

United States  
Environmental Protection  
Agency

Region VIII  
1860 Lincoln Street  
Denver, Colorado 80295

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Solid Waste

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# **A TECHNICAL ASSISTANCE PROGRAM REPORT**

**ANALYSIS OF WASTE TRANSFER ALTERNATIVES  
FOR CLEAR CREEK COUNTY, COLORADO**

A TECHNICAL ASSISTANCE PANELS PROGRAM REPORT:

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FOR CLEAR CREEK COUNTY, COLORADO

Prepared for:

U.S. Environmental Protection Agency  
Region VIII  
1860 Lincoln Street  
Denver, Colorado 80295

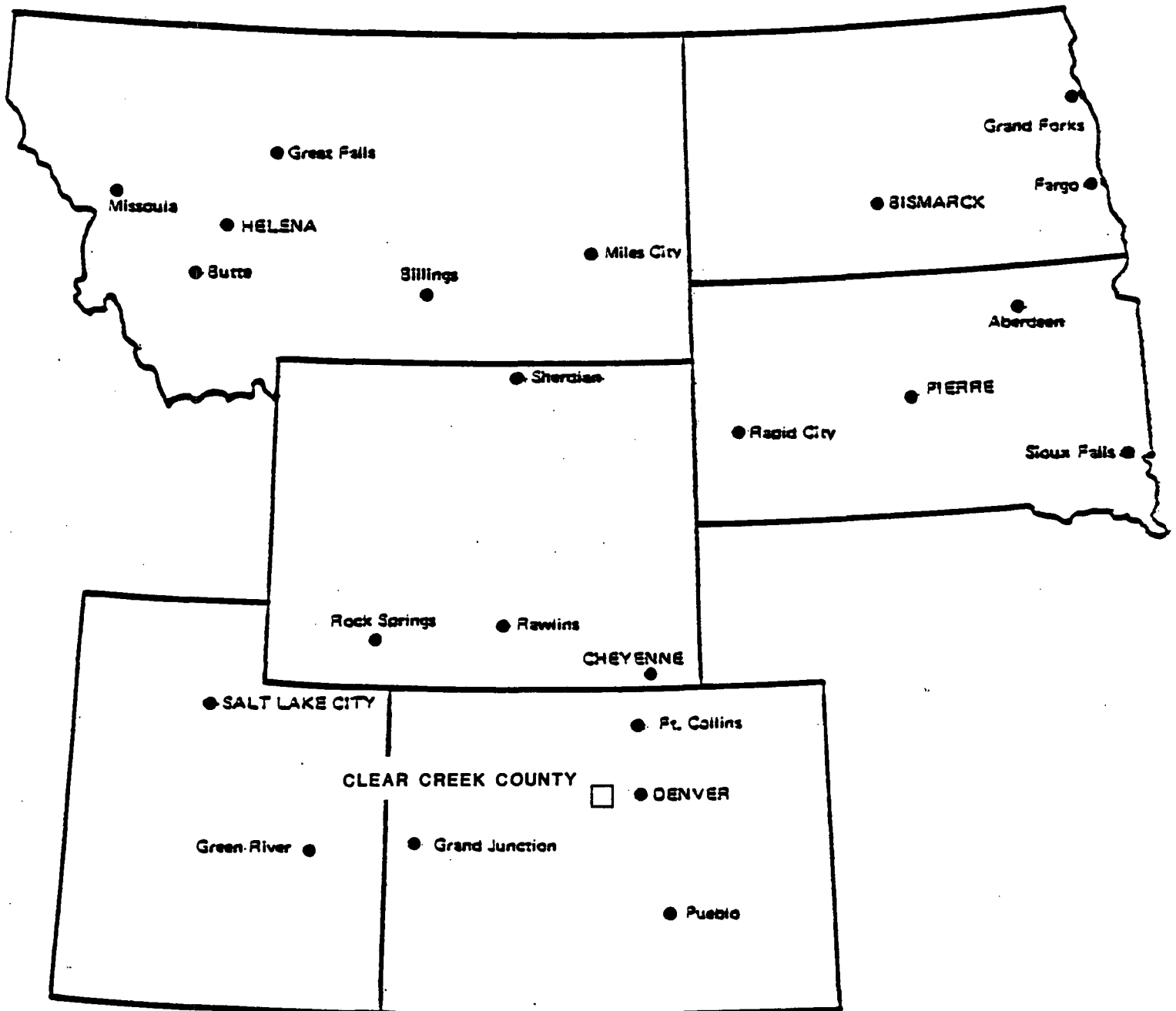
Prepared by:

Fred C. Hart Associates, Inc.  
Market Center  
1320 17th Street  
Denver, Colorado 80202

July, 1981

ANALYSIS OF WASTE TRANSFER ALTERNATIVES  
FOR CLEAR CREEK COUNTY, COLORADO

ENVIRONMENTAL PROTECTION AGENCY REGION VIII



Public Law 94-580 - October 21, 1976

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. EXECUTIVE SUMMARY

Clear Creek County, a rural and somewhat sparsely populated county located 25 miles west of Denver, soon will fill to capacity its only municipal waste disposal site (the Empire Landfill) and, as a result, will need to assess the various solid waste disposal options available to it. In addition to the Empire Landfill site, the County also operates a transfer station for municipal wastes and a rubble dump both at Idaho Springs.

Population projections indicate that the County's 1980 population of 7,500 will increase to 10,100 by 1990; as a consequence, the waste volumes generated within the County are expected to escalate also. The daily per capita waste generation rate for Clear Creek County, as estimated in this study, is 4.1 pounds of waste per capita per day. Using this rate, the total annual waste volume in Clear Creek County for 1980 is 5,612 tons and for 1990 (projected) it will be 7,652 tons.

Five possible solid waste disposal alternatives have been identified in this study -- two in the initial scope of work (alternatives 1 and 2) and three later on in the study (alternatives 3-5). The five alternatives are listed below:

- o Alternative 1: development of a dual-containerization transfer station at the existing Empire Landfill site to handle both municipal and bulky wastes.
- o Alternative 2: development of a transfer station at the existing Empire site for municipal wastes only, in conjunction with development of the adjacent land as a rubble dump.
- o Alternative 3: expansion of the single transfer station and rubble dump at Idaho Springs to consolidate disposal services for the entire County.



- o Alternative 4: expansion of the single transfer station and rubble dump at Idaho Springs with green boxes for the western part of the County.
- o Alternative 5: development of a sanitary landfill at the Idaho Springs site for the entire County.

Alternative 1, the dual-containerization transfer station at Empire was later made obsolete and was not analyzed in detail because of the inclusion of the Idaho Springs site into the study and because of the possibility of using the Empire site as a rubble dump. Of the remaining four alternatives, Alternative 5, the landfill alternative, was deemed to be the least cost system both in the short and long terms. The most expensive alternative, the two roll-off transfer stations (Alternative 2), is 78 percent more costly than the landfill system.

Over the long run, the development of a landfill site within Clear Creek County offers the potential of significantly reducing County waste disposal costs. The County could close the present Empire Landfill and consolidate all waste disposal operations at Idaho Springs. An out-of-county transfer operation could also be maintained in order to preserve long-term flexibility.

## II. INTRODUCTION

### Project Background

Until early 1980, the solid waste disposal needs in Clear Creek County were predominantly met by a sanitary landfill located near the Town of Empire servicing the entire western portion and some eastern sections of the County, and a transfer station in Idaho Springs where wastes from the remaining eastern parts of the County were collected to be ultimately transported and disposed of at a landfill in nearby Jefferson County.

In the spring of 1980, the County Commissioners of Clear Creek County, having determined that the County's only municipal waste disposal site (the Empire Landfill) was nearing capacity, investigated the possibility of leasing or purchasing additional land adjacent to the landfill. Negotiations on this land were initiated by the County for the purpose of developing a new sanitary landfill 100 yards above the site of the existing fill. The proposed new landfill was intended to continue to meet the solid waste disposal needs of those parts of the County served by the Empire Landfill.

In February 1980, the Colorado Department of Health (CDH) was contacted and steps were initiated for designating the new site as appropriate for sanitary landfill operations." After inspecting existing operations at the Empire Landfill and evaluating the area targeted for future sanitary landfill operations, the CDH recommended that the County should either explore the use of alternative solid waste disposal technologies (such as incineration or development of an additional transfer station within the County) or attempt to identify a more suitable location for future landfiling operations in Clear Creek County.

In a letter to the Board of County Commissioners, dated August 8, 1980, the CDH further clarified its recommendations (see Appendix B). The site of the proposed new sanitary landfill

was rejected for use in disposing of municipal wastes, due to the lack of available cover material for such wastes and because the site was felt to be too small to meet the County's municipal waste needs for an appreciable length of time. The CDH recommended that a better option for long-term disposal of municipal wastes would be to develop a transfer station (similar to the one in use at Idaho Springs) on the surface of the existing landfill. If such a system could not be in place before the landfill reached capacity, the CDH further recommended that the County initiate use of a rural disposal or "green box" system to meet the temporary needs of the area until a more permanent solution could be developed.

The Department did not rule out using the proposed new site as a dump for rubble materials such as wood or construction wastes. Because smaller amounts of such wastes would be generated, it was estimated that the life of the site could extend over a greater period of time. However, it was emphasized by CDH that if the new site were to be developed for such a purpose, difficult engineering and construction problems would have to be overcome, in order to provide the area with adequate drainage.

Consequently, the CDH recommended that the County should explore the possibility of developing a dual-containerization transfer station at the existing site for both rubble and municipal wastes which would ultimately be transported for permanent disposal out of the county. Such an alternative was believed to present significant advantages from the standpoints of capital investment, operating costs, and operational control of the site.

The CDH further recommended that cost estimates for the various disposal alternatives be quantified and suggested that the County seek federally funded technical assistance from the Region VIII Office of the U.S. Environmental Protection Agency (EPA) located in Denver, Colorado. The County adopted this recommendation and in September, 1980 EPA authorized its designated techni-

cal assistance contractor, Fred C. Hart Associates, Inc., to provide specific solid waste management service to the County. The contractor was instructed to develop cost estimates for various transfer alternatives and provide recommendations as to the most appropriate method of implementation.

### Scope of the Study

Several tasks were initially identified for this project. These tasks included the development of waste generation estimates on a county-wide basis and for the part of the County now being served by the Empire Landfill. These estimates were to be developed for a ten-year planning period beginning September 1980.

As identified in the initial scope of work, two waste transfer alternatives for the Empire area were also to be evaluated: (1) development of a transfer station at the Empire disposal site providing a dual-containerization system for municipal and rubble wastes; and (2) development of a transfer station at the Empire Landfill for municipal wastes only, with disposal of rubble/construction wastes occurring at the new site adjacent to the existing fill. The existing transfer station/rubble dump site at Idaho Springs was not considered in the original scope of work.

In addition to these two transfer alternatives identified in the initial scope of work, the decision was made later on to examine three additional alternatives involving the consolidation of the County's waste management facilities at Idaho Springs. This was done because of the apparent inefficiency and unnecessary incremental cost of operating two facilities in a county the size of Clear Creek County. The relatively short distance between the two potential rubble dump sites and the small amount of bulky wastes generated within the County tended to reduce the necessity of operating both facilities. These three new alternatives were: 1) a single transfer station and rubble dump at Idaho

Springs; 2) the single transfer station and rubble dump at Idaho Springs with a "green box" system for the western part of the County; and 3) a sanitary landfill which would serve the entire County and would be used to dispose of municipal garbage as well as bulky waste. A recommended course of action for the collection and disposal of Clear Creek County's solid waste was developed from among these alternatives.

The original scope of work also stated that various contractual arrangements which could be used by the County to implement a solid waste management plan be described. Additionally, the scope of work called for the development of a Request-For-Proposal (RFP) to solicit solid waste equipment and services. However, the county, EPA, and the contractor mutually agreed to examine three additional alternatives and to substitute this additional workload in lieu of both analyzing the various contractual arrangements and a RFP.

In developing the different alternatives, a comparison of different types of transfer equipment (such as self-contained trailer vs. stationary compactors) will be evaluated. Factors affecting sizing of equipment will also be examined, as well as the compatibility of new equipment with existing equipment. This study will also identify the types of equipment required and provide a list of available manufacturers. Capital and annual costs will be quantified and operational requirements will be identified. Cost scenarios will only be projected for a five-year planning period instead of the ten-year period originally identified. This is due in part to the uncertain future availability of landfill space outside the County and the difficulty in estimating future equipment costs (it is expected that the equipment will have to be replaced after five years).

In addition, alternative waste disposal methods will be evaluated and long-range waste management options for the County will be identified based on such factors as land value, population growth, rising energy costs and the projected availability of disposal sites outside the County.

### III. DESCRIPTION OF THE STUDY AREA

Clear Creek County is located 25 miles west of Denver in northern central Colorado, totally within the South Platte River Basin (see Figure 1). The County is bounded on the east by Jefferson County and on the west by the Continental Divide. The County has a total area of 395 square miles, with an extreme length of 25 miles and an extreme width of 20 miles.

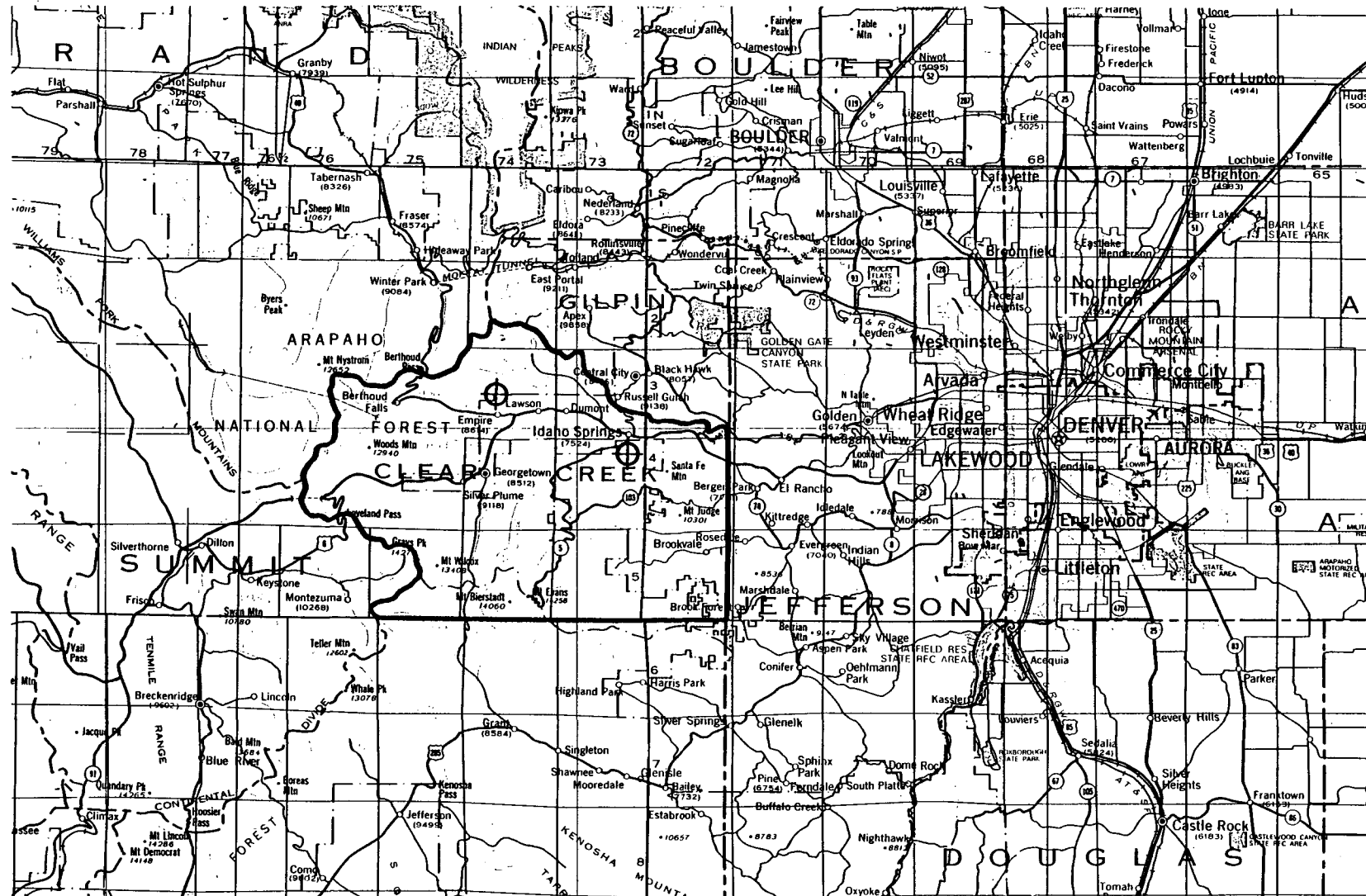
Governmental services are located in the County seat in Georgetown. Three elected commissioners oversee the funding of all county services.

Clear Creek County is characterized by high mountains and deep narrow canyons, making transportation in the harsh winter months somewhat difficult. U.S. Interstate 70, built in 1968-69, is the County's primary access route, particularly between the Towns of Empire (which is located two miles off Interstate 70 on U.S. Route 40) and Idaho Springs where the County's two waste handling facilities are located.

Of the total land area in the County, 83 percent of the land is either Federally or State-owned. Little industry exists in the County, although a major molybdenum mine is in operation in the western part of the County. In addition to mining, the County's economy is primarily based on such tourist attractions as Mount Evans, the Georgetown loop railroad, and two major ski areas.

