290 for a deficit of \$21,220. Revenues per ton were \$6.70 while costs were \$26.20.

Tables 7 through 10 provide similar detailed cost and revenue estimates for the other four solid waste sites. Table II presents a comparison of the total costs and revenues of all five sites and for the Solid Waste Management system as a whole. The 1981 costs for the solid waste management system were \$499,170 with revenues of \$415,110 which resulted in a shortfall of \$84,060. Of the five

sites, only the Fort Collins-Loveland landfill collects fees which total greater than its costs.

The per ton cost and revenue figures are also interesting (see Table 12). Costs per ton range from a low of \$2.20 at the Fort Collins-Loveland landfill to \$8.50 at Wellington and \$9.40 at Estes Park. There is quite a differential in terms of actual costs at the landfills.

The transfer stations handling costs (which also include landfilling costs) are much greater at \$26.20 per ton at Berthoud and \$53.20 at Red Feather. These costs cannot be directly compared to the landfilling costs because these are essentially collection and disposal operations which involve transportation of wastes. Commercial haulers in the Ft. Collins area and the City and County of Denver report that transportation costs may account for over 90 percent of their total costs. Assuming that actual disposal costs for Berthoud are \$2.50 per ton (since the solid waste is disposed of at the Fort Collins-Loveland landfill where the estimated charge per ton = \$2.50) the remaining \$23.70 (Berthoud total cost per ton = \$26.20 - cost per ton for disposal = \$2.50 = \$23.70) represents approximately 90 percent of the total costs. That compares directly with the commercial haulers' estimates. The same sort of reasoning applied to the Red Feather situation yields an estimate of 95 percent of total costs attributable to transportation. The percentages compare well as do the actual cost comparisons. The City and County of Denver reports costs of \$27 to \$54 per ton for collection and disposal.

Table 13 attempts to compare costs per ton to charges for disposal. The estimated costs per ton from Tables 6 through 10 are listed in the first column. The second column lists the estimated charge per ton of compacted solid waste. This relates to the probable average cost to a commercial compactor hauler. The charge to haulers who purchased punch tickets as \$0.75/yd³. Assuming a compacted density of 600 lbs/yd³, this averages about \$2.50/ton of solid waste. Compactor units are not allowed to use either of the transfer stations or the Wellington landfill so none of the revenues are the result of compacted waste. The third column lists the estimated charge per ton to individuals hauling loose household wastes. The accuracy of these estimates is questionable. Since Berthoud, Red Feather and Wellington do not accept compacted wastes, the

TABLE 6
1981 COSTS AND REVENUES FOR THE BERTHOUD TRANSFER STATION

--COSTS--

1. Labor and Benefits.	1981 \$
1 Gatekeeper, part-time employee, and a substitute (SWDCS--01-04) [APPENDIX B]	5,190
2. Equipment, Capital Costs and Maintenance.	
No equipment owned by County General maintenance (SWDCS 11-21, 11-22) [APPENDIX C]	0 500
3. Fuel, Oil and Antifreeze.	
Fuel used for heating gatehouse during winter months (SWDCS 11-30) [APPENDIX D]	400
4. Land.	
Land owned by the Town of Berthoud, leased to County in 1975 for \$10/20 years. Yearly Charge = $\frac{\text{Total Cost} = \$1,500}{\text{Design Life} = 20} = \75 (City of Berthoud)	80
5. Buildings and Associated Facilities.	
1 Gatehouse and Dock, original cost (1975) of \$50,000 Yearly Charge = $\frac{\text{Total Cost} = \$50,000}{\text{Design Life} = 20} = \$2,500$ (SW Department)	2,500
6. Other Operating Costs.	
County contract with Yellow Barrel Disposal to haul roll-offs to County Landfill @ \$2.70/yd ³ (SWDCS 11-23)	19,640
7. Administrative Costs.	
Administrative costs apportioned relative to waste volume (SW Department) [APPENDIX E]	200
8. Total	
	28,510 26.20 per ton
--REVENUES--	
	7,290 6.70 per ton

TABLE 7
1981 COSTS AND REVENUES FOR THE ESTES PARK LANDFILL

--COSTS--

	1981 \$
1. Labor and Benefits.	
1 Gatekeeper, full-time employee, 1 loader-operator, full-time, 1 substitute (SWDCS--01-02,04)	30,930
1 Full-time County employee works approximately 36 hrs/mo overtime (June-->September) with an hourly salary of \$14.01--paid by Road and Bridges Department. [APPENDIX B]	3,540
2. Equipment, Capital Costs and Maintenance.	
1 Loader, new cost \$108,770 Assuming a 10-year life with 20% reclaim value yearly charge = $\$108,770 \times .8 \div 10 \text{ yrs} =$ (SWDCS 90-99)	8,700
General Maintenance (SWDCS 11-21, 11-22) [APPENDIX C]	3,610
3. Fuel, Oil and Antifreeze.	
Heating (SWDCS 11-30) [APPENDIX D]	700
Gas, Oil and Antifreeze (SWDCS 11-40) [APPENDIX D]	4,740
4. Land.	
Owned by the City of Estes Park, purchased around 1920 and presently leased for a nominal (or no) fee to the County (City of Estes Park)	0
5. Buildings and Associated Facilities.	
1 Gatehouse, original cost \$28,000 Yearly Charge = $\frac{\text{Total Cost} = \$28,000}{\text{Design Life } 20} = \$1,400$ (SW Department)	1,400
6. Other Operating Costs.	
Significant cost to the County for cover material acquisition and stockpiling (Road and Bridge Department)	83,900
7. Administrative Costs.	
Administrative costs apportioned relative to waste volumes (SW Department) [APPENDIX E]	2,750
8. Total.	
	140,270 9.40 per ton

