

**INTEGRATED MINED-AREA RECLAMATION  
AND LAND USE PLANNING**

**Volume 3A**

**A Case Study of Surface Mining and Reclamation Planning:  
South Boulder Creek Park Project,  
Sand and Gravel Operations,  
Boulder, Colorado**

Prepared for the

Resources and Land Investigations (RALI) Program  
U. S. Department of the Interior and  
U. S. Geological Survey

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**ENERGY AND MINERAL RESOURCES**

**ARGONNE NATIONAL LABORATORY**

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Volume 3A

A Case Study of Surface Mining and Reclamation Planning:  
South Boulder Creek Park Project,  
Sand and Gravel Operations,  
Boulder, Colorado

by

Leslie R. Lewis, Allen O. Perry,  
and James R. LaFevers

Energy and Environmental Systems Division

February 1977

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## FOREWORD

This report is one in a ten-volume series prepared by the Energy and Environmental Systems Division of Argonne National Laboratory and the Resource and Land Investigations (RALI) Program of the U.S. Department of the Interior under the sponsorship of the U.S. Geological Survey. Because of the close interrelationship of the ten documents in the series, each volume will be most useful only when its relationship to the other products of the program is considered.

The reports in this series are designed primarily to familiarize professional land use and resource planners with the range of possibilities and effective procedures for achieving integrated mining, reclamation, and land use planning. These reports are based on a research program which included an extensive literature review, the compilation and analysis of case study data, and close coordination and interaction with related government programs.

The first volume in the series, *A Guide to Integrated Mined Area Reclamation and Land Use Planning*, summarizes the information in the other volumes and presents conclusions and observations drawn from analyses of that information. Volume 2, *Methods and Criteria for Land Use and Resource Planning in Surface Mined Areas*, examines planning procedures used in several mineral industries and mining regions and discusses problems facing professional planners who must consider surface mine areas in their planning programs.

In Volume 3, *A Guide to Mined Area Reclamation Technology for Reclamation and Land Use Planners*, the methods used to reclaim land in each of several mineral industries are discussed in relation to the physical and cultural constraints that must be considered in planning a reclamation program. Much of the information for this document was obtained from case studies conducted in several mining districts. The case study sites were chosen after consideration of the following: (a) coverage by commodity of those surface mining activities that disturb the greatest acreages, (b) coverage of a variety of cultural and land use settings, (c) evidence of integration of mining, reclamation, and land use planning, (d) cooperation on the part of operating companies and appropriate planning entities, (e) coverage of a variety of surface mining and reclamation methods, and (f) coverage of a variety of physical settings (geology, physiography, climate, hydrology). After the preliminary case study selection, some sites were changed and others dropped because of a lack of company cooperation. The remaining six case studies all meet the criteria listed above. They are not intended to be perfect examples of reclamation and planning procedures. Rather, they illustrate a variety of procedures utilized in different physical and cultural settings to achieve planning goals under a variety of technological, legal, and economic constraints.

Since the case studies are intended to be used as appendices to Volume 3, they are numbered accordingly. The case study reports include:

Volume 3A: *A Case Study of Surface Mining and Reclamation Planning: South Boulder Creek Park Project, Sand and Gravel Operations, Boulder, Colorado.*

Volume 3B: *A Case Study of Surface Mining and Reclamation Planning: International Minerals and Chemical Corporation, Phosphate Operations, Polk County, Florida.*

Volume 3C: *A Case Study of Surface Mining and Reclamation Planning: Georgia Kaolin Company, Clay Mines, Washington County, Georgia.*

Volume 3D: *A Case Study of Surface Mining and Reclamation Planning: Area Strip Coal Mining, Peabody Universal Mine, Universal, Indiana.*

Volume 3E: *A Case Study of Surface Mining and Reclamation Planning: ASARCO Open Pit Copper Mine, Casa Grande, Arizona.*

Volume 3F: *A Case Study of Surface Mining and Reclamation Planning: Cannelton Mountain-Top Removal Coal Mine No. 9-S, Cannelton, West Virginia.*

Volume 4, *A Bibliography of Integrated Mined Area Reclamation and Land Use Planning, With Annotations*, includes primarily references pertinent to reclamation planning and plan implementation.