The total county population is small. In 1970, Clear Creek County's population was estimated to be 4,819. The current 1980 population for the County, as estimated by the Denver Regional Council of Governments (DRCOG), is about 7,500 persons.<sup>1</sup> Major population and employment centers are located in Idaho Springs, Georgetown, and Empire, with estimated 1980 populations of 2,300, 1,300 and 670, respectively. Since 1960, the County is estimated

# FIGURE 1. PROJECT LOCATION MAP



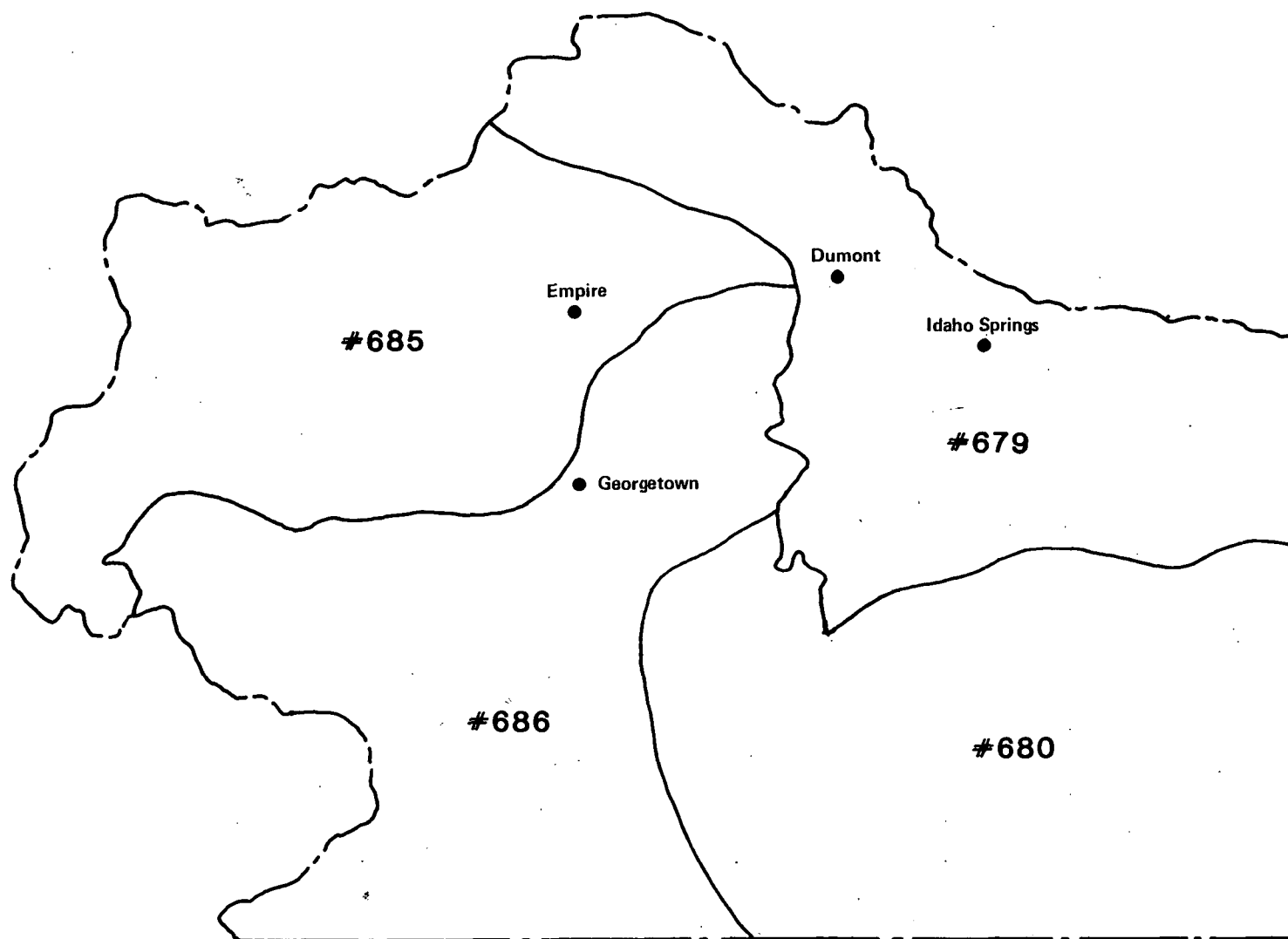
EXISTING SOLID WASTE HANDLING SITES IN CLEAR CREEK COUNTY

to be growing at a rate of approximately 3 to 4.5 percent annually. According to DRCOG, the County population is projected to increase to 10,100 in 1990 and 12,800 by the year 2000. The Census Enumeration Districts for Clear Creek County are identified in Figure 2. Based on the Census' Enumeration Districts and the total County population as estimated by DRCOG, Table 1 provides adjusted estimations of current County population figures for each of the four County districts, and each of the district's percent of total County population. Additionally, the population for incorporated areas and rural areas within each district are provided.

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<sup>1</sup>The preliminary Federal Census count for 1980 indicates a population of 7,264.





**FIGURE 2. CLEAR CREEK COUNTY CENSUS ENUMERATION DISTRICTS**

TABLE 1

BREAKDOWN OF POPULATION IN CLEAR CREEK COUNTY<sup>1</sup>

<u>Area</u>	<u>Census Enumeration District</u>	<u>Total Area Population</u>	<u>Percent Of Total Population</u>	<u>Population In Incorporated Areas</u>	<u>Population In Rural Areas</u>
Idaho Springs, St. Mary's Glacier	679	3,713	49.5%	2,300	1,413
Evergreen, Bergen Park	680	1,137	15.2%	0	1,137
Empire, Silver Plume	685	1,036	13.8%	670	366
Georgetown	686	<u>1,614</u>	<u>21.5%</u>	<u>1,300</u>	<u>314</u>
TOTAL:		7,500	100.0%	4,270	3,230

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<sup>1</sup> Source: Clear Creek County Planning Department

#### **IV. EXISTING SOLID WASTE OPERATIONS IN CLEAR CREEK COUNTY**

##### **Background**

In order to develop specific solid waste alternatives for the County, it is first necessary to examine a number of parameters affecting the County's current and projected disposal needs. These parameters include: population estimates (both current and projected for the ten-year study period beginning September, 1980); population distribution County-wide; the current total annual waste volume for the County; the projected County waste volumes for the study period; waste types; waste collection services; existing waste handling facilities servicing the County; the proportion of the population served by each of these facilities; and the current and projected ten-year waste volumes for the area now served by the Empire Landfill. Other important factors to be considered include the County's annual solid waste budget and the existing equipment owned or leased by the County.

Both current and projected population figures for the County were examined previously in Section II and will not be discussed in this section. A general discussion of population distribution was also provided in the previous section. In this section, an extended discussion of population distribution is included since it affects the estimates of the number of persons utilizing specific waste handling facilities within the County. All of the remaining parameters identified above will be examined in this section in order to provide an overall profile of solid waste management operations in the County.

In addition, this section will also briefly examine current state-of-the art transfer technology. Various types of transfer equipment and factors affecting sizing of equipment will also be discussed to the extent they relate to the five transfer alternatives to be evaluated in the next section.

## Current and Projected Total Waste Volumes in Clear Creek County

Per Capita Waste Generation. In developing total waste generation rates for an area, the most commonly employed method is to first derive a per capita waste generation rate and then apply this rate to the estimated population in the area.

The daily per capita waste generation rate for Clear Creek County, as estimated in this study, is 4.1 pounds of waste per capita per day. In developing a per capita waste generation rate for the County, it was first assumed that residents within incorporated areas would generate 5 pounds of waste per capita per day, while residents of rural areas would generate only 3 pounds of waste per day. These estimates reflect national and regional averages and the presumption that per capita waste generation increases with population density, due to the increase in commercial and industrial activities associated with urbanization. These daily per capita waste generation estimates were weighted on the basis of population distribution in order to obtain the per capita waste generation rate for the County. As previously noted, there are 4,270 persons residing in the incorporated areas of the County and 3,230 persons in the rural areas. The waste generation estimate can be calculated as follows:

$$\begin{aligned} & \frac{(4,270 \text{ persons } (5 \text{ lbs/per day}) + 3,230 \text{ persons } (3 \text{ lbs/per day}))}{7,500 \text{ persons}} \\ & = 4.13 \text{ lbs per capita per day.} \end{aligned}$$

While the resulting estimate of 4.1 pounds per capita per day is consistent with the results reported for other Western rural areas, the accuracy of the estimate was crosschecked by developing an additional per capita waste generation rate for the Idaho Springs station in Clear Creek County. This transfer station is the only waste handling facility in the County for

which reliable data on waste volume exists. This waste generation estimate was based on the size of the compaction container at Idaho Springs and trip records of the out-of-County hauler contracted by the transfer facility to remove the waste for ultimate disposal in Jefferson County. Two trips are made weekly, plus an additional trip for peak Labor Day and Memorial Day loads, or a total of 106 trips per year. The density of compacted waste hauled per trip was estimated to be 475 lbs/yd<sup>3</sup> with 60-cubic yards (compaction container size) hauled per trip. The density of compacted waste can be estimated by assuming a loose refuse density of 250 lbs/yd<sup>3</sup> and a standard compaction ratio of 1.9 to 1 (compacted to loose refuse density). In addition, the local hauler's estimation of the percent of people in that part of the County employing the collection service to Empire and the district's percent of total County population were used to estimate the percent of total County population utilizing the Idaho Springs facility. It was estimated that 27.2 percent of the total County population of 7,500 used this facility, or a total of 2,040 persons. Based on this information for the Idaho Springs transfer station, an average of 4.05 pounds of waste per capita per day was calculated as follows:

$$\frac{106 \text{ trips/yr} \times 60 \text{ yd}^3/\text{trip} \times 475 \text{ lbs/yd}^3}{2,040 \text{ persons} \times 365 \text{ days/yr.}}$$
$$= 4.05 \text{ lbs. per capita per day.}$$

This waste generation estimate is within one percent of the weighted per capita generation rate of 4.13 pounds per capita per day estimated earlier.

**Current Annual Waste Volume.** Using the waste generation rate of 4.1 pounds per capita per day the total annual waste volume in Clear Creek County for 1980 is estimated to be 5,612 tons and was calculated as follows:

7,500 persons x 4.1 lbs/person/day x 365 days/yr.

2,000 lbs/ton

= 5,612 tons/yr.

Projected Total Waste Volume for the Study Period. The projected total waste volume for Clear Creek County during the ten-year study period beginning September, 1980 is 66,193 tons. This figure is equal to the sum of the projected annual waste volumes for the ten-year study period based on a linear increase in waste volume of 194.5 tons/yr. This is for a 1990 population of 10,100 and assumes a constant increase in population of 260 persons per year and a constant waste generation rate of 4.1 pounds per capita per day over the study period. With these assumptions, annual waste generation would increase by 35 percent (1,950 tons) by the year 1990 (see Table 2).

#### Waste Type

Municipal Waste. According to County sources, over 90 percent of the waste generated in Clear Creek County is municipal waste, that is, waste produced by residences and commercial establishments. A significant characteristic of this type of waste is that it is easily compactible. The resulting volume reduction through compaction can result in considerable savings in solid waste collection and transportation costs.

Bulky Wastes. Due to the non-industrial economic base of the area, only a very small percentage of the waste generated in Clear Creek County is rubble or bulky wastes. These wastes include industrial wastes, construction wastes, woody debris, and oversized waste items such as discarded appliances. It should be noted, however, that while only approximately 10 percent of the County's waste is classified as rubble or bulky debris, the total percentage of wastes currently disposed as rubble is somewhat higher, due to inefficiencies in waste disposal operations at

TABLE 2

PROJECTED ANNUAL WASTE GENERATION VOLUMES FOR CLEAR CREEK COUNTY,  
SEPTEMBER, 1980 - AUGUST, 1990

<u>Study Year</u>	<u>Projected Annual Waste Volume (Tons)<sup>1</sup></u>
1980 (Sept. - Dec.)	1,869
1981	5,807
1982	6,002
1983	6,197
1984	6,392
1985	6,587
1986	6,782
1987	6,977
1988	7,172
1989	7,367
1990 (Jan. - Aug.)	<u>5,041</u>
TOTAL	66,193 Tons

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<sup>1</sup> Based on a linear increase of 195 tons/year beginning with a total projected 1980 volume of 5,612 tons.

both the Empire and Idaho Springs facilities and poor disposal practices which occur during the hours when the sites are unsupervised. Consequently, much municipal waste fails to be separated from the bulkier wastes and instead is disposed of as rubble.

Estimations of municipal and bulky waste percentages county-wide do not reflect mining wastes generated by the Henderson Mine, a major molybdenum mine located in the western end of the County. These wastes are privately disposed out of the county and do not effect either the County's present or future waste management operations. The Henderson Mine complex, however, is the largest single producer of solid wastes in the County, generating approximately 720 cubic yards of solid waste monthly. The mine's solid waste is placed in a 60-cubic yard compactor unit and then privately hauled to a disposal site in the Denver metropolitan area.

### **Waste Collection Services**

Currently, no public collection services are available in the County other than numerous one-cubic yard containers provided by the U.S. Forest Service in high use areas for visitors. These containers are only in service during the summer months (June through August). The U.S. Forest Service uses a 12-cubic yard rear load compactor unit and collects about 30 to 36 cubic yards of compacted waste over this three month period. These wastes are ultimately hauled to the Empire Landfill for disposal.

A large number of households in both the eastern and western portions of the County elect to use the Clear Creek Disposal Service, a private collection service which hauls their waste out of the County. The remaining County residents independently transport their waste either to the Empire Landfill, the Idaho Springs site or to the Evergreen transfer station in Jefferson County, depending on their proximity to the site.



**Clear Creek Disposal Service.** Clear Creek Disposal Service is a local business offering solid waste collection service to residences and businesses in Clear Creek County. The company is equipped with three rear load collection units, at 13, 16, and 20 cubic yards. Containers are available to service commercial accounts. The company estimates that it is currently serving 60 percent of the population west of the Town of Dumont or 21.2 percent of the County's total population. East of Dumont, the company estimates it serves about 45 percent of the population or 22.3 percent of the total County population (for an extended discussion see the Proportionate Use Section which follows). Waste collected by the Clear Creek Disposal Service is currently disposed at the Empire Landfill.

**Evergreen Disposal.** Evergreen Disposal is a private collection service located in Jefferson County with operations extending into the southeastern portion of Clear Creek County. The company estimates it serves about 80 percent of the population within the southeastern portion of the County or about 12 percent of the total Clear Creek County population. Wastes are hauled out of the County to the Leyden Landfill in Jefferson County.

### **Existing Waste Handling Facilities for Clear Creek County**

Two waste handling facilities are located in Clear Creek County: the Empire Landfill where the majority of County waste is transported and disposed; and the Idaho Springs transfer station where some of the County's rubble is permanently disposed and much of the County's remaining municipal waste is temporarily collected for ultimate disposal at a landfill in Jefferson County.

**The Empire Landfill.** The Empire Landfill is located approximately one mile north of the Town of Empire. The landfill has been in operation for the past ten years and currently handles about 60 percent of the waste generated in Clear Creek County.

Both municipal and rubble wastes are now disposed on-site. It is estimated that 75 percent of the wastes disposed at this landfill are privately hauled to the landfill by the Clear Creek Disposal Service Company. The remainder of the waste disposed at this site is hauled separately by individuals residing in the western part of the County.

The Empire Landfill is open to the public 24 hours a day, 7 days a week. The site is manned by a County employee 5 days per week, 8 hours each day. However, because a great deal of the residential household wastes are deposited after hours and on weekends, control of the site is a problem during unsupervised periods.

The landfill consists of a valley-fill operation progressing up a steepwalled mountain ravine. The site may have access problems due to the steep, narrow unimproved roads that lead to the site. A number of other problems have occurred at the landfill including inadequate surface drainage, a lack of readily available cover material and insufficient fencing material. Deficiencies in cover and fencing material have resulted in windblown debris problems at the site. Numerous small fires have also been caused by the uncovered trash. Cover material is currently being supplied by a gold mine adjacent to the landfill, however, the mine is not always able to provide a sufficient amount of material. The Colorado Department of Health has already cited the landfill for insufficient cover material and perimeter fencing.

The site, which is currently nearing or at capacity, has already begun to encroach upon private land near the upper end of the landfill. An option is presently held on this land by the County which is contemplating using the additional acreage for a rubble dump. As previously mentioned, the CDH rejected the County's original request to develop the new land into an extension of the site's current sanitary landfill.

Idaho Springs. The Idaho Springs transfer station is located approximately one mile south of Idaho Springs. Until 1975, the Idaho Springs site was operated as a landfill and was frequently cited for non-compliance with State landfill standards. Since 1975, the facility has been operated both as a transfer station for municipal wastes and a permanent rubble dump. The site is estimated to serve about 27.2 percent of the total County population (see Proportionate Use Section which follows). All waste transported to the Idaho Springs site is hauled there by individual residents within the County. However, municipal wastes collected at the site are ultimately transported by Colorado Disposal Inc. (CDI), a private hauler, for disposal in the Leyden Landfill located in Jefferson County. Rubble is disposed on-site in a dump located in the eastern portion of the grounds.

The transfer station is open to the public six days a week from 7:00 a.m. until 7:00 p.m. in the summer and 7:00 a.m. until 4:00 p.m. in the winter. The site is currently utilizing a small stationary compactor roll-off transfer system. Non-bulky wastes are disposed in a 60 cubic yard compaction container which is operated during site hours by an attendant. Bulky items and rubble are not placed in the compactor because of size limitations in the receiving opening of the compactor. Bulky wastes in general bypass the compactor and are disposed at the rubble site. The attendant is also responsible for operating the International crawler loader used at the rubble dump.

The Idaho Springs rubble dump was recently cited by the CDH for surface drainage problems and inadequate cover and fencing materials, however, measures have already been initiated by the County to remedy these problems.

Recently, an additional 40 acres near the site was purchased by the County for expansion of the rubble dump and the possible future inclusion of a sanitary landfill.

## Proportionate Use of the Empire Landfill and Idaho Springs Transfer Station

In order to better understand the role played by the Empire landfill and Idaho Springs transfer station in the County's waste management plan, it is necessary to examine the patterns of use at each of these sites.