--REVENUES--

TABLE 8
1981 COSTS AND REVENUES FOR THE FT. COLLINS-LOVELAND LANDFILL

--COSTS--

1. Labor and Benefits.	1981 \$
6 Full-time employees, 3 part-time (SWDCS--01-02,04) [APPENDIX B]	127,560
2. Equipment, Capital Costs and Maintenance.	
Purchased by SW Department: New Cost:	
71 Dodge Pickup \$ 2,990 *	
73 Cat Loader 44,690	
74 Chevy Pickup 3,040	
75 Cat Compactor 109,410	
75 Air Compressor 6,720	
79 Cat Scraper 153,000	
80 Cat Dozer 236,000	
TOTAL: \$552,860	
Purchased by Road and Bridge: New Cost:	
48 Cat Blade *	
57 Cat Dozer 70,800 *	
61 GMC Truck 4,830 *	
* greater than 10 years old so not included	
Assuming a 10-year life with a 20% reclaim value	
yearly charge = $\$552,860 \times 8 \div 10 = \$44,229$	44,230
(SW Department)	
General Maintenance	31,610
(SWDCS 11-21,22) [APPENDIX C]	
3. Fuel, Oil and Antifreeze.	
Heating	1,810
(SWDCS 11-30) [APPENDIX D]	
Gas, Oil and Antifreeze	47,430
(SWDCS 11-40) [APPENDIX D]	
4. Land.	
Original 320 acre parcel, purchased 1962 for \$30,000 (Cities of Fort Collins, Loveland)	
Additional 160 acre parcel, payments end in 1983, total cost \$185,600	
yearly charge= $\text{Total Cost} = \$215,600 = \$10,780$	10,780
Design Life 20	
(Public Works Fund--Larimer County)	
5. Buildings and Associated Facilities.	
Gatehouse, replacement value (built 1965) \$2,500	
Yearly Charge = $\text{Total Cost} = \$2,500 = \125	130
Design Life 20	
(SW Department)	
6. Other Operating Costs.	
Groundwater monitoring	6,280
(SWDCS 11-32)	
7. Administrative Costs.	
Administrative costs apportioned relative to waste volumes	24,530
(SW Department) [APPENDIX E]	
8. Total	294,360
	2.20 per ton

--REVENUES--

TABLE 9
1981 COSTS AND REVENUES FOR THE RED FEATHER LAKES TRANSFER STATION

--COSTS--

1. Labor and Benefits.	1981 \$
1 Gatekeeper, part-time employee (SWDCS--01-04) [APPENDIX B]	2,700
2. Equipment, Capital Costs and Maintenance.	
1 "Tandem Truck" (1970) Don't attribute a yearly cost to because it is over 10 years old General Maintenance (SWDCS 11-21, 22) [APPENDIX C]	3,610
3. Fuel, Oil and Antifreeze.	
Heating (SWDCS 11-30) [APPENDIX D]	230
Gas, Oil and Antifreeze (SWDCS 11-40) [APPENDIX D]	4,740
4. Land.	
Leased from Colorado Department of Fish and Game for \$1/99 yrs.	- 0 -
5. Buildings and Associated Facilities.	
1 Gatehouse and dock, original (1978) cost of \$50,000 yearly charge = $\frac{\text{Total Cost} = \$50,000}{\text{Design Life } 20} = 2,500$ (SW Department)	2,500
6. Other Operating Costs.	
	- 0 -
7. Administrative Costs.	
Administrative costs apportioned relative to waste volumes (SW Department) [APPENDIX E]	60
8. Total.	
	13,840 53.20 per ton
--REVENUES--	
	1,200 4.60 per ton

TABLE 10
1981 COSTS AND REVENUES FOR THE WELLINGTON LANDFILL

--COSTS--

1. Labor and Benefits.	1981 \$
1 Gatekeeper, part-time employee (SWDCS 01-04) [APPENDIX B]	5,400
2. Equipment, Capital Costs and Maintenance.	
1 Road and Bridge Bulldozer used approx. 4/hrs./ week for solid waste operations. See #6 below. General Maintenance (SWDCS 11-21, 22) [APPENDIX C]	500
3. Fuel, Oil and Antifreeze.	
Heating (SWDCS 11-30) [APPENDIX D]	660
4. Land.	
Land owned by the County, Gravel operation also conducted there.	- 0 -
5. Buildings and Associated Facilities.	
1 Gatehouse, original (1978) cost of \$2,980 yearly charge = $\frac{\text{Total Cost} = \$2,980}{\text{Design Life } 20} = 149$ (Road and Bridge constructed this building and billed the SW Department, but it is unknown if the money was ever transferred.	150
6. Other Operating Costs.	
Significant cost to the County for cover material acquisition and stockpiling (Road and Bridge Department)	15,000
7. Administrative Costs.	
Administrative costs apportioned relative to waste volumes (SW Department) [APPENDIX E]	480
8. Total	
	22,190 8.50 per ton
--REVENUES--	
	7,000 2.70 per ton

TABLE 11
1981 COSTS AND REVENUES FOR THE LARIMER COUNTY
SOLID WASTE MANAGEMENT SYSTEM

Solid Waste Management Site	Costs \$	Revenues \$
Berthoud Transfer Station	28,510	7,290
Estes Park Landfill	140,270	37,520
Ft. Collins-Loveland Landfill	294,360	362,100
Red Feather Lakes Transfer Station	13,840	1,200
Wellington Landfill	22,190	7,000
TOTAL	499,170	415,110
PER TON (153,636)	3.30	2.70

TABLE 12
SITE-SPECIFIC COMPARISON OF COSTS AND REVENUES PER TON OF
SOLID WASTE HANDLED IN LARIMER COUNTY

Facility	Handling Cost Per Ton of Solid Waste (\$)	Average Revenue Per Ton of Solid Waste (\$)
Berthoud Transfer Station	26.20	6.70
Estes Park Landfill	9.40	2.50
Ft. Collins-Loveland Landfill	2.20	2.70
Red Feather Lakes Transfer Station	53.20	4.60
Wellington Landfill	8.50	2.70