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*INTEGRATED MINED-AREA RECLAMATION AND LAND USE PLANNING**Volume 3A: A Case Study of Surface Mining and Reclamation  
Planning: South Boulder Creek Park Project, Sand and  
Gravel Operations, Boulder, Colorado**by**Leslie R. Lewis, Allen O. Perry, and James R. LaFevers**ABSTRACT*

This case study details reclamation planning for the Flatiron Companies' South Boulder Creek Park Project in Boulder, Colorado. The site contains a deposit of high-quality sand and gravel considered to be one of the best and largest known deposits of aggregate materials in the Front Range area. The aggregate deposit is located in a highly visible site just off the Denver-Boulder Turnpike at the entrance to the city from Denver, and adjacent to a residential portion of the city. In order to make maximum use of pre-mining planning, as a tool for resolving a conflict over the company's proposed operation, an extensive cooperative planning effort was initiated. This included the preparation of an environmental impact assessment, numerous public hearings, operating and reclamation plan review by city authorities, annexation of the site to the city, and the granting of a scenic easement on the property to the city for the development of a regional recreation park. A suite of contractual agreements was worked out among Flatiron Companies, the City of Boulder, the Colorado Open Lands Foundation, and the Federal Bureau of Outdoor Recreation. The purpose of this case study is to allow the planner to gain insight into the procedures, possibilities, and constraints involved in pre-mining planning in a cooperative situation.

*1 INTRODUCTION*

The excavation, processing, and distribution of sand and gravel constitutes the largest non-fuel mining industry in the United States. Sand and gravel pits are a familiar sight within or near the environs of many of the nation's large metropolitan areas and municipalities. The industry supplies aggregate for concrete construction, asphalt paving, and road base and sub-base, and is basic to many local economies since the industry's products are essential to the construction industry in meeting the demands of urban growth and development.

Sand and gravel is second only to coal in the amount of acreage disturbed each year by extraction. More than 60,000 acres are mined annually at sites ranging in size from a few to several hundred acres. The rehabilitation of land disturbed by sand and gravel extraction has become of increasing

concern in recent years, because of greater public awareness of the environment and concern that land with development potential may be lost through inadequate pre-mining planning and poor rehabilitation practices.

### 1.1 THE SAND AND GRAVEL INDUSTRY IN THE UNITED STATES

Highway, dam, and building construction utilized 97% of the nation's total 1974 sand and gravel production of 979 million tons (Pajalich, 1974). The total value of sand and gravel products consumed in the United States during that year was \$1.5 billion. Analysis of the data from 5,636 operations indicates that 62% of the production came from dry pits on land and 27% from wet pits on land (Pajalich, 1974). Production from riverbeds, lakes, bays, and oceans accounted for the remaining 11%. States producing the greatest tonnages of sand and gravel are given by rank in Table 1.1.

On a nationwide basis, the majority of sand and gravel operations fall into a small to medium size category, with 65% of the construction-industrial and 66% of the industrial classes producing less than 200,000 tons per year.

### 1.2 THE SAND AND GRAVEL INDUSTRY IN COLORADO

In 1974, 200 sand and gravel operations in Colorado produced 23,793,000 short tons having an estimated value of \$39,674,000. Examination of existing data (Pajalich, 1974) shows that most sand and gravel operations used either stationary (57 plants) or portable (115 plants) processing plants at pit sites. The bulk of sand and gravel extracted in the state was produced from dry pits by front-end loaders and draglines. In terms of land and resource ownership, 47% of the sand and gravel excavated in Colorado in 1974 was from company-owned lands and 46% from leased mineral rights on private or public land, in each case accompanied by some form of royalty payment. The greatest tonnages of sand and gravel produced in Colorado were consumed for roadbase and subbase