In estimating the proportionate use of the facilities for this study, the Town of Dumont (located approximately equidistant from the two facilities see Figure 2) was used as an arbitrary boundary to define the approximate service areas for the Empire and Idaho Springs facilities. Thus, persons in Enumeration Districts 685 and 686 to the west of Dumont, not employing the local collection service, presumably haul their wastes to the Empire site, as this site is closer to their homes. The residents in the northeast sector (District 679) to the east of Dumont, not employing the Clear Creek Disposal Service, are assumed to haul their wastes to the Idaho Springs facility. It was further assumed that the few residents in the extreme southeastern portion of the County (District 680) not using the Evergreen Disposal Service, would probably haul their wastes to the Evergreen transfer station.

In order to calculate proportionate use rates for the study area, the Clear Creek Disposal Service and the Evergreen Disposal Companies provided estimates of the percentage of people they serve in each of the County's four Enumeration Districts.

From this information, it is possible to estimate the number of persons utilizing the Empire Landfill and Idaho Springs transfer station for each section of the County (see Table 3). This information is summarized in Table 4 to reflect the total percentage of County residents electing either to use private collection services or to haul independently to each site, and the total population served by each site on a county-wide basis.

TABLE 3

UTILIZATION OF COLLECTION SERVICES

<u>Enumeration District #</u>	<u>Area</u>	<u>Location In County</u>	<u>Percent Of Total County Population</u>	<u>Estimated Percent Population In District Using Collection Service</u>	<u>Collection Service Used<sup>1</sup></u>
680	Evergreen Brooks Forest	Southeast of Dumont	15.2%	80%	EDS
679	Idaho Springs	East of Dumont	49.5%	45%	CCD
685	Empire, Silver Plume	West of Dumont	13.8%	60%	CCD
686	Georgetown	West of Dumont	21.5%	60%	CCD

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EDS = Evergreen Disposal Service. CCD = Clear Creek Disposal Service,

TABLE 4

UTILIZATION OF DISPOSAL FACILITIES

<u>Site</u>	<u>Percent Of County Using Site Via: Collection Service/Individual Hauling</u>		<u>Total County Use</u>
Jefferson County (out-of-county)	12.1%	3.1%	15.2%
Idaho Springs <sup>1</sup>	0 %	27.2%	27.2%
Empire	<u>43.5%</u>	<u>14.1%</u>	<u>57.6%</u>
TOTALS	55.6%	44.4%	100.0%

---

<sup>1</sup> Municipal wastes delivered to the Idaho Springs transfer station are ultimately disposed of in Jefferson County.

As can be seen in Table 4, 14.1 percent of the citizens west of Dumont currently haul their own trash to the Empire Landfill. If a waste handling facility is not continued at the Empire site, it is this group of people representing about 1,060 residents or approximately 350 households (assuming three persons per house) that would need to transport wastes to a more distant site and would probably be inconvenienced by the longer trip.

#### Current and Projected Waste Volume for the Empire Area

Once the population served by the Empire Landfill has been calculated, it is possible to compute the current and projected ten-year waste volumes for the part of the County now served by the Empire Landfill.

Current Annual Waste Volume at Empire. As shown in Table 4, approximately 57.6 percent of the total County population of 7,500, or 4,320 persons, currently disposes their waste at Empire. This corresponds to 3,232 tons of waste a year.

$$\frac{4,320 \text{ persons} \times 4.1 \text{ lbs/person/day} \times 365 \text{ days/yr}}{2,000 \text{ lbs/ton}}$$

$$= 3,232 \text{ tons/yr.}$$

Projected Ten-Year Waste Volume for the Area Now Served by Empire. Earlier in this section, the projected total waste volume for Clear Creek County during the ten-year study period was estimated to be 66,193 tons. According to County sources, the County's population distribution should remain constant over the study period. If this assumption holds true, an estimated 38,127 tons of waste (57.6 percent of the total County waste volume) would be disposed at the Empire site.

## County Solid Waste Budget

In 1979, the County budget for solid waste disposal was approximately \$84,000. The projected budget for 1980 is estimated at \$138,000, approximately 3.5 percent of the total County budget. This increase of \$54,000 over the past year is primarily due to the purchase of additional land adjacent to the Idaho Springs facility to extend the useful life of the site by several years. According to data supplied by the County Road and Bridge Department, the cost of disposing waste at the Empire landfill is approximately \$11 per ton and the cost of transferring waste from the Idaho Springs facility to an ultimate disposal site in Jefferson County (including tipping fees) is \$31 per ton.

Over the last five years, the County has budgeted almost \$500,000 for solid waste management. In addition to this allotment, the County Road and Bridge Department's crew has provided both labor and equipment for related waste management operations, such as road clearing near the two sites. Road and Bridge Department expenditures for such services over the same five-year period total about \$200,000 above the monies budgeted directly for waste management.

## Existing Equipment

Site equipment at the Empire Landfill consists of a crawler loader with a three-cubic yard bucket. The loader is ten years old and is owned by the County. Also located on site is a small metal building, which is used as a shelter for the loader.

Equipment at the Idaho Springs transfer station includes: a crawler loader (5 years old) with a 2-3/4 cubic yard bucket, a top-opening hydraulic compaction unit, a 60-cubic yard roll-off container, a concrete pad, and a 20-cubic yard holding hopper. The Idaho Springs site also contains a small personnel shelter which is lighted and heated and contains a telephone.



It should be noted that the compaction and transfer equipment used at the Idaho Springs facility, other than the facility's concrete pad and hopper, is completely owned by the private hauler. The County currently rents this equipment on a month to month basis. Consequently, any future waste management options considered by the County should be based on the absence of any compactor or roll-off equipment for the site. Thus, if the County decides to continue compaction operations at this location, it would be necessary to start over again from the perspective of purchasing or leasing the necessary compaction equipment.

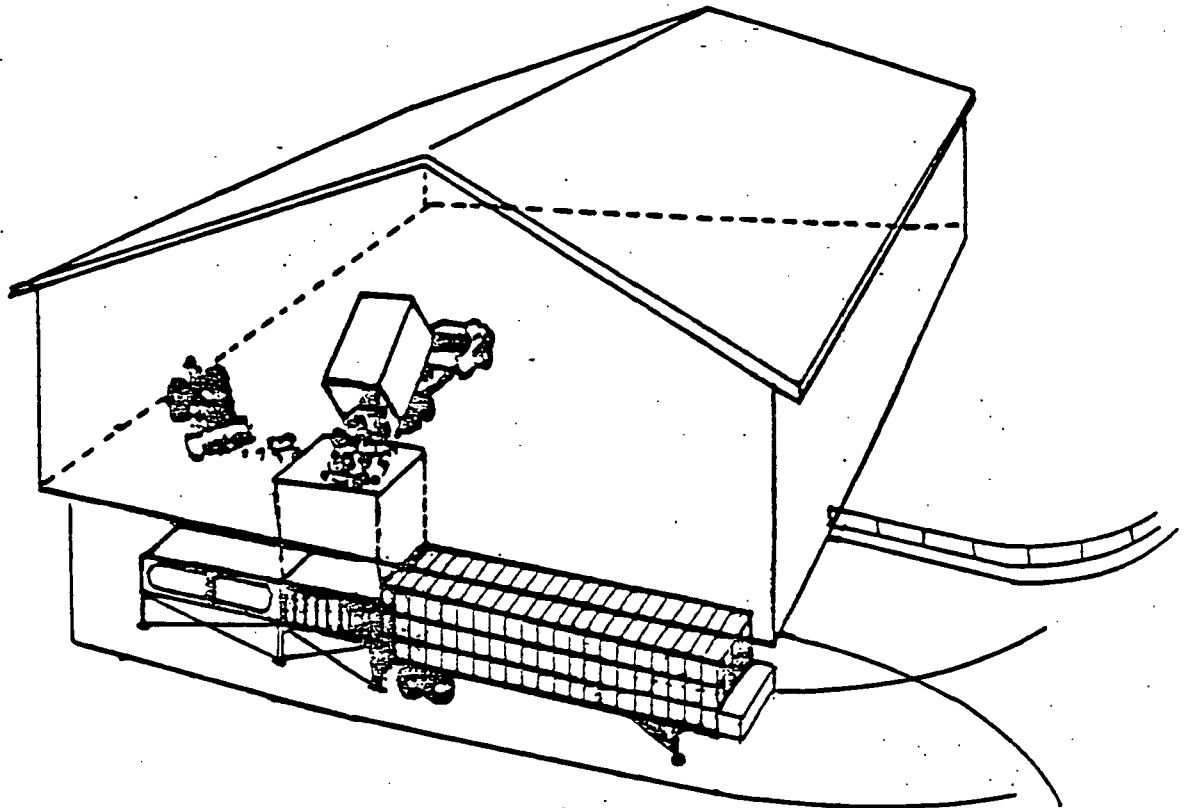
Other equipment available for solid waste management on an intermittent basis through the Road and Bridge Department includes 11 dump trucks, 2 loaders, 2 bulldozers, a Diamond-Reo 10 wheel tractor rig and miscellaneous shop facilities.

### **General Review of Solid Waste Transfer Options**

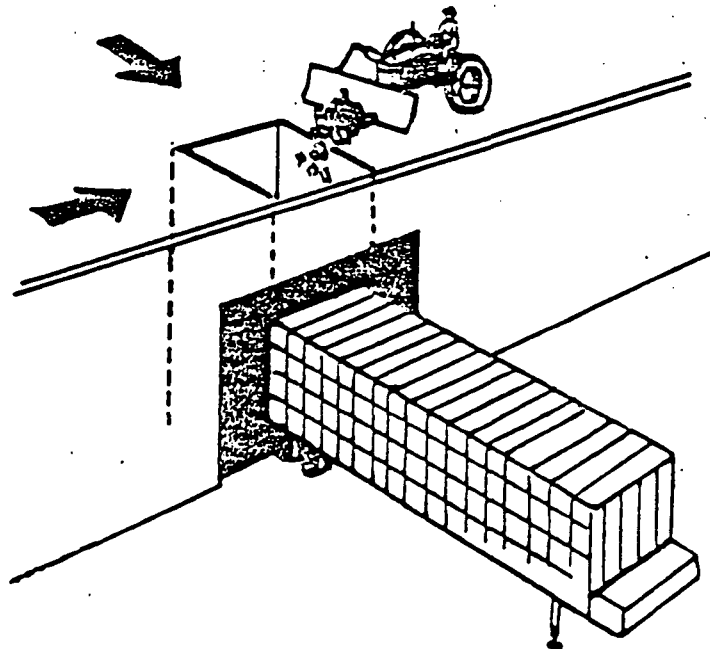
Rural, sparsely populated areas are often faced with collecting solid wastes from a very large area. Additionally, in these areas, land is either unsuitable for sanitary landfill operations or suitable land is unavailable due to either prohibitive costs or incompatibility with adjacent land use patterns. The combination of these factors often make it advantageous to transport wastes out of the area for ultimate disposal. For this option to be feasible, transportation costs must be reduced to a minimum. One method to reduce transportation costs is to utilize a transfer station where solid wastes are temporarily deposited and then transferred to large capacity vehicles (usually a semi-trailer with the capacity to transport up to 20 tons of waste). These large vehicles, in turn, transport the wastes to a regional disposal site.

**Transfer Stations.** Transfer stations are commonly designed to function in one of two ways (see Figure 3). One method is direct transfer (Direct Dump) of the wastes from the collection

**FIGURE 3. TRANSFER STATIONS**



**DIRECT DUMP TRANSFER STATION**



**STOCKPILE / FRONT END LOAD TRANSFER STATION**

Source: Hegdahl, Tobias. Solid Waste Transfer Stations,  
U.S. Environmental Protection Agency Report  
(SW-99), 1973.

vehicles to the larger capacity transfer trucks. The second method (Stockpile/Front End Load) consists of stockpiling the wastes from the collection vehicles and periodically moving the stockpiled wastes into the transfer vehicle. Generally in cases involving small daily waste loads on the order of 50 tons per day (TPD) or less, direct transfer of the wastes is the most cost-effective alternative. Larger volume transfer stations - 50 to 250 TPD - usually utilize the stockpile method plus sophisticated transfer equipment. Additionally, transfer stations of this size have the potential to implement limited resource recovery operations (e.g. paper and aluminum can separation and recycling) to offset capital and operating costs. Transfer stations with various arrangements of optional equipment are commercially available from a number of nationwide manufacturers, some of whom offer turn-key services.

**Compaction Unit.** In general, areas where populations exceed 1,000 and transportation distances exceed approximately 15 miles, it is most economical and practical to have the transfer station equipped with a compaction unit to reduce the volume of the waste. This allows for a substantial increase in the quantity of waste which can be transported each trip and thus decreases the number of vehicle trips taken to the ultimate disposal site.

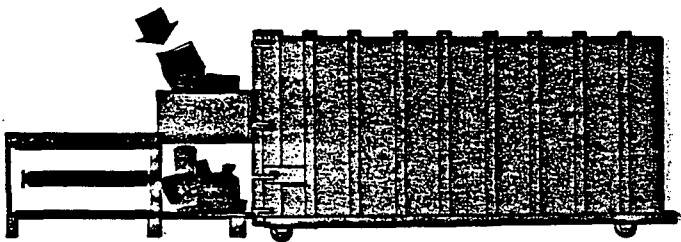
**Transfer Vehicles.** There are two types of transfer vehicles which can be used with compaction equipment. These are the tilt frame/roll-off container vehicle, such as the one currently used at the Idaho Springs facility, and the transfer trailer.

The tilt frame/roll-off is so named because of the moveable rail structure which is mounted directly on the truck chassis or separately on a trailer bed (see Figure 4). A roll-off container is collected by "tilting" the rails and winching the entire container onto the structure. When the container is to be emptied, the rear doors of the container are opened and the entire package is tilted so that the compacted refuse falls out. Commercially

**FIGURE 4.**

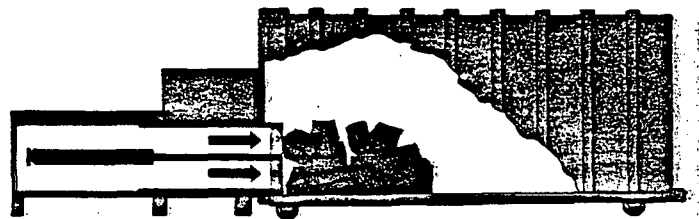
**TILT FRAME/ROLL-OFF TRANSFER VEHICLE**

**1.**



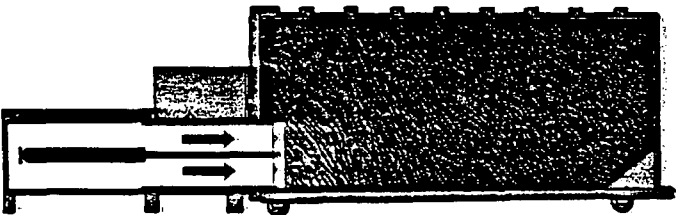
1. Refuse is inserted into the compactor hopper by various methods. Loading procedure can be selected to best suit each installation.

**2.**



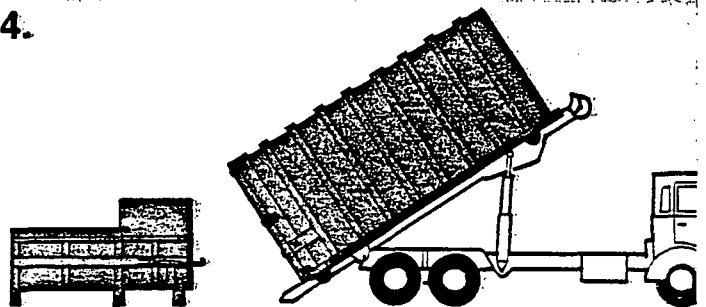
2. Simply activate pushbutton control and your trash is compacted and stored in a sanitary, closed system.

**3.**



3. High compaction forces allow large volumes of refuse to be stored in the smallest space.

**4.**



4. Your trash is removed by a roll-off truck when your receiving container is full and your system is ready for work again.

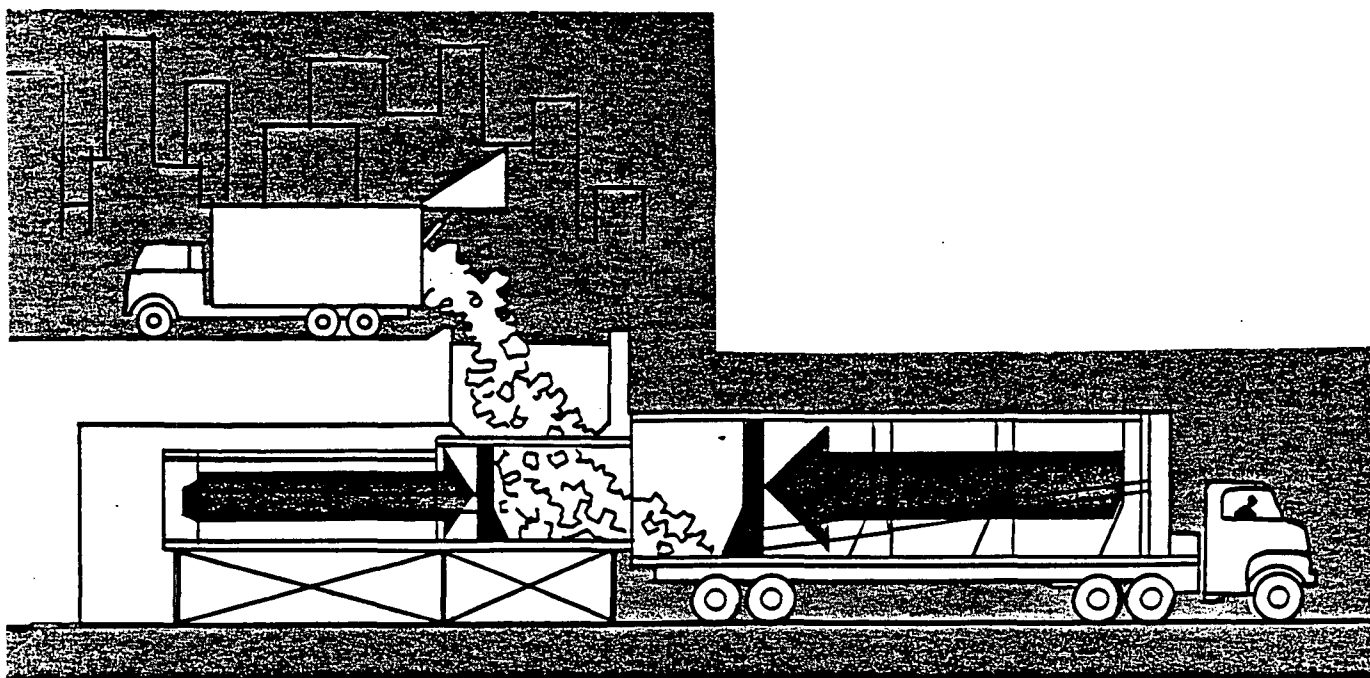
**SOURCE: DEMPSTER DUMPSTER SYSTEMS, KNOXVILLE, TENNESSEE**

available tilt frame/roll-off transfer vehicles must be equipped with a separate refuse compactor. Refuse is deposited in a hopper feeding the compactor which forces the waste into the roll-off container. There is little compaction of refuse until the container is nearly full since, only then does the compactor exert a significant pressure. A typical ratio of compacted to loose refuse density achievable by this type of system is 1.9 to 1 by weight.