TABLE 13
SITE-SPECIFIC COMPARISON OF COSTS AND CHARGES PER TON OF
SOLID WASTE IN LARIMER COUNTY

Solid Waste Management Facility	Handling Cost Per Ton of Solid Waste (\$)	Estimated Charge Per Ton of Com- pacted Solid Waste (\$)	Estimated Charge Per Ton of Uncom- pacted Solid Waste (\$)
Berthoud Transfer Station	26.20	*	6.70
Estes Park Landfill	9.40	2.50	+
Ft. Collins-Loveland Landfill	2.20	2.50	3.00
Red Feather Lakes Transfer Station	53.20	*	4.60
Wellington Landfill	8.50	*	2.70

* Compactor units are not allowed to dispose of wastes at these facilities.

+ Cannot be estimated from the limited data available.

charge per ton is the same as the estimated revenues per ton (total revenues ÷ estimated tons per year). This resulted in estimates of \$6.70/ton at Berthoud, \$4.60/ton at Red Feather and \$2.90 a ton at Wellington. The \$3.00/ton estimate for the Ft. Collins-Loveland landfill required more detailed calculations (see Appendix F). The fact that there are differences in the estimated charges per ton of uncompacted solid waste is not surprising. The charges are based on estimated costs and, in the case of Red Feather and Wellington, on estimated revenues. The relative consistency of the estimates for Ft. Collins-Loveland (\$3.00/ton), Red Feather (\$4.60/ton), and Wellington (\$2.70/ton) suggests that gatekeepers at the facilities are estimating waste loads in a similar manner and that total waste estimates are probably reasonably correct.

The Berthoud charge per ton estimate is the most different. Since it appears that a fairly accurate volume estimate is available (from the hauling contractor fees), it seems most likely that the density figure used (300/lbs/yd³) is too low. This is not readily explainable, however.

It does not appear that the system as a whole was breaking even in 1981. An increase in user fees was instituted in January 1982. Rates were increased from \$0.75/yd³ for compacted garbage (corresponds to approximately \$2.50/ton) to \$1.25/yd³ (approximately \$4.20/ton). It is not possible to generalize about the increase in rates for uncompacted garbage because former fees were charged according to vehicle types (see Figures 2 and 3), not on a volume basis and average load volumes are not known. However, Larimer County Health Department officials suspect that the rate increase has resulted in the higher incidence of illegal dumping which is occurring.

The total cost per ton figure for the Larimer County solid waste system suggested that costs per ton for the entire waste management system totaled \$3.25. The cost estimates demonstrate that the solid waste management system in Larimer County is being operated in an efficient and economical manner. The increase in rates implemented in 1982 may bring the system as a whole to a break even point.

FIGURE 2
1981 LANDFILL USER RATES

Effective Date: February 1, 1981

	<u>\$ Charged per Unit</u>	
	<u>Covered</u>	<u>Uncovered</u>
Automobiles	\$1.25	2.50
Station Wagon or Vans With More Than 3 Containers	1.75	3.50
Pickup Truck With 3 or Less Containers	1.25	2.50
2-Wheel Trailer - Max, CU. YD. CAP.	1.50	3.00
4-Wheel Trailer	2.00	4.00
Pickup With Raised Bed	4.00	8.00
Other Trucks	5.00	10.00
Self-Loader Trucks	6.00	12.00
Old Auto Bodies	5.00	
Commercial Appliances	3.00	
Household Appliances	1.50	
Dead Animals Under 100 Lbs.	4.00	
Dead Animals Over 100 Lbs.	12.00	
Septic Discharge Where Allowed	7.00	
All Packer Trucks	.75/yd ³	1.50/yd ³
Tandem Axle Trucks	8.00	16.00
Semi-Trailer Trucks	10.00	20.00

yd³=cubic yard

FIGURE 3
1982 LANDFILL USER RATES

Effective Date: January 1, 1982

Loose Waste - \$2.00 for first 1 cubic yard or any portion thereof, plus
\$1.00/yd³ for each additional cubic yard or any portion thereof.

Compacted Waste - \$1.25/yd³ (Packer Trucks)

Tires - \$0.50 each

Animals - \$2.00 per 50 lbs. (or any portion thereof)

Septic Waste - \$0.75 per 100 gal. (or any portion thereof)

Note: Above rates are for covered loads. Rates for uncovered loads are double the amounts shown above.

IV. SOLID WASTE DATA COLLECTION SYSTEM

Solid waste disposal is becoming a more important and visible issue in all parts of the United States. Increasingly sophisticated management techniques are required to cope with rising costs, volumes and public awareness. Essential to successful management decisions are accurate and current data on costs, revenues and solid waste characteristics. Therefore, an accessible solid waste data collection system is fundamental to successful management.

Cost and revenue data are needed to assess the efficiency of existing solid waste management operations and to provide a basis of comparison for potential options such as resource recovery. Data concerning the volumes, composition, seasonal variation and waste generation rates are absolutely critical in cost benefit analyses performed to assess the potential for resource recovery. For example, solid waste composition (i.e. the relative percentage of waste components such as paper, plastic, glass, metals etc.) provides the information necessary to calculate the heat value of solid waste and the potential energy which it could produce as a result of incineration. It also provides recycling interests with information regarding the potential "raw material" markets they may expect. Seasonal variation of the waste stream affects the number of seasonal employees required at a landfill site or the size of a potential incinerator facility and consequently the costs of either.