Table 1.1. Sand and Gravel Production in Leading States, 1974<sup>a</sup>

State	Production (10 <sup>6</sup> tons)	Avg. Value per Ton (\$)	Value (\$10 <sup>6</sup> )
Alaska	117.8	0.45	52.9
California	105.2	1.67	176.2
Michigan	60.0	1.38	82.6
Illinois	42.7	1.61	68.6
Texas	42.5	1.92	81.4
Ohio	41.4	1.65	68.3
Minnesota	36.7	1.56	42.4
New York	30.6	1.57	46.7

<sup>a</sup>From Pajalich, 1974.

on commercial and publicly-funded projects, and for commercial nonresidential and residential construction. All but 9.5% of the total required some form of processing; the most common processing techniques are sizing, washing, and crushing.

The average price per ton of sand and gravel produced in Colorado in 1974 was \$1.67 f.o.b. pit. Since this is an average, however, it must be pointed out that aggregate prices f.o.b. pit are dependent upon grade specifications and the amount and type of processing required to meet the specifications of a particular contract. For this reason, an average price serves only as a guide to the development of overall price changes due to increases in land values and labor, rehabilitation, fuel, and pollution control costs. In addition, the cost of sand and gravel to the consumer in any given area is dependent on transportation costs.

### *1.3 THE EFFECT OF TRANSPORTATION COSTS ON COMMODITY VALUE AND MINE LOCATION*

Sand and gravel aggregates are considered low unit-value, high place-value commodities; their value is determined by closeness to market. Transportation costs are calculated on the basis of ton-miles (Newport and Moyer, 1974); as distance to the consumer increases, the cost of moving the commodity to its point of consumption increases proportionally. For that reason, sand and gravel deposits close to users have a greater value before mining than more distant deposits, which are likely to be less attractive to a company considering the opening of a new sand and gravel pit. Because most aggregate users are in or near metropolitan or municipal areas, other land use demands compete with sand and gravel extraction for available land. The result of this competition is an upward trend in land prices within economical hauling distances to customers, which increases operating and delivered unit costs. Although the cost of land acquisition or leasing may be lower at a greater distance from the market area, the resulting increase in transportation cost is often greater and offsets the lower land costs.

Competing land use demands are of great concern to the sand and gravel industry for two principal reasons. The first is that as urban and suburban growth progresses, areas of high-quality commercial sand and gravel deposits come into demand for surface development. The cost of acquiring land or mineral rights is greatly increased. A second major concern is the preemption of high-quality sand and gravel deposits by exclusionary zoning. Preemptive land uses can in effect remove a sand and gravel deposit from the resource base, particularly if the land use involves structures such as residential housing or commercial buildings. The exclusion of sand and gravel extractive operations through zoning laws is designed to protect residential land uses in adjacent areas but, where a significant commercial deposit exists, prevents the extraction and utilization of a basic building material important to local economies. Preemptive land use and exclusionary zoning often have the effect of increasing the construction costs for buildings and highways due to the need for hauling aggregate greater distances.

#### 1.4 CASE STUDY SITE SELECTION

This case study examines a process that does not, at this date, have an end result. Although much of the planning for the South Boulder Creek Park Project is near completion, the mining of sand and gravel at the site has been minimal. The project was selected to examine the cooperative aspects of reclamation planning where a variety of legal, regulatory, and procedural devices were used to try to arrive at a planned sand and gravel extraction and rehabilitation program that would satisfy conflicting interests. (Although the project is still in progress, some elements may be amenable to other areas and industries.)

Choosing the South Boulder Creek Park Project for a case study does not suggest that it represents an ideal. Planning procedures and authorities are too variable from one locality to another to allow such an approach. The case study should be considered as an example of one proposed operation in a specific locality that may contain ideas and suggestions for further development of effective cooperative planning programs in other locales and for other industries.