In contrast to the external compactor associated with the tilt frame/roll-off type of trailer, the transfer trailer has a hydraulic ejection ram mounted inside the trailer compartment (see Figure 5). When emptying the trailer, the rear doors are opened and refuse is pushed out by the ram. This ram provides a significant advantage for the transfer trailer as opposed to the roll-off system. The ram allows the transfer trailer to achieve a much higher density of wastes in one of two ways. If a separate compactor is utilized, it can work against the ejection ram which is extended at first and gradually retracted as the volume of contained wastes increases. Alternatively, the ejection ram can be used as a compaction device. In this system, wastes are introduced via a hopper into a "top dumping" trailer just behind the face of the ram. When a certain volume has been deposited, the operator can use the ram to compact the wastes against the rear door of the trailer. The advantage of this method is that no separate piece of compaction equipment is required. All that the trailer requires is a source of hydraulic pressure which can be provided through a "wet-pack" hookup from the tractor rig or a stationary hydraulic pump (gas or electric). A typical ratio of compacted to loose refuse density achievable by this type of system is 3 to 1 by weight.

**"Green Box" System.** One type of transfer system that is often used effectively in conjunction with a transfer station is a rural disposal or "green box" system. For rural areas and communities with populations less than approximately 1,000 where no

**FIGURE 5. TRANSFER TRAILER VEHICLE**



**SOURCE: DEMPSTER DUMPSTER SYSTEMS, KNOXVILLE , TENNESSEE**

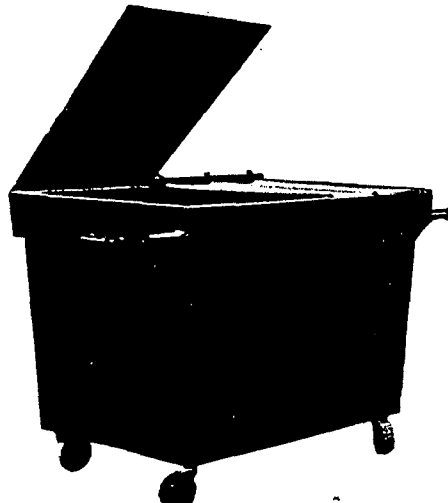
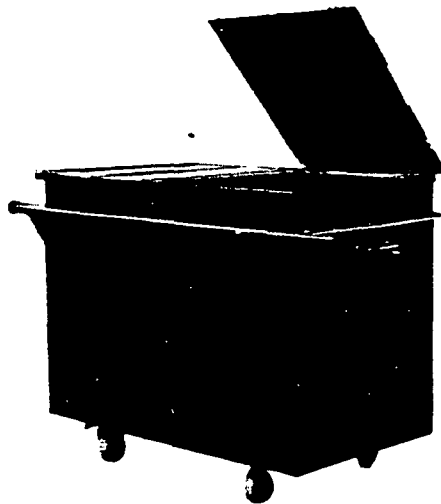
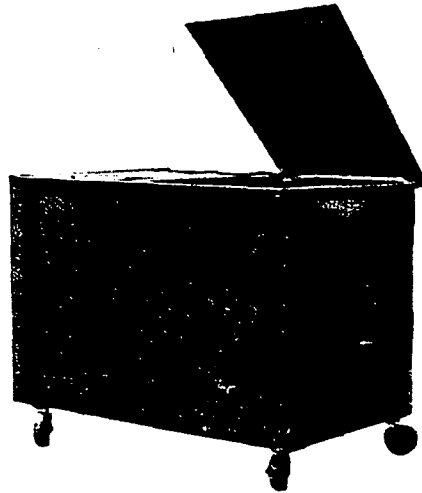
individual door-to-door collection service is available, a potentially economical solid waste collection alternative is the use of containers strategically placed throughout the service area. Through the use of specially-equipped vehicles, these containers, referred to as green boxes, are emptied periodically and the waste is then transported to a central transfer facility to await final transportation and disposal at a regional disposal site. In many rural areas, a container system has replaced several small indiscriminate dumps allowing for an economical waste disposal method which is in compliance with all local, State, and Federal laws.

The "green box" system consists of locating several small containers (see Figure 6) varying from 3 to 8 cubic yards in size throughout a sparsely populated area. These containers are placed in locations which are readily accessible including intersections of local highways, recreational areas, previous dump sites, and in or near small communities. These container systems can be designed such that the waste in the containers can be emptied into either a front loading or rear loading waste collection vehicle (see Figure 7). Both private haulers in Clear Creek County are equipped to service this type of system.

The "green box" system would require special County-wide ordinances to control the type of waste being deposited in these green boxes. Such ordinances would have to address the fact that:

- a) Containers can accept:
  - residential and household waste
  - light commercial waste
  - yard trimmings

**FIGURE 6. GREEN BOXES**



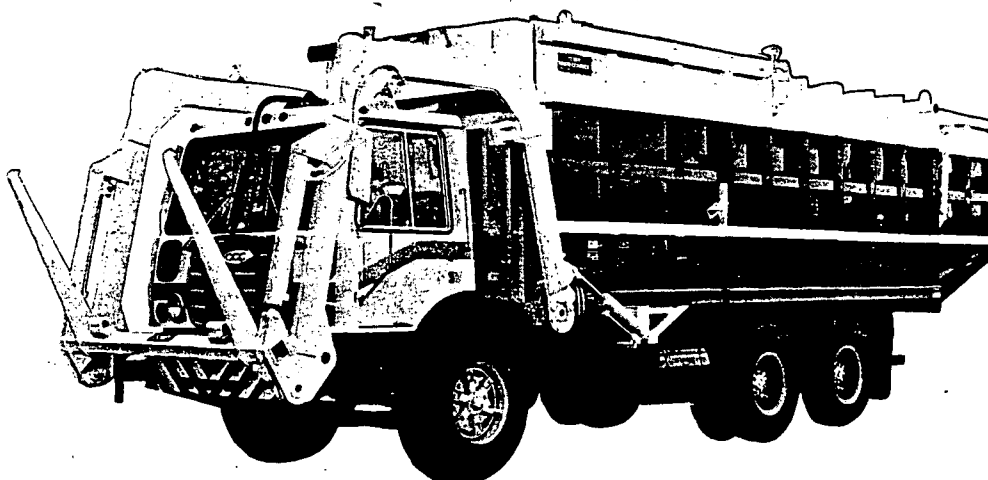
**SOURCE: GEORGE SWANSON & SON, INC., ARVADA, COLORADO**



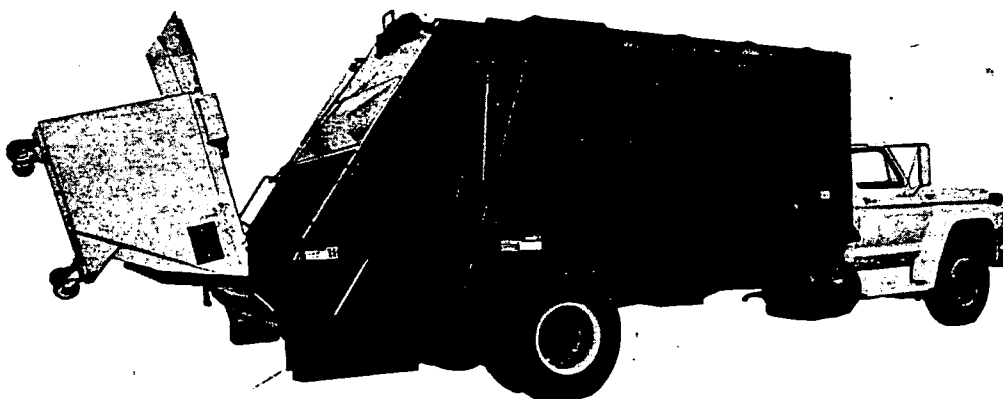
**FIGURE 7.**

**FRONT AND REAR-LOADING GREEN BOX**

**COLLECTION VEHICLES**



**SOURCE: PERFECTION - COBEY CO., GALION, OHIO**



**SOURCE: DEMPSTER DUMPSTER SYSTEMS, KNOXVILLE, TENNESSEE**

b) Containers cannot accept:

- burned or burning materials
- industrial waste
- bulky waste; i.e., stoves, refrigerators, construction debris, tree trunks, auto parts, etc.
- dead animals.

## **V. EVALUATION AND COST ANALYSIS OF TRANSFER ALTERNATIVES**

Summarily, the five solid waste disposal options so far discussed (the two identified for Empire in the initial scope of work and the three additional alternatives involving the consolidation of services at Idaho Springs) will now become known as Alternatives 1 through 5. Figure 8 utilizes a matrix system to facilitate a better understanding of the five systems.

Alternatives 1 and 2 were identified to be evaluated in the initial scope of work. Both alternatives involved a modification of services for only the western part of the county which had previously utilized the Empire landfill. The two alternatives were: Alternative 1: development of a dual-containerization transfer station at the existing Empire site to handle both municipal and bulky wastes; and Alternative 2: development of a transfer station at the existing Empire site for municipal wastes only, in conjunction with development of the adjacent land now held by option by the County as a rubble dump for the permanent disposal of bulky wastes.

Alternative 1, the dual-containerization transfer station at Empire, was deleted early in the course of the study. Although opposed to the continued utilization of the Empire site as a sanitary landfill, the Colorado Department of Health (CDH) had no apparent disagreement with retaining Empire as a rubble disposal site. Additionally, the rubble disposal site at Idaho Springs was not considered in the original scope of work. The inclusion of the Idaho Springs site into the study coupled with apparent ability of the County to retain the Empire site as a rubble dump made the dual-containerization concept obsolete, and this alternative was therefore replaced with the three new alternatives involving Idaho Springs.

FIGURE 8  
SUMMARY OF SOLID WASTE DISPOSAL ALTERNATIVES FOR CLEAR CREEK COUNTY

<u>Alternative 1</u>		<u>Alternative 2</u>	
	<div> <div>Empire</div> <div>Idaho Springs</div> </div>		<div> <div>Empire</div> <div>Idaho Springs</div> </div>
Sanitary Landfill	NO NO	Sanitary Landfill	NO NO
Rubble Dump	NO YES	Rubble Dump	YES YES
Transfer Station	NO YES	Transfer Station	YES YES
Dual Transfer Station	YES NO	Dual Transfer Station	NO NO

<u>Alternative 3</u>		<u>Alternative 4<sup>1</sup></u>	
	<div> <div>Empire</div> <div>Idaho Springs</div> </div>		<div> <div>Empire</div> <div>Idaho Springs</div> </div>
Sanitary Landfill	NO NO	Sanitary Landfill	NO NO
Rubble Dump	NO YES	Rubble Dump	NO YES
Transfer Station	NO YES	Transfer Station	NO YES
Dual Transfer Station	NO NO	Dual Transfer Station	NO NO

<u>Alternative 5</u>	
	<div> <div>Empire</div> <div>Idaho Springs</div> </div>
Sanitary Landfill	NO YES
Rubble Dump	NO NO
Transfer Station	NO NO
Dual Transfer Station	NO NO

<sup>1</sup> Utilizes "Green Box" System for the western part of the County.

The three new alternate waste management schemes identified for the County were: Alternative 3: an expanded single transfer station and rubble dump at Idaho Springs to consolidate disposal services for the entire county, Alternative 4: this expanded single transfer station and rubble dump at Idaho Springs with a "green box" system for the western part of the County, and Alternative 5: a sanitary landfill at the Idaho Springs site serving the entire County. These three alternatives reduce the unnecessary and duplicative costs, and eliminate the inherent inefficiency of running two facilities in a county the size of Clear Creek County. Alternative 4 was analyzed to show the incremental cost of providing service to the approximately 350 households inconvenienced by eliminating the Empire facility. This system would provide three cubic yard containers ("green boxes") in the Georgetown/Empire area for the convenience of those residents in the area not electing to employ the private collection service or to directly haul their wastes to the expanded Idaho Springs station. These containers would be purchased and installed by the County and serviced and maintained by the local hauler at the County's expense. Alternative 5 was developed after a field inspection of the Idaho Springs facility revealed that sufficient area is available to operate a sanitary landfill.

In developing cost estimates for the remaining four alternatives, an attempt was made to develop basic, or minimum costs for each. For each alternative, equipment already owned by the County was utilized where feasible to minimize capital outlay. This equipment was billed at the hourly rate provided by the County Road and Bridge Department, which includes depreciation and operating costs exclusive of fuel and labor. Equipment selection and sizing is discussed within the analysis of each alternative. A list of landfill equipment manufacturers and suppliers is supplied in Appendix A.

Additional costs associated with difficult site access and environmental requirements are not included in the cost analyses. The problems of site access were such that no one site

demonstrated a clear-cut cost advantage or a greater likelihood of feasibility over another site. For instance, the cost and feasibility of rebuilding the unpaved road at the Empire site might be matched by the improvements required at the Idaho Springs site to accommodate the additional traffic associated with a County transfer or disposal site there. Environmental requirements that might adversely impact the cost analyses (i.e., - cover requirements, drainage modifications, etc.) were again similar enough to even out any such additional cost differentials between the alternatives. Given the fact that no alternative exhibited a distinct advantage by including these costs, both access improvement costs, and environmentally related costs were omitted in order to obtain more realistic cost comparisons.

For each alternative, costs are broken down into two categories: capital and annual operating and maintenance costs. Capital costs were annualized using a straight line amortization method assuming no interest and zero salvage value at the end of the stated depreciation period. Interest was assumed to be zero, and therefore excluded from consideration, because it doesn't affect the validity of the comparisons and, perhaps more importantly, because the County, through various financing arrangements, might be able to avoid interest charges altogether. Amortization periods were chosen to fit the existing situation or the approximate reasonable payback periods. In particular, land costs were amortized over three years because the County is paying for the land over that period of time. A five year lifetime for mobile equipment is in the low end of the normal range given, and was chosen because the site conditions are likely to be severe, resulting in a more rapid deterioration of the equipment. Capital improvements to the sites were discounted over 10 years. To complete the analysis, equipment replacement costs should be considered after five years, however, for reasons to be discussed, the alternatives were only costed for five years. Capital costs include such items as:

1. Site construction including planning and design, site preparation and grading, and construction of facilities and roads;
2. Stationary equipment, such as the compactor unit, hoppers, etc.; and
3. Vehicular equipment, such as roll-off or transfer trailers, containers, etc.

For each of the alternatives, contingency plans should be identified for those times when equipment is broken down or in need of repair or maintenance. Alternative 2 has a built-in equipment redundancy because two transfer station/rubble dumps will exist. If equipment failure forces the closure of one site, the other could conceivably handle the increased waste load temporarily. If the stationary compactors (Alternative 2), or compacting transfer trailers (Alternatives 3 and 4) become inoperable temporarily, the County could purchase or perhaps lease a trailer with a removable top into which wastes could be top-dumped. Because no compaction is involved with this interim system, more transfer trips would be required thus increasing the operational costs. Alternative 5 offers sufficient built-in equipment redundancy because the only equipment needed is one crawler-loader and the County already owns two.

For any of the transfer alternatives (Alternatives 2, 3, and 4), a problem could occur if the County-owned tractor rig breaks down. The County owns only one and is not required to purchase any additional such equipment for any of the alternatives. A proper maintenance program will, however, as it will with all of the equipment, reduce equipment downtime. The rubble dumps in Alternatives 2, 3, and 4 could also be utilized to temporarily store municipal wastes until such time as the faulty transfer equipment could be placed back on line.

Annual operating costs were estimated based on the estimated tonnage of wastes to be handled in 1980. Operating costs include such items as labor and fringe benefits, equipment maintenance, fuel costs, and tipping charges. For each alternative, operating costs were assumed to increase at a 12 percent annual rate based primarily upon inflation and the approximate annual 3 percent increase of waste tonnage attributable to population growth.

Finally, cost scenarios have only been projected for five years. The most important reason for not costing transfer systems for the ten-year period, as was originally recommended, is that the availability of landfills that are within a reasonable haul distance from Clear Creek County cannot be projected. This problem is discussed in Section V. Also equipment replacement should be considered after five years, and the difficulty of estimating future equipment costs was such that, given increases in equipment costs which far outpace inflation, a better comparison of alternatives could be made over a five-year planning period rather than the original ten-year period.