Solid waste data collection practices have progressed significantly in the past year in Larimer County. In the past few months recordkeeping systems designed to monitor and assess solid waste volumes, preliminary composition, disposal charges, seasonal variation and equipment usage and maintenance have been implemented.

Beginning in March, 1982, each of the five disposal facilities had a functioning basic data system. At the Larimer County and Estes Park landfills, computerized cash registers were installed. The cash register system has eight coded categories called "departments" (see Figure 4) which refer to eight waste

FIGURE 4
COMPUTERIZED CASH REGISTER TICKET

Journal (Actual size)

06-01-79 — Date

2 1234 — Register No

Z — Reset Symbol

* 58970 — Non-Resettable Grand Total

140 — Sum of Items

* 42534 — Gross Sales Total

Single Item Dept. — 0 10 — Item Count of Single Item Dept

* 1876 — Single Item Dept. Total

28 — Item Count of Dept.

* 11416 — Dept. Total

26 —

* 7876 —

Dept. — 3 27 —

* 6803 —

4 20 —

* 4096 —

5 8 —

* 2603 —

6 10 —

* 4654 —

Zero Preset Dept. — 7 4 — Item Count of Zero Preset Dept

* 000 —

Negative Dept. — 8 2 — Item Count of Negative Dept

-250 — Negative Dept. Total

* 1812 — Tax Total

34 — Net No. of Customer

* 40886 — Net Sales Total

4 — No. of Dollar Discount

* 019 — Dollar Discount Total

29 — No. of Cash Transaction

* 27633 — Cash Total

2 — No. of Check Transaction

* 3203 — Check Total

3 — No. of Charge Transaction

* 10031 — Charge Total

2 — No. of R/A Transaction

* 4000 — R/A Total

1 — No. of PO Transaction

* 2000 — Paid Out Total

* 29236 — Cash In-Drawer Total

5 — No. of Check Transaction

* 3600 — Check-In-Drawer Total

4 — No. of Void

* 677 — Void Total

3 — Item Count of Return Merchandise

* 721 — Return Merchandise Total

* 250 — Sum of Negative Dept. Total

10 — No. of Customer for Cashier A

* 7668 — Gross Sales Total for Cashier A

9 —

* 9671 —

8 —

* 7405 —

7 —

* 17790 —

00022 — Reset Count

00772 — Non-Resettable Consecutive No

Receipt (Actual size)

**Thank you
Call again** — Electro Stamp

06-01-79 — Date

2 1234 — Register No

1 — Taxable Item

3 — Void Symbol

2 —

4 —

-001 — Discount

* 096 — Tax Amount

* 1690 — Total Amount

* 1000 — Check Tendered

* 1000 — Amount Tendered

* 310 — Change

00572 — Clerk

A — Consecutive No

Specifications

	Total		Counter	
	Number	Capacity	Number	Capacity
Non-resettable GT	1	16	-	-
Department	1248	8	1248	4
Transaction	15	8	10	4
	GS NS - CAT CHG CHK R/A PO CAID CKID VD RTN - DP Single Item TX			
Clerk	4 (A B D E)	8	4 Customer	4
Counter	Z Counter - Non resettable - 4 digits Consecutive No - Non resettable - 4 digits Total Customer Counter - 4 digits Cash and Charge Customer Counter - 4 digit			
Dimensions (Big Drawer)	460(W)x400(D)x364(H) m/m			
Weight (Big Drawer)	18.5 kg			
Power	AC 117V (220V 240V) ±10% 50/60 Hz			
Ambient Temp	0°-40° (32°F-104°F) 10-90% RH			

categories. The department numbers on the upper left of the diagram are coded to the following:

<u>Dept. #</u>	<u>Waste Category</u>
1	Loose waste, first yd ³
2	Loose waste, additional yardage
3	Septic wastes
4	Compacted wastes
5	Tires
6	Animals
7	Junk cars
8	Roll-offs

These categories are also cost categories (see Figure 3). When the number of units is punched in by category the total charge per category and per load is calculated. The cash register also keeps track of the payment method (i.e., cash, charge, and no charge). At the end of each operating day the register tallies each category separately as well as a total. So, each day of operating produces a computerized total of the waste volumes, waste types and the amount charged for the wastes.

Berthoud, Red Feather and Wellington have a manual records system for tracking of slightly less information (see Figure 5). At these sites, the gatekeepers tally the volumes charged and the following types of waste for each load on dump-tickets.

1. Loose
2. Compacted
3. Tires
4. Uncovered
5. Roll-offs

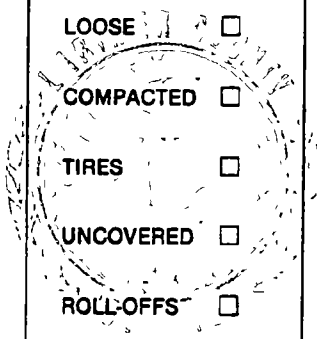
The administrative coordinator for the Public Works Department presently collects both the cash register tapes and the dump-tickets. The volumes,

FIGURE 5
SOLID WASTE DUMP TICKET

0001

**LARIMER COUNTY, COLORADO
SANITARY LAND FILL**

CASH ☐
TICKET ☐
CHECK ☐

VOLUME			TYPE	COST		
1	1	1		1	1	1
2	2	2		2	2	2
3	3	3		3	3	3
4	4	4		4	4	4
5	5	5		5	5	5
6	6	6		6	6	6
7	7	7		7	7	7
8	8	8		8	8	8
9	9	9		9	9	9
0	0	0		0	0	0

DATE _____

CLERK _____

☐ 50

shop enterprises

categories and amount charged are tallied for each operating day and recorded on ledger sheets (see Figure 6). At the end of each month, monthly subtotals are obtained.

Once a year's data have been collected and tallied, this information will provide valuable figures on seasonal variation of solid waste in the County as a whole and by site. This information may provide further indications of local waste composition and sources.