## 2 THE SOUTH BOULDER CREEK PARK PROJECT

The South Boulder Creek Park Project is a proposed sand and gravel extraction and land reclamation operation adjacent to the City of Boulder. The site is bordered along its east side by South Boulder Creek, a tributary to the South Platte River. Although mining has not begun, a considerable cooperative effort has been undertaken by Flatiron Companies (owner of the site) and the City of Boulder\* to ensure that environmental concerns and economic objectives will be met. The degree of cooperation between the city and Flatiron merits careful examination and exposition as a planning effort designed to achieve company goals in providing needed aggregate to a growing urban area at a profit, and to alleviate local concern for environmental degradation at the main approach to the city. An understanding of the development of the project requires an assessment of the multitude of factors that suggested the resulting course of action.

### 2.1 THE BOULDER COMMUNITY

Boulder is a growing city of approximately 80,000 located about 25 miles northwest of Denver. Other than local retail and service businesses, the city's major employers are the University of Colorado, IBM, the National Bureau of Standards, the National Center for Atmospheric Research, and several smaller scientific installations. The U.S. Nuclear Regulatory Commission (NRC) Rocky Flats Plant is located a few miles to the south.

Boulder is an environmentally aware community because of the high educational background of a large segment of its population, and an accompanying concern for controlling local growth and maintaining a high level of environmental quality. This awareness creates conflicts between economic and environmental values and can be seen in the predominate attitude of control and limitation in an area where strong pressures exist for residential growth. An indication of the citizens' environmental concerns was the passage in November 1967 of Boulder's "Open Space Plan," which includes a 0.4% sales tax for land acquisition. There is a vocal segment of the population capable of gathering substantial support to debate local problems and issues. Although many have a stake in the city in terms of its residential environment, the local business economy does not affect them directly. For this reason, a balance between economic necessity and environmental quality is often difficult to achieve.

Figures 2.1 and 2.2 indicate the location of the project site and its relationship to Boulder and the heavily traveled Denver-Boulder Turnpike (U.S. 36). Herein lies one of the chief areas of local concern, since the project is bounded on the northeast by the main connecting link to Denver. Considerable opposition to a sand and gravel operation at the main approach to the city exists on aesthetic grounds, because of the potential appearance of the operation in contrast to present open pastures and farm lands. This opposition was exemplified by the City Council's 5 to 4 vote for passage of the ordinance granting a special use permit for the project.

The principal items of concern to the residents of the city, which the cooperative planning effort of the city administration and Flatiron Companies has addressed, are as follows:

---

\*"City of Boulder" will denote the city government, and "Boulder," the city.