Detailed descriptions and complete cost breakdowns for alternatives 2 through 5 follow:

### Alternative 2

For this system, a transfer station and a rubble dump would be established at both the Idaho Springs and Empire sites. This transfer system would haul 54 tons per week 40 miles from each site. For economical operation the number of trips required per year should be reduced to a minimum. Therefore, a hydraulic compaction unit should be used at both sites. The compaction ratio achievable by this equipment is approximately 1.9 to 1 (compacted to loose refuse density). Based on the current waste volume gen-



erated in Clear Creek County, approximately 8 trips per week divided between the two sites, would be required. Since each trip requires three hours, twenty four hours per week of driving time are required. Peak loads during holiday seasons can be handled by temporarily increasing the number of trips per week.

The largest roll-off containers commercially available should be used since the additional capital cost of \$6,300 or 16% over the next smallest container is minimal compared to the cost of additional trips over the life of the system. Three containers are required for flexibility and efficiency of operations.  
Equipment:

Major equipment requirements are listed in Table 5. Where County owned equipment is specified, that fact is noted with an asterisk. No capital costs are included for County equipment, although the billing rate presumably covers those costs.

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TABLE 5

MAJOR EQUIPMENT REQUIREMENTS FOR ALTERNATIVE 2

- 1 Diesel Tractor Rig, 10 Wheel;\*
  - 1 Tilt-frame, Roll-off Trailer with dual axle
  - 3 Covered Roll-off Containers (60 yd<sup>3</sup> capacity)
  - 2 Stationary Compactors with 3 yd<sup>3</sup> hopper
  - 2 Crawler Loaders\*
-

**Labor:**

A foreman, a part-time driver, and three operators are required to keep both facilities open seven days per week, nine hours per day with one operator at each site. This includes a staggered schedule for the operators, with each getting four hours per week overtime. A foreman is required to provide good management, ensure that system expenses do not exceed the budgeted amount, and perform various administrative and planning functions.

**Fuel:**

Fuel costs are estimated for both the transfer and rubble dump operations. At the 1980 cost of \$1.07 per gallon, fuel costs are about 4% of the total cost. If fuel costs were to double, this would increase the system cost by less than 4%.

**Tipping Fees:**

Tipping fees at the ultimate disposal site are assessed on the basis of cubic yardage. Rates vary from \$1 to \$3 per cubic yard at the landfills in close proximity to Clear Creek County. Partial loads are charged as full loads. Since the container capacity is 60-cubic yards and the fee at the nearest landfill (near Golden) is \$1.50 per cubic yard, this equals \$90 per trip, or approximately \$35,500 per year.

A complete breakdown of capital and operating costs for Alternative 2 is provided in Table 6.

**Alternative 3**

A single transfer station at Idaho Springs is the heart of this system. Because the entire waste stream would be handled at this one site, the greater expense of a transfer trailer, versus a smaller capacity tilt frame/roll-off trailer, can be justified.

TABLE 6

Alternative 2 - Two Roll-off type transfer stations with rubble dumps, one at Empire, and one at Idaho Springs.

Assumed Design Parameters

- o 14.24 tons per trip (60 yd<sup>3</sup>)
- o 394 trips per year
- o 75 miles average roundtrip distance to landfill
- o 3 hours per trip
- o 4.6 miles per gallon (county tractor)
- o \$1.07 per gallon - fuel costs
- o \$1.50 per cubic yard - tipping fee at landfill

Capital Costs

	<u>Total Cost</u>	<u>Period (Years)</u>	<u>Annual Cost</u>
o Land - 40 acres at Idaho Springs	\$ 50,000	3	\$16,700
20 acres at Empire	50,000	3	16,700
o Site Preparation, Construction 1-2	12,000	10	1,200
o Fencing	5,000	10	500
o Miscellaneous	3,000	10	300
o Equipment - 2 stationary compactors	17,000	5	3,400
3 60-cubic yard containers	19,500	5	3,900
1 tilt frame trailer	26,000	5	5,200
Subtotal 1	\$182,500		\$47,900
o Engineering and Design (7% of total capital cost)	13,000	10	1,300
Subtotal 2 (First three years)	\$195,500		\$49,200

Annual Operating Costs

o Labor, including fringes (county rates)	
foreman - 40 hrs/week @ \$7.70/hr.	16,000
driver - 24 hrs/week @ \$6.75/hr.	8,400
operators 132 hrs/week @ \$5.13/hr.	35,200
o Tractor Trailer Costs	
County rate - 394 trips/yr x 3 hrs/trip	
x \$41.60/hr.	49,200
fuel - 394 x 75 miles/trip x (\$1.07/gal + 4.6 mpg)	6,900
o Tipping Fees	
394 trips/yr. x 60 yd <sup>3</sup> /trip x \$1.50/yd <sup>3</sup>	35,500

o Rubble Dump (Equipment)	
County ownership and operating cost -	
4 hrs/week per site @ \$44.55/hr.	18,500
Fuel - 8 hrs/week, 4 gal/hr. @ \$1.07/gal	<u>1,800</u>

Subtotal 1	\$171,500
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o Site and Equipment Maintenance (5% of total capital cost)	<u>9,100</u>
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Subtotal 2	\$180,600
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Summary

o Annualized Capital Costs (First three years)	\$ 49,200
o Annual Operating Costs	<u>180,600</u>

TOTAL	\$ 229,800
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o Fifth Year Cost	\$ 300,100
-------------------	------------

o Five Year Operation Cost	\$1,326,400
----------------------------	-------------

o Cost per ton of waste disposed	\$ 40.95
----------------------------------	----------

<sup>1</sup> Does not include improvements to access or electric hookup.

<sup>2</sup> Construction required at Empire site only.

Achievable compaction ratios with this type of equipment are on the order of 3 to 1. Approximately four trips per week would be required with a 75-yd<sup>3</sup> trailer, and at 2 1/2 hours per trip, approximately 30 additional hours per week would be available to handle peak loads.

Site construction at Idaho Springs involves building a transfer trailer station in place of the existing roll-off station. The site preparation and construction costs are higher than the cost of building a roll-off facility at Empire, primarily because more earthwork materials and labor are required.

#### **Equipment:**

Major equipment items are listed in Table 7. Existing county equipment is noted with an asterisk. No capital costs are included for county equipment, as the hourly billing rate presumably covers that cost.

#### **Labor:**

A foreman, a part-time driver, and three operators are required to keep the facility open seven days per week, nine hours per day, with two operators on duty at all times. A foreman is required to ensure that operations are as efficient as possible, to control expenditures, and to perform various administrative and planning functions.

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TABLE 7

#### MAJOR EQUIPMENT REQUIREMENTS FOR ALTERNATIVE 3

Tractor Rig, 10 Wheel\*  
Transfer Trailer 75 yd<sup>3</sup> capacity  
Crawler Loader\*

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**Fuel:**

Fuel costs are less than 3% of the total system cost at a unit cost of \$1.07 per gallon. Doubling the cost of fuel therefore would increase the total system cost by less than 3%, or approximately \$4,000 out of \$173,000.

**Tipping Fees:**

Since the transfer trailer has a greater compaction ratio, more refuse is carried per cubic yard than with the roll-off system, the resulting total tipping fee is smaller for alternative 3 than for alternative 2. It should be noted that if the tipping fees at local landfills were based on weight, this advantage of the transfer trailer over the roll-off trailer would not exist, although the transfer trailer would still require fewer trips per year and thus would incur less travel time expense. A complete breakdown of capital and operation costs for alternative 3 is included in Table 8.

**Alternative 4**

This alternative is identical to alternative 3 except that capital costs for container ("green box") acquisition and operating costs for contract collection of those containers is included. At an incremental cost of \$16,000, a total of about 350 households would be served via this option. Effectively, those residents in the western portion of the County who elect not to use the private hauler, for whatever reason, are provided this service so as to reduce the inconvenience caused by consolidating the waste management facilities in Idaho Springs. This is about \$46 for each of the 350 households paid by the County compared to the \$72 to \$96 per household paid for a private collection service by each household. The choice between alternatives 2 and 3 is not so much an economic decision as a decision by the County

TABLE 8

Alternative 3 - One trailer type transfer station with rubble dump located at Idaho Springs.

Assumed Design Parameters

- o 26.25 tons per trip (75 yds<sup>3</sup>)
- o 214 trips per year
- o 60 miles average roundtrip distance to landfill
- o 2.5 hours per trip
- o 4.6 miles per gallon (county tractor)
- o \$1.07 per gallon - fuel costs
- o \$1.50 per cubic yard - tipping fee at landfill

Capital Costs

	Total Cost	Period (Years)	First Year Cost
o Land - 40 acres at Idaho Springs	\$ 50,000	3	\$16,700
20 acres at Empire	50,000	3	16,700
o Site Preparation, Construction <sup>1</sup>	20,000	10	2,000
o Fencing	5,000	10	500
o Miscellaneous	3,000	10	300
o Equipment - 1 transfer trailer	45,000	5	9,000
Subtotal 1	\$173,000		\$45,200
o Engineering and Design (7% of total capital cost)	12,000	10	1,200
Subtotal 2 (First Three Years)	\$185,000		\$46,400

Annual Operating Costs

o Labor, including fringes (county rates)	
foreman - 40 hrs/week @ \$7.70/hr.	16,000
driver - 12 hrs/week @ \$6.75/hr.	4,200
operators 132 hrs/week @ \$5.13/hr.	35,200
o Tractor Trailer Costs	
County rate - 214 trips/yr x 2.5 hrs/trip x \$41.60/hr.	22,300
fuel - 214 x 66 miles/trip x (\$1.07/gal ÷ 4.6 mpg)	3,300
o Tipping Fees	
214 trips/yr. x 75 yd <sup>3</sup> /trip x \$1.50/yd <sup>3</sup>	24,100

o Rubble Dump (Equipment)	
County ownership and operating cost -	
4 hrs/week per site @ \$57.85/hr.	12,000
Fuel - 4 hrs/week, 4 gal/hr. @ \$1.07/gal	<u>900</u>

Subtotal 1	\$118,000
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o Site and Equipment Maintenance (5% of total capital cost)	<u>8,700</u>
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Subtotal 2	\$126,700
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#### Summary

o Annualized Capital Costs (First three years)	\$ 46,400
o Annual Operating Costs	<u>126,700</u>

TOTAL	\$173,100
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o Fifth Year Cost	\$212,400
o Five Year Operation Cost	\$969,900

o Cost per ton of waste disposed	\$ 30.84
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<sup>1</sup>Construction at Idaho Springs site only.



on the degree of service to be provided. A complete breakdown of capital and operating costs for Alternative 4 is included in Table 9.

If implemented by the County, the green box collection service may initially experience overloading problems as a result of those residents who will drop the private collection service in favor of the "free" green box service. If this situation does develop, the County will have to either increase the green box collection frequency or the number of boxes collected. Either consequence will increase County expenses. This situation may also have some effect on the private haulers, either by increasing their efficiency (less house to house service) or decreasing their revenues, or both. Politically, it is unfair to those residents who still pay for the private collection service. The political ramifications of this situation, all beyond the scope of this report, must be evaluated before this alternative's practicality can be determined.

#### **Alternative 5**

A single, sanitary landfill located in Idaho Springs is provided in Alternative 5. The proposed landfill site, which is adjacent to the Idaho Springs transfer station/rubble dump site, is similar to many mountain community landfills. Located in a ravine approximately 150 to 200 feet wide, the site slopes at an average grade of between 10 to 20 percent. Although the site is situated near the head of a drainage basin, there is only intermittent drainage out of the ravine and there are no springs in the area.

Soda Creek runs along the access road to the Idaho Springs site and is an alternate, although unused, water supply for the town of Idaho Springs. A landfill at this site should therefore be carefully managed to ensure that the quality of water in Soda

TABLE 9

Alternative 4 - Same as Alternative 3 with green boxes for area west of Dumont.

Assumed Design Parameters

- o (See Alternative 3)
- o 36 persons per 3-cubic yard box (pick-up once weekly).

Capital Costs

	<u>Total Cost</u>	<u>Period (Years)</u>	<u>Annual Cost</u>
o Land, Site Preparation and Construction, Fencing and Miscellaneous same as Alternative 3	\$128,000		\$ 36,200
o Equipment			
Transfer Trailer - 1	\$ 45,000	5	9,000
Green Boxes - 30, 3 cubic yard containers @ \$400 each	12,000	5	2,400
Subtotal 1	\$185,000		\$47,600
o Engineering and Design (7% of total capital cost)	13,000	10	1,300
Subtotal 2 (First three years)	\$198,000		\$48,900

Annual Operating Costs

o Labor, Tractor Trailer Costs, tipping fees, and rubble dump same as Alternative 3	118,000
o Contract Collection of Green Boxes - 30 boxes @ \$36/month each	<u>13,000</u>
Subtotal 1	131,000
o Site and Equipment Maintenance (5% of total capital costs)	9,300
Subtotal 2	140,300

Summary

o Annualized Capital Costs (First three years)	48,900
o Annual Operating Costs	<u>140,300</u>
TOTAL	\$189,200
o Fifth Year Cost	\$236,300
o Fifth Year Operation Cost	\$1,068,800
o Cost per ton of waste disposed	\$ 33.71

Creek will not be degraded. A potential problem with access could develop if this light duty road leading to the site were to be heavily traveled by refuse collection vehicles, particularly in inclement weather. Neither problem, however, appears to be significant enough to effectively prohibit the development of a landfill at this site.

Conceptually, the landfill would be operated in the following manner. An access road would be constructed to the highest point to be filled in the ravine, and the clearing, grubbing, and drainage diversion structures required for the first year's operation would be completed. At the same time, cover material stripping could be started, with stripping operations occurring approximately 6 months ahead of filling operations. Cover should be stockpiled above the fill area initially, and then later on the landfill mass. The landfill body would be constructed in one lift approximately 25 to 30 feet high, with a final grade equal to that of the original land surface, and a working face slope of about 3 horizontal to 1 vertical. Daily cover of six inches and a final cover of two feet are recommended. The landfill body should be crowned in the center to promote drainage towards the edges of the fill, where diversion ditches could carry the water away. A temporary berm at the crest of the working face would divert drainage away from that face.

Wastes would be deposited at the toe of the fill by residents or by the commercial hauler. The wastes would then be spread, compacted, and covered up the working face by the operator using one of the County-owned crawler loaders.

Cutter wheel or steel-wheeled compactors have been demonstrated to achieve up to a 30% higher compaction density than a standard tracked dozer and can thus extend the life of a landfill while minimizing settlement and leachate problems. The use of this special purpose compactor at the Idaho Springs landfill site, however, is not believed to be cost effective.

Although the cutter wheel compactor can achieve a fill density of 1,300 pounds per cubic yard (as compared to 1,000 pounds per cubic yard potentially achievable with a standard tracked dozer), it will increase equipment operating costs by at least 100 percent. Also, a new landfill compactor such as this can cost up to \$500,000 and is not generally cost-effective at landfills which receive less than 60 to 90 tons per day (TPD). The Idaho Springs landfill would receive approximately 15 TPD.

Cover material at the site consists of weathered bedrock and silt. The bedrock in the area is generally a biotitic gneiss and schist of pre-Cambrian age which decomposes to a clayey silt. This material, if present to a sufficient depth of approximately four feet, is suitable for daily and final cover. A well prepared revegetation plan for the final cover would mitigate any erosion problems.

Slope stability and rockslide/rockfall problems could be experienced at the site, and should be considered when developing the landfill design. A well conceived drainage plan should help alleviate the problem. Subsidence problems should not be encountered as there are no records of underground workings beneath the site.

In summary, development of the site appears to be technically feasible and should be approved by the State Health Department after a detailed engineering design report and operations plan is submitted. Appendix E, which contains the State regulations pertaining to solid waste, and Appendix F, containing the guidelines for review, will be useful in discerning and preparing such a report.

Forty acres of land have been acquired by the County at the Idaho Springs transfer station/rubble dump site. Of this area, approximately 15 acres, encompassing the ravine and access road, will be required to provide the County with a long-term (approximately 40 years) disposal site.

Volume requirements were determined by calculating the as delivered waste volume and adding approximately 20% cover material (by volume) as per standard specifications. Cover material was assumed to be available from site development after a field inspection was completed.

**Equipment:**

No major equipment acquisitions are required for this alternative. The County-owned crawler loader, presumably the only equipment needed, can be utilized at the billing rate provided by the County Road and Bridge Department.

**Labor:**

A foreman and three operators are required to keep this facility open seven days per week, nine hours per day, with two operators on duty all the time. One operator would serve as gate attendant while the other operated the crawler loader. A foreman is required to provide careful management, making sure that landfill space is not wasted, and to perform various administrative and planning functions.

**Fuel:**

Fuel costs are approximately 3% of the total. An increase of 100% in fuel costs would equal an increase of less than 3% in the total system costs.

**Tipping Fees:**

Since a landfill outside the county is not required in this alternative, no tipping fees are experienced. In fact, the County could obtain revenue from this system by charging private collection services a moderate tipping fee to cover the costs of

the landfill. This possibility is not included in the cost analysis. A complete breakdown of capital and operating costs is included in Table 10.

### Cost Summary

Table 11 summarizes the cost information developed in each of the detailed system analyses. This table shows the first and fifth year expenditures, and the total cost over five years for each alternative. No increase in system capacity is included for this comparison, although the landfill alternative would require the least additional expense if additional capacity became necessary.

The landfill alternative is the least cost system, both in the short and long terms. The most expensive alternative, the two roll-off transfer stations (Alternative 2), is 78% more than the landfill system and 24% more than the next most expensive option, Alternative 4.

It is interesting to compare the first year costs of these alternatives with previous County solid waste disposal expenditures. As mentioned in Section 3, the projected 1980 County budget for waste disposal was estimated at \$138,000. First year costs for Alternatives 2 through 4 are noticeably higher than the projected 1980 County expenditures, however, the first year cost of Alternative 5, the landfill alternative, is lower.

TABLE 10

Alternative 5 - Sanitary landfill at Idaho Springs Site.