The County has also made progress in terms of strict cost accounting for the Solid Waste Department and the Roads and Bridges Department by setting up a Fleet Management Department in April, 1982. This department owns and has full responsibility for all the equipment used by the two departments. The Solid Waste Department will pay a rental fee for use of the equipment which will be determined on the basis of depreciation, maintenance costs and operating costs (including fuel, oil, etc.). Equipment usage will be accounted for and billed to the appropriate department. Once this system is functioning, a very accurate accounting of the actual equipment-related costs of solid waste management will be obtainable.

The current solid waste data collection system appears to be a useful, efficient and flexible system. Since it has been fully functioning for only about one month, it is inevitable that problems and/or backups will occur. These can best be worked out by the people who participate in the daily maintenance of this data system. The data collected can and will be useful in assessing solid waste management costs, disposal charges and in providing data necessary to judge the feasibility of resource recovery systems.

At this point, it is not possible to predict how frequently and to what extent this information will be used. No plan for periodic review of the data has been formulated.

Because the Solid Waste Department has implemented an excellent recordkeeping system which tracks all of the items mentioned in the scope of work, it was not necessary or appropriate to suggest a new format. The first full month of the data management system was March 1982. Figure 7 reproduces the monthly compilation and totals of operations at the Ft. Collins - Loveland landfill.

[illegible]

FIGURE 6
SOLID WASTE DATA LEDGER SHEET

FIGURE 7

MARCH 1982 SOLID WASTE DATA SUMMARY FOR FT. COLLINS - LOVELAND LANDFILL

LARIMER COUNTY SOLID WASTE DEPT Ft. Collins Loveland																			
Disposal		Household Waste		Additional Waste		Commercial		Industrial		Unsorted		From Other		Total		Accepted		Cost	
Area	C.Y.	Area	C.Y.	Area	C.Y.	Area	C.Y.	Area	C.Y.	Area	C.Y.	Area	C.Y.	Area	C.Y.	Area	C.Y.	Area	C.Y.
M 1	155	510.00	207	207.00	853	141.25	283	141.00				105	52.50	2	1.00	5	10.00	5	37.00
T 2	160	520.00	198	198.00	776	970.00	438	216.00		2.00		99	47.00	16	8.00	2	4.00	5	39.00
N 3	101	202.00	120	127.00	819	1043.75	512	456.00				170	53.00	2	1.00	1	2.00	7	60.00
TR 4	45	90.00	51	51.00	903	1127.50	672	306.00				36	17.00					3	43.00
F 5	50	100.00	81	81.00	768	960.00	488	222.00				88	44.00	2	1.00			4	30.00
S 6	236	472.00	117	117.00	399	498.25	132	66.00				60	30.00	2	1.00	8	16.00	2	16.00
Sm 7	242	484.00	117	117.00	38	23.30				11.00		39	19.50	11	5.50	18	36.00	8	109.50
MA 8	132	264.00	141	141.00	747	933.75	394	177.00				118	59.00			2	4.00	10	37.50
T 9	118	236.00	145	145.00	922	1152.50	572	286.00		5.00		118	59.00					18	184.00
N 10	71	142.00	103	103.00	355	382.50	366	183.00				80	40.00	2	1.00			4	41.00
TR 11	139	278.00	123	123.00	432	1163.75	703	351.00				60	30.00	4	2.00			6	28.00
F 12	115	230.00	131	131.00	767	958.75	428	211.00				62	31.00	4	2.00	10	20.00	2	22.00
S 13	351	702.00	177	177.00	274	342.50	242	111.00				10	5.00	28	14.00	6	12.00	23	194.00
Sm 14	389	778.00	207	207.00	71	88.25	132	66.00		2.00		10	5.00	28	14.00	6	12.00	23	194.00
MA 15	347	694.00	178	178.00	176	122.50	322	161.00		4.00		42	21.00	24	12.00	14	28.00	24	71.00
T 16	257	514.00	200	200.00	978	1222.50	570	285.00		3.00		101	50.50	16	8.00	2	4.00	7	74.00
N 17	245	490.00	243	243.00	128	103.50	244	122.00				107	53.50	14	7.00	11	22.00	12	63.00
TR 18	230	460.00	244	244.00	390	1237.50	678	339.00				62	31.00					28	168.00
F 19	213	426.00	293	293.00	410	1025.00	548	274.00				10	5.00	28	14.00	6	12.00	23	194.00
S 20	341	682.00	213	213.00	208	166.00	236	118.00				41	20.50	20	10.00	7	14.00	7	74.00
Sm 21	340	680.00	223	223.00	38	23.30				6.00		4	2.00	2	1.00			4	72.00
MA 22	229	458.00	173	173.00	807	1008.75	162	81.00		2.00		110	55.00	10	5.00	18	36.00	6	50.00
T 23	177	354.00	229	229.00	119	123.75	770	385.00		3.00		93	46.50	10	5.00			16	128.00
N 24	161	322.00	173	173.00	186	189.75	176	88.00		4.00		30	15.00	6	3.00	5	10.00	8	37.00
TR 25	89	178.00	139	139.00	176	107.50	322	161.00		3.00		118	59.00					2	6.00
F 26	155	310.00	190	190.00	1081	1351.25	622	311.00				50	25.00	14	7.00			1	3.00
S 27	379	758.00	187	187.00	200	160.00	180	90.00				10	5.00	2	1.00			1	3.00
Sm 28	445	890.00	187	187.00	47	47.75	30	15.00				10	5.00	2	1.00			1	3.00
MA 29	294	588.00	198	198.00	113	113.75	294	147.00		4.00		75	37.50	7	3.50			7	58.00
T 30	151	302.00	126	126.00	552	1164.75	418	209.00		2.00		90	45.00	4	2.00	2	4.00	9	54.00
N 31	171	342.00	143	143.00	871	1031.25	988	494.00				36	18.00			7	14.00	8	51.00
		6687	13374.00	3299	6598.00	2072	26178.75	11318	56575.00		77.00	1814	907.00	376	188.00	123	246.00	1	7.50
																		217	1022.50
																		1567	27587.50
																		195	1200.00
																		17,745.75	17,745.75
																		270.00	270.00
																		30.00	30.00
																		58,386.00	58,386.00