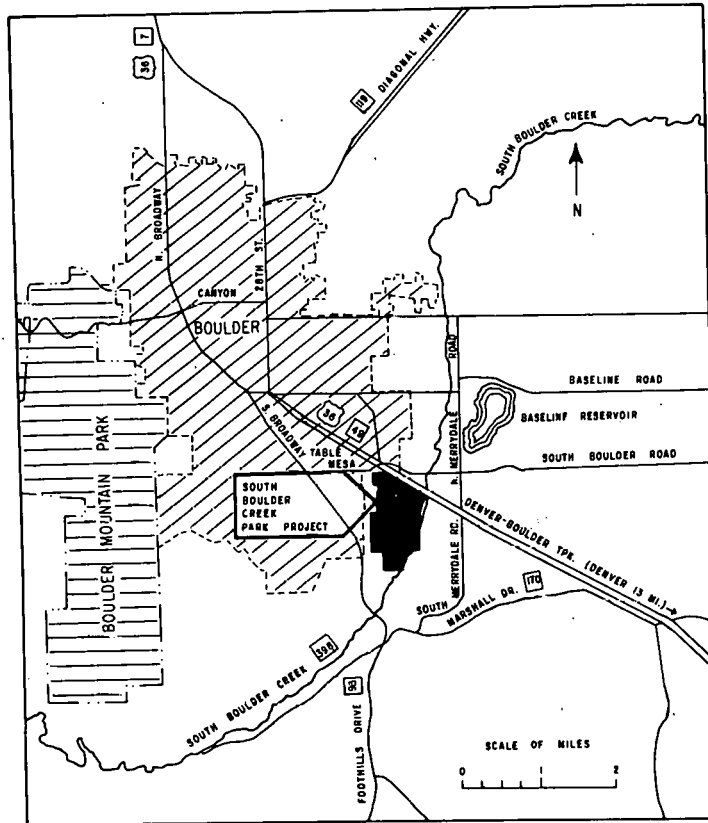


Fig. 2.1. Location of the South Boulder Creek Park Project (after *South Boulder Creek Park: Environmental Impact Assessment*; hereafter EIA, 1975)

- Potential detrimental aesthetic impact of a sand and gravel operation at the main approach to the city,
- Potential impact of noise and airborne dust associated with extractive and processing operations,
- Potential impact of mining and processing operations on valuable water resources,
- Potential degradation of the ecology of South Boulder Creek,
- Future need for aggregate material, and
- Future need for additional recreational facilities within or in close proximity to the city.

How these concerns have been dealt with, in terms of reclamation and land use planning, will be detailed in subsequent sections of this report.

## 2.2 PROJECT DESCRIPTION

In the Boulder area, high quality sand and gravel deposits occur along the floodplains of Boulder and South Boulder Creeks. Lower quality deposits