Assumed Design Parameters

- o 2,700 yds<sup>3</sup> per month of waste
- o 190 yds<sup>3</sup> per month of cover required
- o Spread, compact and cover-Productivity of crawler loader @ 50% efficiency - 45 yd<sup>3</sup>/hr
- o Rip and Stockpile cover material - Productivity of crawler loader at 89% efficiency - 32 yd<sup>3</sup>/hr

Capital Costs

	<u>Total Cost</u>	<u>Period (Years)</u>	<u>Annual Cost</u>
o Land - 40 acres at Idaho Springs	\$ 50,000	3	\$16,700
20 acres at Empire	50,000	3	16,700
o Fencing (both sides)	5,000	10	500
o Miscellaneous	3,000	10	300
Subtotal 1	\$108,000		\$34,200
o Engineering and Design (7% of total capital cost)	10,000	10	1,000
Subtotal 2 (First three years)	\$118,000		\$35,200

Annual Operating Costs

o Labor, including fringes (county rates)		
foreman - 40 hrs/week @ \$7.70/hr.		16,000
operators 120 hrs/week @ \$5.13/hr.		32,000
o Crawler loader		
64 hrs/month - spread and cover		
6 hrs/month - rip and stockpile		
County billing rate -		
70 hrs/month @ \$57.85/hr		48,600
fuel-70 hrs/month, 4 gal/hr (\$1.07/gal)		3,600
Subtotal		\$100,200

Summary

o Annualized Capital Costs (First three years)	35,200
o Annual Operating Costs	100,200
TOTAL	\$135,400
o Fifth year cost	\$159,500
o Five Year Operation Cost	\$745,600
o Cost per ton of waste disposed	\$ 24.13

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TABLE 11

SUMMARY OF COSTS, ALTERNATIVES 2, 3, 4, 5

<u>ALTERNATIVE #</u>	<u>FIRST YEAR</u>	<u>FIFTH YEAR</u>	<u>CUMULATIVE TOTAL</u>
2	\$229,800	\$300,100	\$1,326,400
3	\$173,100	\$212,400	\$ 969,900
4	\$189,200	\$236,300	\$1,068,800
5	\$135,400	\$159,500	\$ 745,600

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## **VI. LONG-TERM DISPOSAL ALTERNATIVES FOR CLEAR CREEK COUNTY**

The previous section examined five alternative systems that could be implemented in Clear Creek County to meet the County's waste disposal needs over a five-year study period. These alternatives were evaluated in terms of their cost, practicality, and efficacy in resolving the County's immediate waste management needs arising from the imminent closure of the Empire Landfill. In a situation requiring immediate resolution, utilization of a transfer system is a particularly attractive waste disposal alternative. As compared with a more common alternative, such as landfilling (an alternative which must first undergo a permitting process and then meet extensive Federal and State regulations), a transfer system can be readily implemented, often on existing land. A landfill, however, requires relatively low capital and operating expenditures.

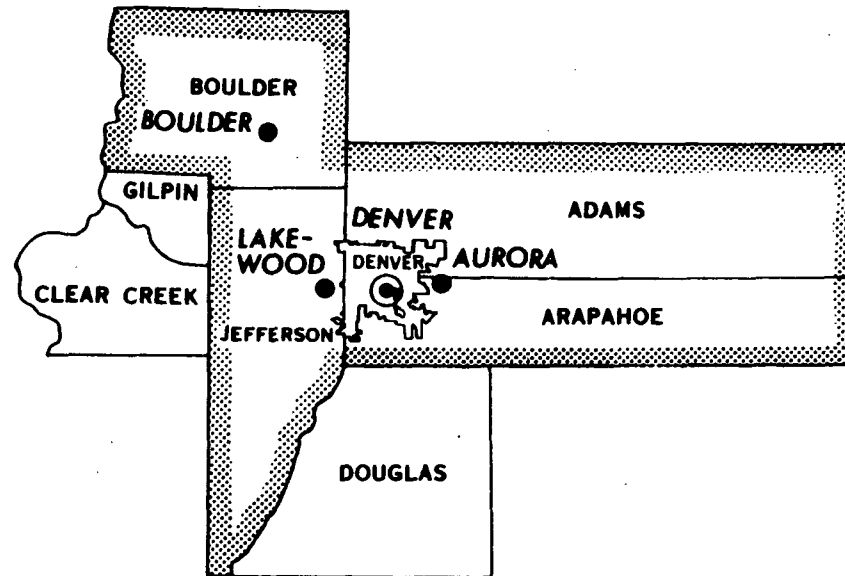
Over the long-term, when a transfer system is adopted as the sole means of waste management for an area, transfer poses a significant disadvantage, since it forces the County to remain dependent on the availability of other waste disposal operations within a reasonable proximity to the transfer station. For Clear Creek County, the transfer alternatives imply dependency on projected waste disposal capacity in the Denver region. When this capacity is examined, it becomes apparent that the long-term disposal needs of the County may not be met through a transfer system alternative for the following reasons:

1. Section 4002 of the Resource Conservation and Recovery Act (RCRA) emphasizes a regionalized approach to solid waste management and encourages the States to develop solid waste management plans through Federal funding incentives. Each State which chooses to prepare a plan will divide the State into regional planning districts.

It is likely that the same districts formulated for other State-wide regional plans will also be used in developing Colorado's solid waste management plan. Colorado is currently developing a State solid waste management plan and has designated the eight county Denver metropolitan area as one of its regional waste planning districts. This area has been designated as State Planning and Management Region 3 (see Figure 9) and the five counties in this region who have chosen to participate collectively make up the Denver Regional Council of Governments (DRCOG).

2. At present, there are five major disposal sites in the Denver region. Two of these, the Leyden Landfill in Jefferson County, currently handling the wastes collected at Idaho Springs, and the Landfill Inc. landfill in Adams County are expected to close within a year. The Colorado Disposal Inc. landfill in Douglas County is projected to close within three to four years. A fourth site, the Marshall Landfill in Boulder County, will close within a year. Finally, the Lowry Landfill, which has a life expectancy of up to 20 years, has recently been the focus of considerable concern as a result of past chemical waste disposal operations at the site. Consequently, the possibility of this site for long-term disposal of Clear Creek County wastes is questionable.
3. Potential future capacity in the Denver region involves two sites. One is a scheduled new landfill in Jefferson County, north of Golden, with a first phase lifetime of four years and possible expansion that would increase life expectancy by ten years. The second, a regional waste disposal site east of the Rocky Mountain Arsenal, is currently under consideration. In view of the Region's projected growth over the next ten years

**FIGURE 9. COLORADO PLANNING AND MANAGEMENT REGION 3**



**AREA CURRENTLY REPRESENTING THE DENVER REGIONAL COUNCIL OF GOVERNMENTS (DRCOG)**

and the diminishing existing disposal space, the supplemental capacity that these sites could provide is not likely to accommodate demand.

4. While it is impossible to predict what future planning may take place in regards to the waste disposal needs of the Denver region, it is clear that any new siting efforts must heed the requirements and guidelines of RCRA. Both the terrain and demography of the region suggest that new sites will probably be located to the east of Denver where soils, topography, land use, and population density are more conducive to the siting of a disposal facility than areas in closer proximity to Clear Creek County.

In summary, the combination of the predicted growth of the Denver region with its concomitant waste burden, diminishing disposal capacity, and current and future regulatory and environmental factors do not provide Clear Creek County with good reason to rely upon ultimate waste disposal outside of the County. Three options remain as potentially viable alternatives which could be implemented within the next ten years:

1. incineration of wastes;
2. resource recovery; and
3. development of a landfill site within the County.

**Incineration.** Incineration is generally a costly means of disposal, though economically feasible under certain circumstances. These include locations in which substantial volumes of hazardous industrial wastes are generated, urbanized areas in which land values are at a premium, and smaller communities where "modular incinerators" may be installed economically due to the potential utilization of waste heat by energy users. At present and in the foreseeable future, Clear Creek County's industrial and economic base seems to preclude selection of waste incineration option on a large scale.

**Resource Recovery.** Resource recovery such as separation and sale of paper products and aluminum cans can and should be implemented for certain domestic wastes within the County. Again, however, the nature of the composition of wastes generated by the County do not indicate that large scale resource recovery systems will completely solve the immediate or long-term disposal needs.

A materials recovery program based on source separation could, however, divert as much as thirty per cent of the waste stream from the transfer system or landfill disposal in the County. The County should carefully evaluate the technical and economical aspects of a resource recovery program in Clear Creek County. The following is presented as a starting point for that analysis.

The market value of all recycable materials in the Clear Creek County waste stream, based on the percentages and prices shown in Table 12, is estimated at \$101,000. Historically, a high resource recovery rate is not achievable, and a more reasonable estimate of gross value, based on recovering 10 to 15 per cent of the waste stream, would be twenty to thirty thousand dollars. From this value, the debt service, operation and maintenance costs, and operator's overhead and profit (if any) must be subtracted to calculate a net value. Frequently, source separation programs operate at a loss, and must be subsidized by the sponsoring entity to some extent. However, in Clear Creek County, a subsidy might be acceptable if it was less than or equal to the cost of disposing a similar proportion of waste via transfer or landfilling.

There are four common types of source separation programs. The first and most popular, although least effective, is the paper drive. This kind of program, because of its infrequent occurrence and the fluctuating paper market, will normally divert less than 1% of the total waste stream.

TABLE 12

GROSS VALUE OF RECYCABLE MATERIALS, 1981<sup>1</sup>

	<u>% of Waste Stream</u>	<u>Current Market Price</u>	<u>Gross Value</u>
Paper and Glass	41	\$30/ton	\$ 69,000
Ferrous Metal	7	\$10/ton	\$ 3,900
Aluminum	1	\$500/ton	<u>\$ 28,100</u>
TOTAL			\$101,000

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<sup>1</sup>Based on a total annual waste stream in Clear Creek County of 5,610 tons.

Source: C. Miller, "Source Separation Programs." NCRR Bulletin, December, 1980.

Drop-off centers, the second type of source separation program, are gaining popularity, and can divert between two and five percent of the wastes in an extensive well-run program. It will normally be less effective than this because of the so called inconvenience factor - the reluctance of people to transport recyclable materials from their homes to a drop-off center.

The buy-back program, a variant of the drop-off center, is the third approach. The most common buy-back material is aluminum, because of its high market value. This alternative partially mitigates the inconvenience factor in the drop-off center, however, it introduces a cash flow problem.

The fourth and most effective approach is curb side collection. A newsprint collection system can recover as much as five to eight percent of the total waste, and multi-material collection as much as ten to fifteen percent. However, curb side collection requires specialized equipment, additional collection labor, and community participation for successful implementation.

In addition, a combination of two or more of the above approaches can provide still further options to the County. For instance, the buy-back of aluminum cans at a drop-off center might be paired with newsprint collection for more optimal resource recovery.

Another factor to consider is the division of operational responsibility among public and private organizations. In Clear Creek County, the private collector might be reluctant to invest in the equipment required for curb side collection or he may be reluctant to expand his operation without sufficient financial guarantee. One method of dealing with this problem is the governmental franchise in which collection is provided by private entity under contract to a city or county government, which then sells the recovered materials, under contract, to a buyer. In this manner, the government agency can encourage recovery activities without incurring too much liability.

In summary, the best potential for materials recovery in the County appears to be multi-material source separation of paper (probably newsprint), glass, and aluminum. Transportation is the biggest unknown cost and could reduce or eliminate revenue from the sale of materials. Coordination with the Summit County recycling program might reduce this to a manageable cost. For the successful implementation of any recycling program, an extensive effort must be made to increase public awareness and involvement in the program. For at least the first year, the County should expect to subsidize the program to some extent. The personal involvement of county officials and careful monitoring of costs are mandatory for the implementation of a successful program.

Landfilling Within the County. During the last ten years, an extensive search for a new sanitary landfill site was conducted by the County Commissioners. Their recent proposal to develop land adjacent to the Empire Landfill for this purpose proved unsuccessful, since the Colorado Department of Health determined the site to be inappropriate for use in this capacity. However, as a result of the recent acquisition of 40 additional acres at the Idaho Springs transfer station, the potential may exist in the near future for development of that site for use as a sanitary landfill. A preliminary evaluation of the land at this site indicates that at projected total County waste volumes, this site could serve the County as a sanitary landfill for 40 years, if operated with modern equipment and techniques. This is an option the County should explore in greater detail.

Conclusions. Historically, landfilling has been the most inexpensive and widely used solid waste disposal alternative in the West. Available information from private landfill operators in the Denver area indicates that landfilling, depending on scale, management, and operation, costs anywhere from \$4 to \$17 per ton of waste disposed. These figures assume that the tipping fees reflect the actual operation cost of the landfill. High



waste volume operations demonstrating an economy of scale, are generally less expensive from an operational and maintenance cost standpoint. A landfill offers the potential of significantly reducing County waste disposal costs.

However, a County landfill is a long term commitment and uses the limited available land in Clear Creek County now without preserving the landfill option for the future when other disposal options are expected to be much more limited than they are at present.

To preserve maximum flexibility and cost effectiveness for both the short and long term the County could close the present Empire landfill and consolidate all waste disposal operations at Idaho Springs. The existing Idaho Springs landfill could be expanded and permitted for a solid waste disposal facility accepting all solid waste generated in the County. Initially the site would be used for rubble and construction debris. In order to preserve its long term flexibility the County should continue to have an out-of-county transfer operation at Idaho Springs. This should be a lease arrangement for five or ten years. The evolving waste management situation in the metropolitan area should be closely monitored and if disposal sites, transportation costs, or fuel availability make out-of-county disposal untenable, then all County wastes could be directed to the Clear Creek County landfill.

Whether or not the rural disposal ("green box") system is implemented in either the short or long term should be carefully evaluated by the County after appropriate public review and comment.

## REFERENCES

1. ASCE Solid Waste Management Committee, Environmental Engineering Division. Sanitary Landfill. Manual and Report on Engineering Practice, No. 39. New York, American Society of Civil Engineering. 1976.
2. Booz-Allen and Hamilton, Inc. Cost Estimating Handbook for Transfer, Shredding, and Sanitary Landfilling of Solid Waste. Washington, U.S. Environmental Protection Agency, 1976.
3. Bruner, D.R., and Keller, D.J. Sanitary Landfill Design and Operation. Washington, U.S. Environmental Protection Agency, 1972.
4. Caterpillar Tractor Company. Caterpillar Performance Handbook, Edition 11. Peoria, Caterpillar Tractor Co., 1980.
5. Fred C. Hart Associates, Inc., Resource Recovery Options for Boulder, Colorado (Draft), 1981.
6. Henningson, Durham and Richardson. Region IV Solid Waste Management Strategy, Helena, State of Montana Department of Health and Environmental Services, 1976.
7. Miller, C. "Source Separation Programs". NCRR Bulletin, Volume 10, No. 4, p. 82, December, 1980.
8. Municipal Environmental Research Lab. Energy Conservation Through Source Reduction. Washington, U.S. Government Printing Office, 1978.
9. Office of Solid Waste Management Programs. A National Survey Agency of Separate Collection Programs. Environmental Protection Publication SW-776. Washington, U.S. Government Printing Office, 1979.
10. Office of Solid Waste Management Programs. Comparative Estimates of Post - Consumer Solid Waste. Environmental Protection Agency Publication SW148. Washington, U.S. Government Printing Office, 1975.
11. Office of Solid Waste Management Programs. Decision - Makers Guide in Solid Waste Management. Washington, U.S. Government Printing Office, 1976.
12. Office of Technology Assessment. Materials and Energy from Municipal Waste. Washington, Government Printing Office, 1979.
13. Ralph M. Parsons Company. Feasibility Analysis of Resource Recovery from Solid Waste. Denver, Denver Regional Council of Governments, 1976.

14. Robert Peccia and Associates. Comprehensive Solid Waste Management Plan for Madison and Lower Gallatin Counties, Final Report. Helena, Madison County Solid Waste Technical Committee, 1979.
15. Robert Peccia and Associates. Park County, Montana, Solid Waste Systems Analysis. Helena, Park County Refuse District, 1980.

PERSONAL COMMUNICATIONS

Cooper, K.; Bestway Equipment Co.; Division of U.S. Disposal Systems; September, 1980.

Kois; Kois Brothers Equipment Co.; September, 1980.

Campbell, J.; George Swanson and Son, Inc.; November, 1980.

Kolig, A.; Stanton Equipment Co.; September, 1980.

APPENDIX A

LIST OF SOLID WASTE EQUIPMENT  
MANUFACTURERS AND DISTRIBUTORS

Landfill Equipment

Allis Chalmers

Banderet Equipment Inc. - 289-5793  
4500 E. 60 Ave.  
Denver

Case Power Equipment - 288-1551

5775 Eudora  
Commerce City

Caterpillar

Wagner Equipment Co. - 289-6111  
6000 Dahlia  
Commerce City

International

H. W. Moore Equipment Co. - 288-0771  
5990 Dahlia  
Commerce City

John Deere

Pete Honnen Equipment - 287-7506  
5055 E. 72nd Avenue  
Commerce City

Rexnord

Booth-Rouse Equipment - 288-6625  
5700 Eudora Street  
Commerce City

Local Manufacturers and Distributors of Waste Handling Equipment

American Transportation & Equipment - 922-3636

2225 So. Kalamath      Jay Weitz, Distributor  
Denver

Jacobs Equipment Company - 292-3580

1950 31st      Chip Spratlen, Distributor  
Denver, 80216

Kois Brothers - 399-7370

4950 Jackson Street      George Kois, Manufacturer and distributor  
Denver, 80216

Swanson and Sons - 423-6200

400 So. Marshall      Al Whiddley, Manufacturer and distributor  
Denver, Co. 80226

APPENDIX B

COLORADO DEPARTMENT OF HEALTH LETTER  
RE: WESTERN CLEAR CREEK COUNTY SOLID  
WASTE DISPOSAL OPTIONS

File Copy  
Transmittal I.O.C.