Examination of the ledger sheet reveals substantial information about the day-to-day operations at the landfill in March. Starting at the left margin the first column marks the day of the month. March 1, 1982 was a Monday. By separating the weeks and marking the highest volume day in each category the weekly variation in waste volume can be observed. The highest volumes of loose waste are generally delivered on Monday or Sunday. One would predict weekends to be the highest for loose waste since it can be assumed that loose waste is being disposed of largely by private individuals who would find weekends the most convenient. Commercial traffic (compacted, roll-offs and septic wastes) occurs seven days a week with the highest volume days mid-week (usually Wednesday or Thursday) and with substantially less being delivered on Sundays.

The ledger sheet supplies evidence about the method of payment used by landfill users. For example, if the subtotals from the 'compacted', 'roll-offs' and 'septic wastes' columns are added together ($\$26,179 + 5,658 + 907 = 32,744$) and the subtotals from the punch tickets and charges column are added ($\$27,581 + 4,850 = 32,431$) it is seen that these quantities are roughly equal. This provides evidence that commercial and large-quantity waste haulers use the punch tickets and that their payments can be assumed to be roughly equivalent to punch ticket sales.

The last two columns show actual cash collections at the landfill. If the amount charged is totaled from all the previous columns and the subtotals of the "no charge" column are subtracted, the cash total from the last column will be obtained.

The ledger sheet shows that in March, 1982 approximately 11,970 yd³ of loose, household waste and, 32,260 yd³ of commercially compacted or industrial wastes, were delivered. With assumptions of 300 lbs/yd³ and 600 lbs/yd³ respectively for the two categories this leads to an estimate of approximately 11,474 tons of solid waste disposed of in the Ft. Collins - Loveland landfill in March.

Data from succeeding months in 1982 will yield information about seasonal variation, evidence about waste composition and growth of the waste generation rate.

The cash register record system at the Larimer County Landfill worked smoothly with few start-up problems. With time, this information will be very valuable in month-to-month and year-to-year comparisons.

The scope of work calls for examination of the recordkeeping system at the Berthoud Transfer Station. However, confusion about the dump ticket format caused the gatekeeper to fill out the tickets incorrectly. Therefore, the information for the month of March is invalid for the Berthoud Transfer Station. Figure 8 provides the March data from the Red Feather Transfer Station. Again, because the system is new, the formats used are not always consistent. Apparently, all transactions were recorded on this form as opposed to the daily tally used on the Larimer County Landfill ledger sheet. In the future, it would probably be more helpful to record only a tally of the operating day's business as individual transaction information may be superfluous. Red Feather collected 104 cubic yards of loose solid waste and 8 tires during the month of March. All transactions were cash transactions for collected revenues of \$133.75.

FIGURE 8
MARCH 1982 SOLID WASTE DATA SUMMARY FOR THE RED FEATHER LAKES
TRANSFER STATION

LARIMER COUNTY SOLID WASTE DEPT. Red Feather																									
Deposits		Minimum		Additional		Uncovered		Part-Offs		Completed		Pump-Tanks		Tires		No. Containers		P.C.E.		Cost		S.M.B.		Date	
Date	Am.	C.Y.	Am.	C.Y.	Am.	C.Y.	Am.	C.Y.	Am.	C.Y.	Am.	C.Y.	Am.	#	Am.	C.Y.	Am.	C.Y.	Am.	Cost	Am.	Cost	S.M.B.	Date	Am.
6																									
		1	2.00	2	3.00															4.00	0011	3.75			
		1	2.00	11	11.00															4.00	0012	4.00			
		1	2.00	13	13.00															15.00	0013	13.00			
13		1	2.00	4	4.00															15.00	0014	15.00			
		1	2.00	1	1.00															6.00	0015	6.00			
		1	2.00	3	3.00															3.00	0016	3.00			
		1	2.00																	5.00	0017	5.00			
		1	2.00	1	1.00															2.00	0018	2.00			
		1	2.00	4	4.00															3.00	0019	3.00			
		1	2.00																	10.00	0020	10.00			
		1	2.00	2	2.00															2.00	0021	2.00			
		1	2.00	1	1.00															3.50	0022	4.00	70.00		
		1	2.00	1	1.00															3.00	0023	3.00			
		1	2.00	2	2.00															2.00	0024	2.00			
		1	2.00	1	1.00															10.00	0025	10.00			
		1	2.00	1	1.00															3.00	0026	3.00			
		1	2.00																	2.00	0027	2.00			
		1	2.00	1	1.00															2.00	0028	2.00			
		1	2.00	1	1.00															3.00	0029	3.00			
		1	2.00	3	3.00															8.00	0030	8.00			
		1	2.00																	5.00	0031	5.00			
		1	2.00	1	1.00															2.00	0032	2.00			
		1	2.00																	3.00	0033	3.00			
		1	2.00	1	1.00															2.00	0034	2.00			
		1	2.00	18	18.00															3.00	0035	3.00			
		1	2.00																	20.00	0036	20.00	63.00	3.25	
25		25	50.00	76	75.50					3	4.00			8	4.00					133.50		133.75	133.50	2.25	25

V. CONCLUSIONS AND RECOMMENDATIONS

Conclusions

1. The five solid waste disposal sites in Larimer County are located at convenient and vital positions around the County.
2. The County presently benefits from the use of inexpensive or free property for location of the solid waste disposal sites.
3. Currently, the Roads and Bridges Department makes significant contributions to the operation of the Solid Waste Department in terms of labor, equipment, capital and materials.
4. The present site of the Estes Park Landfill will be exhausted in the near future and location of an alternative site and/or means of disposal will be imperative.
5. The Solid Waste Management System is efficient and low cost.
6. The new data management procedures assure that accurate figures will be obtainable for estimated solid waste volumes, types, disposal charges, cyclic variations, equipment usage and costs.
7. The costs of solid waste management are rising in Larimer County.

Recommendations

1. Alternatives to the Estes Park Landfill should be examined immediately and costs of the options compared so the County will be prepared for site closure.
2. The County should consider installation of scales at the Ft. Collins-Loveland Landfill so that accurate data regarding tonnage of waste can be compiled for future planning purposes.

APPENDIX A

SOLID WASTE DEPARTMENT COST SUMMARY

REPORT ID 8138-W		COST SUMMARY		PAGE 138			
		AS OF 02/23/02					
		CHARGED TO PRIOR CALENDAR YEAR					
FUND	010 SOLID WASTE FUND			PERCENT OF YEAR GONE = 15%			
DEPT	054 SOLID WASTE						
CENTER	001 SOLID WASTE						
	BUDGET	DISBURSEMENTS MONTH	TO DATE	ENCUMBERED	TOTAL EXPENSE	BALANCE	PR CNT SPENT
01 PERSONNEL EXPENSES							
01 SALARY - DEPARTMENT HEAD	0	00	00	00	00	00	0.0
02 SALARIES - PERMANENT	122,678	00	120,372.38	00	120,372.38	2,297.62	98.1
03 SALARIES - PART TIME	0	00	00	00	00	00	0.0
04 SALARIES - OTHER	24,880	00	27,281.88	00	27,281.88	3,281.88	113.6
71 SOCIAL SECURITY	9,780	00	9,768.53	00	9,768.53	68.53	100.7
73 HOSPITAL INSURANCE	3,238	00	3,435.48	00	3,435.48	285.48	106.3
74 RETIREMENT	3,470	00	1,966.38	00	1,966.38	1,503.70	56.6
75 WORKMANS COMP	4,408	00	8,416.21	00	8,416.21	4,016.21	191.2
76 UNEMPLOYMENT INSURANCE	580	00	442.97	00	442.97	57.83	88.5
01 OBJECT 01 TOTALS	167,978	00	171,683.75	00	171,683.75	3,713.75	102.2
11 OPERATING EXPENSES							
05 OFFICE SUPPLIES	238	00	117.83	00	117.83	112.97	50.8
06 OPERATING SUPPLIES	758	00	1,395.12	00	1,395.12	445.12	106.8
13 TELEPHONE	988	00	00	00	00	988.00	0.0
14 POSTAGE	58	00	1.68	00	1.68	48.48	3.2
16 ADVERTISING	0	00	00	00	00	00	0.0
17 PRINTING	418	00	9.68	00	9.68	408.40	2.3
21 REPAIR & MAINT - EQUIPMENT	26,478	00	37,615.89	00	37,615.89	11,145.89	142.1
22 REPAIR & MAINT - SUPPLIER	2,538	00	2,173.65	00	2,173.65	356.35	85.9
23 HAULING CONTRACTS	22,558	00	19,644.34	00	19,644.34	2,985.66	87.1
25 EQUIPMENT RENTAL	0	00	00	00	00	00	0.0
26 RENTAL - BLDG & BEALESTATE	0	00	00	00	00	00	0.0
27 DUES & SUBSCRIPTIONS	58	00	11.08	00	11.08	39.88	22.8
28 MEETINGS	0	00	00	00	00	00	0.0
30 UTILITIES	3,888	00	3,298.68	00	3,298.68	9.32	99.7
31 REPAYMENT TO GENERAL FUND	0	00	00	00	00	00	0.0
32 PROJECT - STUDYS	39,888	00	6,288.91	00	6,288.91	28,719.89	17.9
40 GAS, OIL & ANTIFREEZE	66,828	00	56,918.36	00	56,918.36	9,981.64	85.1
46 TIRES & TUBES	0	00	38.88	00	38.88	38.88	999.9
50 FILL DIRT	20,668	00	00	00	00	20,668.00	0.0
95 TRANSFER TO ROAD FUND	0	00	00	00	00	00	0.0
11 OBJECT 11 TOTALS	188,388	00	127,987.38	00	127,987.38	52,312.62	78.9
16 PARTS, SUPPLIES, & FUELS							
48 REPAIRS & MAINT. - SUPPLIES	0	00	00	00	00	00	0.0
51 GAS & DIESEL	0	00	00	00	00	00	0.0
52 DIESEL	0	00	00	00	00	00	0.0
61 REPAIR & MAINT. - PARTS	0	00	00	00	00	00	0.0
63 ANTIFREEZE	0	00	00	00	00	00	0.0
64 OIL & GREASE	0	00	00	00	00	00	0.0
16 OBJECT 16 TOTALS	0	00	00	00	00	00	0.0

COST - SUMMARY

PAGE 131

AS OF 02/23/02

CHARGED TO PRIOR CALENDAR YEAR

A-2

APPENDIX B
PERSONNEL COST CALCULATIONS

01			
	02	Salaries - Permanent (full-time)	120,372.38
	04	Salaries - Temporary (part-time)	<u>27,281.88</u>
		Total	147,654.26

	Benefits to All Employees		
		Social Security	9,768.53
		Workman's Compensation	8,416.21
		Unemployment Insurance	<u>442.97</u>
		Total	18,627.71