August 8, 1980

Board of County Commissioners  
Clear Creek County  
Box 265  
Georgetown, Colorado 80444

Attention: Byron Guanella, Chairman

Subject: Empire Landfill Closure and Future Transfer Station and/or  
Landfill Plans

Gentlemen:

This letter is to document our recent conversations and to clarify our recommendations in handling western Clear Creek County's solid waste disposal.

Closure of the existing Empire landfill necessitates another location for disposal of both municipal solid waste and "rubble" or wood and construction waste, appliances, tires, furniture, etc. (Closure requirements are noted in the separate inspection report.)

We believe that a roll-off trailer box and ram compacter transfer station similar to the one in use at the Idaho Springs site is the best long-term disposal option for municipal waste. The proposed landfill above the existing site is too small to use for an appreciable length of time, as well as having too little available cover material to be used for municipal waste. The closed fill surface seems to be the best transfer station location, since the public is used to this location, the owner is willing to sell the property, and no other feasible sites are available. If the compacter/transfer station cannot be set up before the landfill is completely full sometime this fall, a "green-box" system with a small (10 cubic yard) compacter truck making frequent pickups may be needed to get through the winter.

The possible use of the site 100 yards above the existing fill as a "rubble" dump has been seriously considered. The small amount of material expected for disposal means that the area would be useable for a fairly long time period. Daily cover would not be required, and the site is "shielded" visually and from wind by numerous trees and steep surrounding slopes. Difficult engineering design and construction problems in providing protected, adequate (100 yr. runoff event) drainage underneath or beside the proposed landfill could be overcome. Erosion and sloughing of the vertical-faced colluvial masses on the east side of the gulch should not present great problems or danger, although the effects of heavy truck traffic to the gold



mine above this site (if that mine is reopened, as rumored) have not been fully evaluated.

However, a transfer station for rubble may be an even better solution. An open roll-off trailer box located next to the municipal refuse compacter box could be used to collect rubble to be hauled to Idaho Springs (or elsewhere). We see several probable advantages in this alternative, as follows:

- (1) Capital investment; a) The new site will have to be purchased outright, as the owner apparently doesn't wish to remain liable for any problems during operation and after closure. b) Costs for developing a design report and operations plan, required by state law before this department may approve the new site. c) Costs for constructing a road, drainage protection, and access control (gate), as well as equipment and operator's time for earthmoving work, needed to prepare the site to accept rubble. d) Costs for staff and commission time, public notice, etc. involved in designating the new site. e) Costs for the open-box transfer station would involve only a concrete pad, access ramp and purchase or lease of the trailer box. No engineering report or re-designation of the site would be necessary.
- (2) Operating costs (a) Earthmoving equipment, operator and maintenance time needed to provide "adequate" compaction and cover: "Adequate" cover is defined by statute as that amount required to minimize windblown debris, prevent fire and rodent and insect infestation. We expect that this would require at least weekly covering of all trash. b) Costs for acquiring cover material. Cover must be provided mainly from off-site, since excavating loose material from the slope below the vertical faces on the east side of the gulch will destabilize the slope and greatly increase the chances for mass wastage (landslides). c) Operating costs for the rubble transfer station would involve only the fee (if contracted) or personnel and equipment time (if equipment is county-owned) for picking up, hauling and dumping the box.
- (3) Operational control of site. Assuming only one person on duty, whether the landfill or a transfer station is installed: a) Dumping at the landfill would be out of sight of the operator, who will probably be required to remain at the municipal refuse compacter station to operate the ram. Haulers headed to the landfill could be required to stop to have their loads checked at the compacter, so this is not a major complication. b) Dumping at the double transfer station with the operator present- would minimize improperly sorted refuse, and potential traffic tangles or accidents (on the road to the landfill) would be eliminated.

These concerns are clearly complex and should be quantified, the costs carefully estimated and studied.

If it is shown that the usable life of the (properly designed and operated) landfill will be long enough to justify preferring it over a transfer-trailer box, we see no reason to disapprove.

We have recommended that the county commissioners request (free) technical assistance from the EPA to get those costs mentioned estimated and compiled in order that a

Board of County Commissioners  
Clear Creek County  
Georgetown, Co.  
August 11, 1980  
Page 3

firm decision can be made. The EPA Technical Assistance Officer, William Rothenmeyer, has indicated his interest and willingness to provide this assistance in the person(s) of Fred C. Hart Associates, who are engineers and designers experienced in the field. Within the next two months they will be able to supply the concrete, quantitative information and dollar estimates on which to base a decision. Further design work will be necessary if the landfill site is developed. The county will need to hire a consulting engineer to do that work. An expanded second phase of the study can also be undertaken to evaluate the entire county's solid waste disposal situation and analyze future waste volumes, landfill needs, and possible alternatives to increasingly expensive transfer of wastes to landfills out of the county.

This summary has attempted to reflect the concerns of Clear Creek County as well as those of this Department. We look forward to working with you to devise economical, workable solutions to the difficult problems of waste disposal. Please feel free to advise us of further concerns or questions.

Sincerely,



Greg Starkebaum, Public Health Engineer  
Radiation and Hazardous  
Wastes Control Division

GS:er

APPENDIX C

COLORADO DEPARTMENT OF HEALTH LETTER  
RE: NOTICE OF VIOLATION FOR CLEAR CREEK  
COUNTY'S SOLID WASTE DISPOSAL SITES

# COLORADO DEPARTMENT OF HEALTH

Richard D. Lamm  
Governor



Frank A. Traylor, M.D.  
Executive Director

August 18, 1980

Clear Creek County Commissioners  
P.O. Box 265  
Georgetown, Colorado 80444

Attention: Mr. Byron Guanella, Chairman

Subject: Notice of Violation  
Solid Waste Disposal Act  
Clear Creek County, Colorado

Gentlemen:

This letter is to inform the County Commissioners of the solid waste disposal sites in Clear Creek County which are not being operated in accordance with the minimum standards presented in 30-20-Part 1, C.R.S. 1973 as amended, the Solid Waste Disposal Sites and Facilities Act. A copy of the Act and Regulations is enclosed for your reference.

Please find attached a description of the Empire and Idaho Springs sites in Clear Creek County, which are not in compliance with the Solid Waste Disposal Sites and Facilities Act. The name of the District Engineer, the date of inspection and the items of noncompliance are also presented.

Your attention is directed to Section 112 of the State Act which states that "The Board of County Commissioners, after reasonable notice and public hearing, shall temporarily suspend or revoke a certificate of designation that has been granted by it for failure of a site and facility to comply with all applicable laws, resolutions, ordinances or to comply with the provisions of this Part 1 or any rule or regulation adopted pursuant thereto".

This division is well aware of your efforts to plan for the closure of the Empire landfill, to install a municipal waste transfer station, and to decide on the best method for disposal of rubble at that site.

Your written reply describing a plan of action and/or a compliance schedule to upgrade the Idaho Springs site must be sent to this office within 30 days of the date of this letter, to receive appropriate attention in the evaluation of that site's noncompliance status. It is in the interest of the public health and safety that corrective measures be implemented as soon as possible.

Clear Creek County Commissioners  
Georgetown, Colorado 80444

Your assistance in this matter is greatly appreciated. If there are any questions regarding this letter, please contact this Department or Mr. John Blair, the District Engineer of this Department serving Clear Creek County.

Sincerely,

Albert J. Hazle, Director  
Radiation and Hazardous Wastes  
Control Division

AJH:GS:er

Enclosure

## Non Complying Sites

### Clear Creek County

Facility Name: Empire Landfill  
Inspection Date: 7/10/80  
District Engineer: John Blair  
Inspecting Engineer: Greg Starkebaum

#### Non Complying Items:

- 1) Surface drainage provisions inadequate. 30-20-110 (1)(d) of C.R.S. 1973 as amended and section 3-e of the Solid Wastes Disposal Sites and Facilities Regulations requires that..."A site and facility operated as a sanitary landfill ...shall provide adequate cover with suitable material and surface drainage designed to prevent ponding and water and wind erosion..." The existing 24 inch concrete pipe under the fill is subject to blockage by debris, resulting in water flow across the top of the fill which would saturate and erode the fill, polluting waters of the state and carrying partially decomposed garbage into the Town of Empire. An engineered, protected flood channel over or around the fill, sized to carry a 100 year storm flow, must be installed as part of the site closure.
- 2) Inadequate cover. 30-20-110(1) (d) of C.R.S. 1973 as amended and section 3(e) of the Solid Wastes Disposal Sites and Facilities Regulations require that "... in the operation of such a site and facility, the solid wastes...shall be fire, insect and rodent resistant through the application of an adequate layer of inert material at regular intervals and shall have a minimum of windblown debris which shall be collected regularly and placed into the fill." Inspection of the site revealed approximately 2000 square feet of uncovered, uncompacted trash. Windblown debris is spread several hundred feet in all directions from the site. A representative of the Empire Town Council stated that the town volunteer Fire Department has spent many hours extinguishing fires in the uncovered trash. A minimum thickness of 2 feet of compacted earth is required as final cover over the fill for closure. A thicker cover should be considered for the face of the fill due to probable erosion problems on the steep (approximately 1 1/2:1) slope.
- 3) Failure to adequately fence site, as required pursuant to 30-20-110 (1) (e) of C.R.S. 1973 as amended which states that "sites and facilities shall be adequately fenced so as to prevent waste material and debris from escaping therefrom ..."

The complete lack of fencing of the site also means that there is no control over hours of operation, location of dumping on the site, or other activities such as target shooting. If the present site is used as a transfer station location in the future, fencing should be installed for all the above reasons and to (partially) protect any equipment from theft and vandalism.

Non Complying Sites

Clear Creek County

Facility Name: Idaho Springs Transfer Station/Rubble fill

Inspection Date: 7/25/80

District Engineer: John Blair

Inspector: Barbara Bogema

Non Complying Items:

1) Surface Drainage provisions inadequate, potential for surface water pollution evident. 20-20-110 (1) (d) of C.R.S. 1973, as amended, requires that "A site and facility operated as a sanitary landfill shall provide ... surface drainage designed to prevent ponding and water and wind erosion and prevent water and air pollution... "

The North end of the fill is now completely blocking a natural drainage channel with a wall of waste approximately ten feet high. This causes ponding of water, saturation of the fill, and consequent backing of any soluble pollutants from the fill, further polluting the nearby stream and possibly destabilizing the face of the fill.

Adequate measures required to correct the situation include either removing the in-place fill, or construction of a drainage system to route runoff from the natural channel over or around the fill, with provisions for preventing erosion of the fill face.

2) Inadequate cover and fencing. 30-20-110 (1) (d), CRS 1973, as amended, requires in part that "...the solid wastes... shall be fire, insect and rodent resistant through the application of an adequate layer of inert material at regular intervals; and shall have a minimum of windblown debris which shall be collected regularly and placed in the fill."

The lack of daily cover and portable screens at the working area of the fill has resulted in a large amount of windblown debris scattered across and below the completed fill face and in the stream below. Much of this material, as well as numerous tires, appliances, etc. has obviously not been collected and placed in the fill for at least a year.

Closer inspection and control of the material dumped at this "rubble" fill, more frequent cover of "blowable" debris and cleanup of the scattered trash must be accomplished for this site to become acceptable, according to the law's minimum standards.

APPENDIX D

CLEAR CREEK COUNTY LETTER  
RE: COMPLIANCE PLAN



# County of Clear Creek

GEORGETOWN, COLORADO

September 19, 1980

Mr. Albert J. Hazle, Director  
Radiation & Hazardous Wastes  
Control Division  
Colorado Department of Health  
4210 East Eleventh Avenue  
Denver, Colorado 80220

Dear Mr. Hazle:

This is to confirm our recent on-site inspections of the Idaho Springs and Empire Landfill sites with Health Department personnel including Mr. Starkebaum, and is written in response to your letter of August 18, 1980.

Our Plan of Action for the Idaho Springs site includes clearing or unplugging both ends of the 30 inch culvert that runs through the center of the rubble fill area ("north end of the fill" referred to in the 7/25/80 inspection report). Due to the current blockage of the culvert, the inspectors have been unaware of this provision for surface drainage.

Also, County work crews will fill the area at the northwestern corner of the fill area which currently provides an opportunity for ponding and saturation of the fill, and will extend the culvert to a point where a grate or vertical bar screen can be installed at an angle of approximately 30 degrees from horizontal in order to allow any debris which might otherwise clog the opening of the culvert to override the inlet and to rest against the 10 foot high berm to be constructed. This berm will serve as a dam and further limit the possibility of storm runoff ponding which could saturate the fill area.

Finally, landfill personnel have been instructed to more frequently clean up windblown debris and to maintain adequate cover. Such "adequate cover" will be easier to accomplish in the future given the County's recent purchase of land to the northwest of the site. We believe Mr. Starkebaum has agreed to this overall Plan of Action at our site visit on September 12.

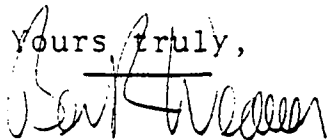


Mr. Albert J. Hazle  
September 19, 1980  
Page 2

The Empire site unfortunately requires longer-term solutions. There, our Plan of Action includes the installation of a double-transfer station which will include a compactor for household wastes similar to the facility at Idaho Springs, and a second container for waste products neither suitable for compaction nor for on-site disposal. Some on-site disposal of non-hazardous (even if saturated with storm runoff) rubble is proposed to occur north of the existing site on land currently under contract for purchase. Adequate provision for surface drainage at this site will be maintained.

Such long term plans may necessitate the closure or partial closure of the Empire site until the transfer facility and related enclosure, control over hours of operation, etc. can be accomplished. Such closure will include adequate cover and provisions for storm runoff. This overall Plan, too, we believe to be in conformance with direction agreed upon by Health Department personnel.

Please call if we can be of further assistance.

Yours truly,  


Berten R. Weaver  
County Planning Director

ps

APPENDIX E

STATE OF COLORADO SOLID WASTE DISPOSAL  
SITES AND FACILITIES REGULATIONS

COLORADO DEPARTMENT OF HEALTH  
4210 East 11th Avenue  
Denver, Colorado 80220

REGULATIONS: SOLID WASTES DISPOSAL SITES AND FACILITIES

AUTHORITY: Chapter 36, Article 23, CRS 1963 (1967 Perm. Cum. Supp.) as amended by Chapter 103, Colorado Session Laws 1971.\*

The following regulations were adopted by The Colorado State Board of Health pursuant to Colorado Revised Statutes 1963, Section 3-16-2 as amended\*\*, and Chapter 36, Article 23, CRS 1963 (1967 Perm. Cum. Supp.) as amended by Chapter 103, Colorado Session Laws 1971, for the designation, operation, maintenance, and design of Solid Waste Disposal Sites and Facilities.

Adopted February 16, 1972

Effective Date April 1, 1972

Section 1. SCOPE These regulations shall be applicable to all solid waste disposal sites and facilities, whether designated by ordinance within the corporate limits of any city, city and county, or incorporated town or by the Board of County Commissioners in unincorporated areas.

Section 2. DEFINITIONS (1) The following definitions extracted from Section 36-23-1, CRS 1963, as amended\*\*\*, shall apply when appearing in these regulations:

- a. "Solid waste" means garbage, refuse, sludge of sewage disposal plants, and other discarded solid materials, including solid waste materials resulting from industrial, commercial and from community activities, but shall not include agricultural waste.
- b. "Department" means the Department of Health.
- c. "Approval site or facility" means a site or facility for which a "Certificate of Designation" has been obtained, as provided

\* Title 30, Article 20. CRS

\*\* 24-4-102, CRS 1973

\*\*\* 30-20-101, CRS 1973

in this act.

- d. "Person" means an individual, partnership, private or municipal corporation, firm, or other association of persons.
- e. "Solid waste disposal" means the collection, storage, treatment, utilization, processing, or final disposal of solid wastes.
- f. "Solid waste disposal site and facility" means the location and facility at which the deposit and final treatment of solid wastes occur.
- g. "Transfer station" means a facility at which refuse, awaiting transportation to a disposal site, as transferred from one type of collection vehicle and placed into another.
- h. "Recyclable materials" means a type of material that is subject to reuse or recycling.
- i. "Recycling operation" means that part of a solid waste disposal facility or a part of general disposal facility at which recyclable materials may be separated from other materials for future processing.

Definitions. (2) Other terms used in the statute or regulations are defined as follows:

- a. "Certificate of Designation" means a document issued under authority of the Board of County Commissioners to a person operating a solid waste disposal site and facility of a certain type and at a certain location.
- b. "Milling-tailings" are that refuse material resulting from the processing of ore in a mill.
- c. "Metallurgical slag" is the cinder or dross waste product resulting in the refining of metal bearing ores.

- d. "Mining wastes" are either mill-tailings or metallurgical slag or both.
- e. A "Junk automobile" is defined to be the hulk or body of a motor vehicle essentially suitable only for one use as scrap metal.  
Junk automobile parts constitute the normally recyclable materials obtainable from a motor vehicle.
- f. "Suspended solids" are finely divided mineral and organic substances contained in the sewage existing in a sewage system.
- g. "Engineering data" shall mean information describing the area of disposal sites in acres, a description of the access roads and roads within the site, a description of fencing enclosing the disposal site, and overall plan listing the method or methods by which the disposal site will be filled with refuse and the use to which it will be placed once the site is filled and closed.
- h. "Geological data" shall mean classes of soil to a reasonable depth from the ground surface, the location and thickness of the significant soil classifications throughout the area of the site and to extend some distance beyond the boundaries of the site, to include information on groundwater elevations, seepage quantities and water wells 1,000 feet beyond the boundary of the disposal site.
- i. "Hydrological data" shall include average, maximum, and minimum amounts of precipitation for each month of the year, surface drainage facilities, streams and lakes adjacent to the disposal site, irrigation water ditches adjacent to the site, wells, streams and lakes.
- j. "Operational data" shall include a plan for overall supervision of the disposal site to include supervisory personnel and labor

personnel, equipment and machinery consisting of all items needed for satisfactory landfill operation, traffic control, fire control, cover material, working face, moisture content, compaction control, and rodent and insect control.

- k. "Sanitary landfill" is the final disposal of solid waste on the land by a method employing compaction of the refuse and covering with earth or other inert material.
- l. A "Composting plant" is a solid waste disposal facility utilizing biochemical degradation to change decomposable portions of solid waste to a humus-like material.
- m. "Incineration" is the controlled combustion of solid, liquid or gaseous waste changing them to gases and to a residue containing little combustible material.
- n. "Hazardous material and toxic substances" are liquid or solids which can be dangerous to man, animal and plantlife unless properly neutralized.
- o. "Minimum Standards" (See Section 3) shall mean the requirements which shall be applied to all solid waste disposal sites and facilities.
- p. "Engineering Report Design Criteria" (See Section 4) shall mean the minimum requirements which shall be applied to new facilities proposed for designation as a solid waste disposal site and facility.

Section 3. MINIMUM STANDARDS (1) (a) the following minimum standards are hereby adopted and incorporated herein as directed by Section 36-23-10 CRS 1963, as amended\*:

- (b) Such sites and facilities shall be located, operated, and main-

tained in a manner so as to control obnoxious odors, prevent rodent and insect breeding and infestation, and shall be kept adequately covered during their use.

(c) Such sites and facilities shall comply with the health laws, standards, rules and regulations of the Department, the Air Pollution Control Commission, the Water Pollution Control Commission, and all applicable zoning laws and ordinances.

(d) No radioactive material or materials contaminated by radioactive substances shall be disposed of in sites or facilities not specifically designated for that purpose.

(e) A site and facility operated as a sanitary landfill shall provide means of finally disposing of solid wastes on land in a manner to minimize nuisance conditions such as odors, windblown debris, insects, rodents, smoke, and shall provide compacted fill material, adequate cover with suitable material and surface drainage designed to prevent ponding and water and wind erosion; prevent water and air pollution and, upon being filled, shall be left in a condition of orderliness, good esthetic appearance and capable of blending with the surrounding area. In the operation of such a site and facility, the solid wastes shall be distributed in the smallest area consistent with handling traffic to be unloaded, shall be placed in the most dense volume practicable using moisture and compaction or other method approved by the Department, shall be fire, insect and rodent resistant through the application of an adequate layer on inert material at regular intervals and shall have a minimum of windblown debris which shall be collected regularly and placed into the fill.

(f) Sites and facilities shall be adequately fenced so as to prevent waste material and debris from escaping therefrom, and material and debris



shall not be allowed to accumulate along the fence line.

(g) Solid wastes deposited at any site or facility shall not be burned, provided, however, that in extreme emergencies resulting in the generation of large quantities of combustible materials, authorization for burning under controlled conditions may be given by the Department.

Section 4. ENGINEERING REPORT DESIGN CRITERIA

- a. The design of a solid waste disposal facility hereinafter designated shall be such as to protect surface and subsurface waters from contamination. Surface water from outside the immediate working area of the disposal site shall not be allowed to flow into or through the active disposal area. The design shall provide for the deflection of rain or melting snow away from the active area where wastes are being deposited. As filling continues to completion, the surface shall be sloped so that water is diverted away from the area where refuse has been or is being deposited. The design shall include methods of keeping groundwater out of the area where refuse is deposited.
- b. The site shall be designed to protect the quality of water available in nearby wells. The necessary distance from the wells is dependent in part on the direction of flow of groundwater under the site and the means used in the design to prevent precipitation falling on the site from reaching the aquifer in question. Soil characteristics. The soil used for covering of landfill type operations shall have enough adhesive characteristics to permit a workable earth cover.
- c. The location of the solid waste site and facility should provide for convenient access from solid waste generation centers.

- d. The access routes shall be designed so as to permit the orderly and efficient flow of traffic to and from the site as well as on the site.

Traffic control routes on the site shall permit orderly, efficient and safe ingress, unloading and egress.

- e. The design of the facility shall provide for effective compaction and cover of refuse materials in such a program as will prevent the emergence or attraction of insects and rodents.
- f. Solid waste deposited at disposal sites and facilities shall be compacted prior to covering. Use of moisture or change of particle size to aid in compaction is recommended.
- g. The design shall contemplate the location and construction of the disposal site and facility in such a manner as will eliminate the scattering of windblown debris. All solid wastes discharged at the site shall be confined to the site and any material escaping from the active discharge area shall be promptly retrieved and placed in the active discharge area.
- h. Recycling operations may be designed to operate at solid waste disposal sites and facilities, provided such recycling operations do not interfere with the disposal of other wastes and provided that such recycle operations are carried out without creation of a nuisance and rodent and insect breeding.
- i. The design shall include such equipment and operational methods to prevent the burning of solid wastes at the site and to extinguish any fires.

- j. Final Closure. Prior to closing a solid waste disposal site except for cause as set forth in Section 36-23-13 CRS as amended\*, the final cover of the deposited solid wastes shall be graded to the elevations which shall be shown in the initial design. The cover shall be of such thickness and material as will prevent the entrance or emergence of insects, rodents, or odors. Such closure elevations shall be such as will provide for the diversion of rainfall and runoff away from the fill area.
- k. A plan and method for protecting solid wastes disposal sites and facilities against damage from floods shall be a part of the engineering design.

Section 5.     THE REPORT OF THE DEPARTMENT to County Commissioners or municipal officials, recommending approval or disapproval of the application, shall consist of a written and signed document made in accordance with criteria established by the Board of Health, Water Pollution Control Commission and Air Pollution Control Commission.

Section 6.     OPERATION OF A SOLID WASTE DISPOSAL FACILITY

An operational plan for placing into operation the engineering design for the disposal site and facility is required.

Such a plan shall include the following information:

- a. The name or titles of the person or persons who will be in charge of the disposal site and facility. Such name(s) shall be of person(s) having the responsibility for the operation as well as the authority to take all corrective action necessary to comply with the requirements of this Department.
- b. The list of equipment to be used at the disposal site.
- c. The hours of operation of the site.

- d. The fire fighting equipment or department available for extinguishing fires.
- e. The frequency of cover of the deposited wastes.
- f. The frequency of retrieval of windblown debris.
- g. A contingency plan for eradication of rodents and insects.
- h. Procedures for implementing other aspects of the design.

Section 7. RESTRICTIONS OF OPERATIONS. CLOSING SITES

- a. In the event a person applying for a Certificate of Designation does not wish to receive at his site all items defined in the statute as solid wastes, his application to the county commissioners for approval of designation shall set forth the limitations as to materials to be accepted at the site. If such site is thereafter designated, the owner shall erect at the entrance to such a site an appropriate design setting forth the items not receivable at such site.
- b. If a person having a site officially designated wishes to close the site for any reason, he shall inform the county commissioners at least 60 days in advance of such closing and shall post a sign, readable from the seat of an entering motor vehicle, informing the public of his intent to close such site. Such site shall be considered officially closed upon receipt of an official notice from the county commissioners, provided such closing date shall be at least 60 days after the notice to the county commissioners and the posting as above set forth. Upon closing of the site, the owner shall post a notice that the site is closed and shall take reasonable precautions to prevent the further use of such site.

Add Section 8. Notification of Violations of an Approved Engineering Design Report

- (a) Whenever the Department determines that a solid waste disposal site is not being operated substantially in accordance with the criteria provided in the Engineering Design Report or these regulations, the operator shall be informed of the nature of the alleged violation by certified mail and within ten days from and after receipt of the letter of citation, he may request a variance from the Engineering Design Report by making Written application to the Department stating the grounds for such request.
- (b) The Department shall either approve such request or schedule the matter for an administrative hearing. If the operator fails to request a variance, or the Department refuses to grant a variance after the hearing, the operator shall be deemed to be in violation of the law and these regulations and the "Certificate of Designation" shall be subject to suspension, revocation or injunction as provided in Sections 36-23-13 and 14, CRS 1963, as amended by Chapter 103, Colorado Session Laws 1971\*. The Department shall promptly report the action taken to the Board of County Commissioners.
- (c) Any person aggrieved by the decision of the Department may request a hearing before the State Board of Health and shall be afforded his rights to judicial review as provided in Section 66-1-13, Colorado Revised Statutes 1963\*\*.

Note: These regulations rescind and supersede solid waste regulations and standards adopted November 21, 1967. Effective January 1, 1968.

\*30-20-112 and 113, CRS 1973

\*\*25-1-113, CRS 1973

PART 4  
GENERAL REGULATIONS

30-15-401. General regulations. (1) In addition to those powers granted by section 30-11-107 and by parts 1, 2, and 3 of this article, the board of county commissioners has the power to adopt ordinances for control or licensing of those matters of purely local concern which are described in the following enumerated powers:

(a) (I) To provide for and compel the removal of rubbish, including trash and garbage but not including weeds, brush, or other growing things in place, from lots and tracts of land within the county, except industrial tracts of ten or more acres and agricultural lands currently in agricultural use as that term is defined in section 39-1-103 (6) (a) (I), C.R.S. 1973, and from the alleys behind and from the sidewalk areas in front of such property at such time, upon such notice, and in such manner as the board of county commissioners may prescribe by ordinance and to assess the whole cost thereof, including five percent for inspection and other incidental costs in connection therewith, upon the lots and tracts from which such rubbish has been removed. The assessment shall be a lien against such lot or tract of land until paid and shall have priority over all other liens except general taxes and prior special assessments.

(II) To inspect vehicles proposed to be operated in the conduct of the business of transporting ashes, trash, waste, rubbish, garbage, or industrial waste products or any other discarded materials and to determine, among other things, that any such vehicle has the following:

(A) A permanent cover of canvas or equally suitable or superior material designed to cover the entire open area of the body of such vehicle;

(B) A body so constructed as to be permanently leakproof as to such discarded materials;

(C) Extensions of sideboards and tailgate, if any, constructed of permanent materials;

(III) To contract with persons in the business of transporting and disposing of ashes, trash, waste, rubbish, garbage, or industrial waste products or any other discarded materials to provide such services, but in no event on an exclusive territorial basis, to every lot and tract of land requiring such services within the unincorporated area of the county or in conjunction with the county on such terms as shall be agreed to by the board of county commissioners. Nothing in this subparagraph (III) shall be deemed to preclude the owner or tenant of any such lot or tract from removing discarded materials from his lot, so long as appropriate standards of safety and health are observed.

(IV) To regulate the activities of persons in the business of transporting ashes, trash, waste, rubbish, garbage, or industrial waste products or any other discarded materials within the unincorporated area by requiring each such person to secure a license from the county and charging a fee therefor to cover the cost of administration and enforcement and by requiring adherence to such reasonable standards of health and safety as may be prescribed by the board of county commissioners and to prohibit any person from commercially collecting or disposing of ashes, trash, waste, rubbish, garbage, or industrial waste products or any other discarded materials within the unincorporated area without a license and when not in compliance with such standards of health and safety as may be prescribed by the board;

(V) To do all acts and make all regulations which may be necessary or expedient for the promotion of health or the suppression of disease;

(VI) To require every person in the business of transporting ashes, trash, waste, rubbish, garbage, or industrial waste products or any other discarded materials to and from disposal sites to have, before commencing such operations, in such motor vehicle a motor vehicle liability insurance policy or evidence of such policy issued by an insurance carrier or insurer authorized to do business in the state of Colorado in the sum of not less than one hundred fifty thousand dollars for the damages for or on account of any bodily injury to or the death of each person as the result of any one accident, in the sum of not less than one hundred fifty thousand dollars for damages to the property of

others as the result of any one accident, and in the total sum of not less than four hundred thousand dollars for damages for or on account of any bodily injury to or the death of all persons and for damages to the property of others. Any liability for failure to comply with the requirements of this subparagraph (VI) shall be borne by the individual, partnership, or corporation who owns such vehicle.

(4) Paragraph (a) of subsection (1) of this section shall not apply to the transporting of ashes, trash, waste, rubbish, garbage, or industrial waste products or any other discarded materials which are collected by a city, county, city and county, town, or other local subdivision within its jurisdictional limits, provided every vehicle so engaged in transporting the discarded materials has conformed to vehicle standards at least as strict as those prescribed in subparagraph (II) of paragraph (a) of subsection (1). Such governing body shall not grant an exclusive territory or regulate rates for the collection and transportation of ashes, trash, waste, rubbish, garbage, or industrial waste products or any other discarded materials.

(5) Any provision of paragraph (a) of subsection (1) of this section to the contrary notwithstanding, the governing body of a city and county shall not be precluded from adopting ordinances, regulations, codes, or standards or granting permits issued pursuant to home rule authority; except that such governing body shall not grant an exclusive territory or regulate rates for the collection and transportation of ashes, trash, waste, rubbish, garbage, or industrial waste products or any other discarded materials.

(6) The board of county commissioners, or the governing body of any other local governmental entity, shall not issue or enter into a contractual agreement for the collection and transportation of ashes, trash, waste, rubbish, garbage, or industrial waste products or any other discarded materials in any area where a hauler or haulers are then providing service without first giving a six-month public notice to said hauler or haulers advising them of the intent to enter into said proposed contractual agreement. Said public notice shall be given in a local newspaper of general circulation in the area served



by said haulers.

(7) Notwithstanding any other provision of law, nothing in this section shall prohibit the providing of waste services by a private person, provided such person is in compliance with applicable rules and regulations, within the limits of any city, county, city and county, town, or other local subdivision if such service is also provided by a governmental body within the limits of such governmental unit. Such governmental body may not compel industrial or commercial establishments or multifamily residences of eight or more units to use or pay user charges for waste services provided by the governmental body in preference to those services provided by a private person.

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Source: Added, L. 79, p. 1144, § 1; (1)(a) amended and (1)(i) and (3) to (7) added, L. 80, pp. 744, 479, 746, § § 7, 2, 7

APPENDIX F

COLORADO DEPARTMENT OF HEALTH GUIDELINES  
FOR THE REVIEW OF SOLID WASTE DISPOSAL FACILITIES

## GUIDELINES FOR THE REVIEW OF SOLID WASTE DISPOSAL FACILITIES

The Resource Conservation and Recovery Act of 1976 requires individual states to form a solid waste management plan. The plan must encourage long-term regional disposal sites which promote resource recovery and minimize environmental impacts that endanger public health and safety.

The Solid Waste Act, Title 30, Article 20, Part 1, delegates regulatory authority between state and local agencies. A Certificate of Designation is required before an applicant can dispose of any solid waste [as defined in the Solid Waste Act: 30-20-101 (6)] on any site. The following guidelines suggest the minimum technical information usually required for review by the Division of Radiation and Hazardous Waste Control.

- I. Alternative sites' feasibility
- II. Size and expected life of site
- III. Feasibility of resource recovery - technical and economic
- IV. Describe projected site use after closure
- V. Engineering geologic data (requires exploratory borings or trenches)
  - A. It is recommended that the following data be evaluated to a depth of ten feet beneath the deepest natural or excavated surface on site.
  - B. Unconsolidated overburden materials
    1. Soils classification - Unified Soils Classification System
    2. Soil thickness and areal extent
    3. Pertinent engineering properties: grain size distribution, atterburg limits, moisture density and compaction characteristics, permeability, etc.

4. Estimated volumes available for cover or liner material
- C. Bedrock Materials
1. Rock type, strike, dip and thickness of bedding, joint or fracture size and spacing, fracture filling material, permeability, rippability, etc.
  2. Estimated volumes available for liner or cover material
- D. Geologic hazards on or adjacent to the site such as:
1. Rockfall, landslide or debris and mudflow hazards
  2. Slope stability
  3. Faulting and folding
  4. Erosion potential
  5. Mine subsidence

## VI. Engineering Hydrologic Data

- A. Surface waters
1. Proximate lakes, rivers, streams, springs or bogs
  2. Site location in relation to 100 year floodplain
  3. Size and slope of contributing drainage basins
  4. Design of diversion and catchment structures for a 25 year, 24 hour precipitation event
  5. Impoundment of contaminated runoff
  6. Background surface water samples
- B. Groundwaters
1. Depth to groundwater - seasonal variations
  2. Wells within one mile radius of site: depth of well, depth to water, yield, use, casing intervals
  3. Nearest points of groundwater discharge
  4. Background groundwater samples, as necessary
  5. Major aquifers beneath site

- C. Surface and groundwater monitoring; plans for leachate collection and treatment.

VII. Operational Data for Solid Waste Disposal

A. Landfills

1. Location and construction details for access roads
2. Plans for waste recycling, as applicable
3. Names of persons in charge of site; having authority to take corrective action
4. Slope of fill surface must divert runoff from working face
5. Refuse cell size, type of construction, location and arrangement
6. Amount of cover and frequency of application to working face
7. Direction of prevailing winds: maximum and average velocities
8. Provisions for retrieval of windblown debris, on and off the site
9. Equipment and manpower retained on site
10. Compactive effort to be applied to refuse and cover material
11. Types of waste received and their segregation
12. Provisions to ventilate methane gas from completed landfill
13. Measures to prevent or contain insect and rodent infestations
14. Measures and equipment to extinguish or prevent fires
15. Hours of operation
16. Final fill surface contours
17. Thickness and compaction of final cover
18. Provisions for maintenance after closure
19. Program of records keeping

B. Potentially toxic industrial or mining solid waste disposal sites

1. All previously listed criteria, as applicable
2. Chemical concentrations of processing and waste solvents
3. Chemical concentrations of solid waste
4. Engineering designs for diversion structures, dams, liners, dikes, tailings or dump sites

5. Engineering designs for holding ponds containing solvents and solutions
6. Plans for ground and surface water monitoring and long-term site maintenance
7. Ultimate disposal of solid waste recycling plans, if applicable

These criteria are applied on a site-to-site basis in the review process. Applications containing this information will be reviewed more quickly and efficiently. Four copies should be provided to this Division for review.