	Full-time Benefits		
		Hospital Insurance	3,435.48
		Retirement	<u>1,966.30</u>
		Total	5,401.78

To Figure Benefits to All Employees:

$$18,627.71 \div 147,654.26 = .12616$$

To Figure Benefits to Full-time Employees:

$$5,401.78 \div 122,760.38 = .04400$$

Berthoud:	Part-time:			
	Employees:			
	1.	2,640.00		
	2.	<u>1,875.94</u>		
		4,515.94	x	.12616
		<u>569.73</u>		
		5,185.67		

Estes Park:	Full-time:			
	Employees:			
	1.	4,775.32		
	2.	5,712.88		
	3.	5,173.67		
	4.	<u>10,530.00</u>		
		26,191.87	x	.12616
		3,304.37		
		1,152.44	x	.04400
		<u>30,648.68</u>		
	Part-time:	252.00	x	.12616
	1.	<u>31.79</u>		
		283.79		
		30,932.47		

APPENDIX B (cont.)

Larimer County Landfill: Full-time: Employees:

1.	21,334.17		
2.	22,270.80		
3.	3,691.98		
4.	10,935.54		
5.	10,018.88		
6.	5,634.62		
7.	18,466.13		
8.	<u>4,216.39</u>		
	96,568.51	x	.12616
	12,183.08	x	.04400
	<u>4,249.01</u>		
	113,000.60		

Part-time:

Employees:			
1.	200.00		
2.	1,875.94		
3.	4,800.00		
4.	<u>6,050.00</u>		
	12,925.94	x	.12616
	<u>1,630.74</u>		
	14,556.68		
	127,557.28		

Red Feather: Part-time: Employees:

1.	1,800.00		
2.	<u>600.00</u>		
	2,400.00	x	.12616
	<u>302.78</u>		
	2,702.78		

Wellington: Part-time: Employees:

1.	4,800.00	x	.12616
	<u>605.57</u>		
	5,405.57		

APPENDIX C
MAINTENANCE COST CALCULATIONS

Solid Waste Department

21	Repair and Maintenance - Equipment	37,615
22	Repairs and Maintenance - Supplies	<u>2,174</u>
		39,789

Assume a Cost of \$500/site for Facility Maintenance and for unknowns	39,789
5 x \$500 = \$2,500	<u>- 2,500</u>
	37,289

Then, assume an equal amount charged to each major piece of equipment which is used solely by the Solid Waste Department $37,289 \div 12 = \$3,107$

<u>Site</u>	<u># Pieces of Major Equipment</u>					
Berthoud	0	x	3,107	0 + 500 =	500	
Estes Park	1			= 3,107 + 500	3,607	
Ft. Collins-Loveland	10			31,074 + 500	31,575 +	\$30*
Red Feather	1			3,107 + 500	3,607	
Wellington	<u>0</u>			-0- + 500	<u>500</u>	
	12				39,789	

* For tires and tubes line item 11-46

APPENDIX D
FUEL COST CALCULATIONS

Solid Waste Department

40 Gas, Oil and Antifreeze \$ 56,918

Assume, equally attributed to each piece of
major equipment owned and solely used by SW Dept.

$$\$56,918 \div 12 = \$4,743$$

<u>Site</u>	<u># Major Equipment</u>		
Berthoud	0	x \$4743 =	
Estes Park	1		\$ 4,744
Ft. Collins-Loveland	10		\$47,430
Red Reather	1		\$ 4,744
Wellington	0		
	12		\$56,918
			<u>\$-56,918</u>
			-0-

Also, Fuel Used for Heating Gatehouses:

30 Utilities \$ 3,791

Divide up by Proportionate Hours of Operation.

<u>Site</u>	<u>Hrs./Wk.</u>	<u>% of hours</u>	
Berthoud	12	.1048 x 3791	-397
Estes Park	21	.1834	-695
Ft. Collins-Loveland	54.5	.4760	-1,805
Red Feather	7	.0611	-232
Wellington	20	.1747	-662
	<u>114.5</u>		<u>-0-</u>

APPENDIX E
ADMINISTRATIVE COST CALCULATIONS

Solid Waste Department

Total Administrative Costs

Roads and Bridges Director and Administrative Coordinator Time for Solid Waste	\$30,000
Roads and Bridges Employee Time Accounted for by E.P. Labor and Benefits	- 3,540
	<hr/>
	\$26,460
Operating Expenses (Includes: Line Item #s 05, 06, 13, 14, 16, 17, 25, 26, 27, and 28)	<hr/>
	1,534
Total	\$27,994

Attribute Administrative Costs Proportionate with
Portion of Solid Waste Volume of Facility.

	West Volume	%		
Berthoud	1,090	.007	x 27,994 =	196
Estes Park	15,000	.098		2,743
Ft. Collins - Loveland	134,685	.876		24,523
Red Feather	260	.002		56
Wellington	2,600	.017		476
				<hr/>
				27,994

APPENDIX F

ESTIMATE OF CHARGE/TON FOR UNCOMPACTED SOLID WASTE AT THE FT. COLLINS-LOVELAND LANDFILL

362,100
- 195,000
167,100

Total Site Collections in 1981
Punch Ticket Revenues at Ft. Collins
Revenues Paid by Private Individuals

\$195,00 ÷ \$2.50/ton (estimated charge per ton of compacted solid waste)

= 78,000 tons of compacted garbage disposed of in 1981

134,685 tons
- 78,000 tons
56,685 tons

Estimated Total Waste Disposal at Ft.
Collins-Loveland in 1981
Compacted Solid Waste
Disposed of by Individuals

\$167,100
÷ 56,685 tons

= \$2.95

Estimated Revenues Payed by Private Individuals
Estimated Tonnage Disposed of by Private
Individuals
Estimated Charge/Ton of Uncompacted Solid Waste

Say, \$3.00