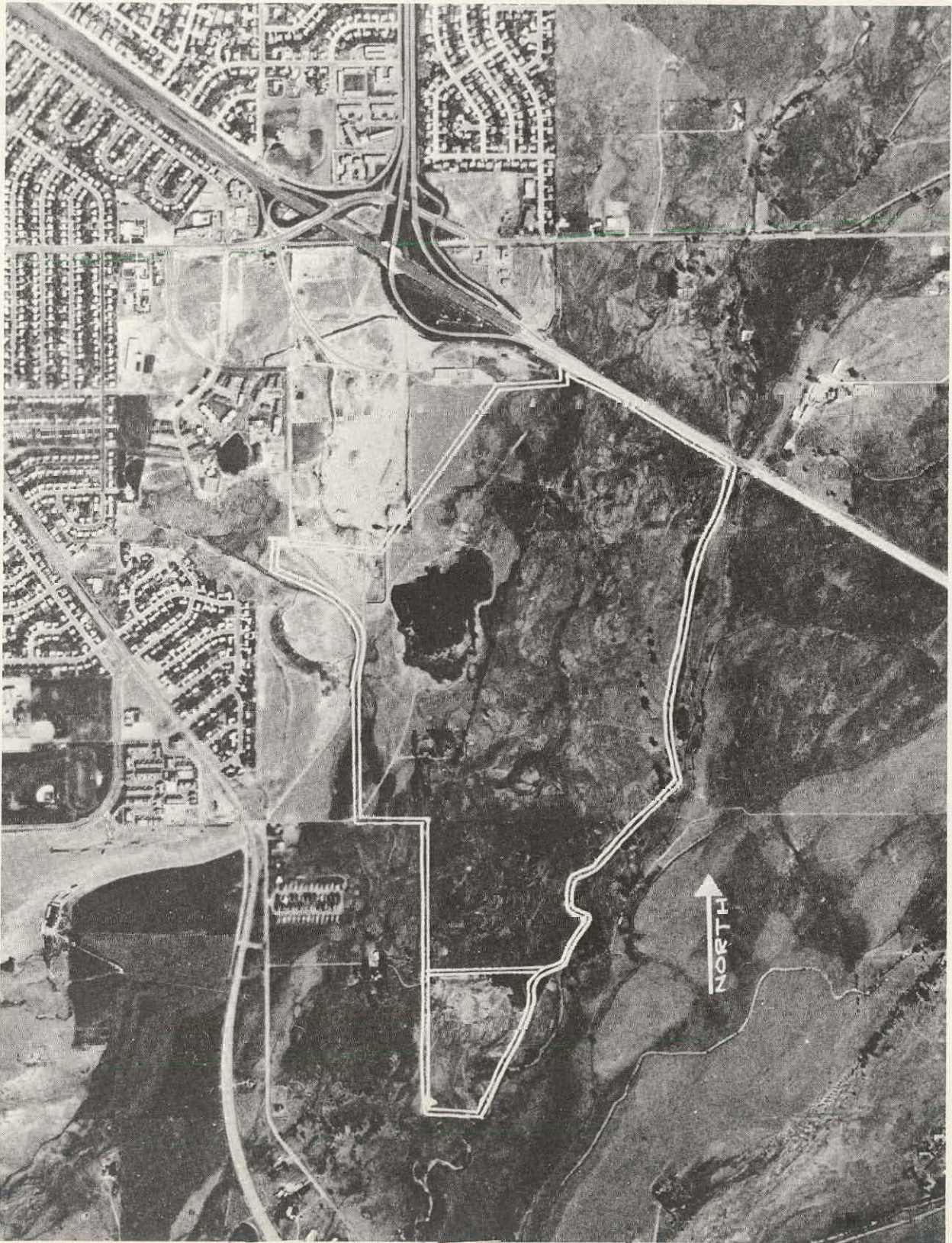


Fig. 2.2. Aerial View of the South Boulder Creek Park Project (double white lines)

also occur at Rocky Flats, as cap gravels on a few hilltops, and in mountain valleys. Floodplain sand and gravel deposits vary in thickness from thin to more than 20 ft, with 10 ft being the average thickness. Due to urban development and the small size of farms on floodplain areas, sand and gravel resource ownership is highly fragmented, making the acquisition of economically mineable acreages difficult.

According to projections made by Flatiron Companies, total sand and gravel usage in the Boulder area is projected to easily exceed 600,000 tons/year even without significant growth in demand for aggregate. Demand with moderate growth could easily exceed 1 million tons/year (EIA, 1975). Sand and gravel from the South Boulder Creek site will be mined over a 20-year period, representing a significant portion of the area's annual aggregate supply; sand and gravel reserves at the site are estimated at about 7 million tons (EIA, 1975).

The primary objective of the project is to supply sand and gravel products for the Boulder area. Due to the short mining time, some of the gravel will have to be marketed outside the immediate area. It should be noted that the company's original intent was to confine gravel sales only to the Boulder area to ensure the availability of high quality aggregate and to minimize transportation and consumer costs. The company has proposed that the site be reclaimed during and following sand and gravel extraction for development as a public park. Excess material from the mining operation will be used to create specified landscape elements according to a master plan prepared jointly by Flatiron and the City of Boulder.

### *2.3 PROPERTY OWNERSHIP*

Land included in the South Boulder Creek Park Project is currently either owned in fee by the Flatiron Companies, or under contract, subject to mining and park plan approval, through Short and Milne (a local real estate partnership). A 39-acre parcel at the south end of the project is owned by the Eagle Construction Company, and will not be mined by the Flatiron Companies. Originally, this property was to be part of the project through a separately negotiated agreement with the City of Boulder. The land area presently included in the project is the 432 acres owned or controlled by the Flatiron Companies. The area to be permitted for mining includes 287 acres, with 300 acres to comprise the future park area.

### *2.4 LAND USE*

Livestock grazing, business, and mining represent the current land uses on the site; grazing predominates. As indicated by existing farm buildings, corrals, and the preponderance of irrigated pasture land, grazing is the major historic land use. At the northern end of the site, Mountain Bell Telephone Company has built and maintains a service garage on property leased from the Flatiron Companies. Eagle Construction Company is currently operating a sand and gravel mining operation adjacent to the south end of the site.

Past land uses on the site have included sand and gravel operations and bulk concrete production. A group of stockpiles in the northwestern part of

the site is evidence of a recent low volume Flatiron Companies operation. The lake southeast of the stockpiles resulted from gravel extraction in the early 1950s for construction of the Denver-Boulder Turnpike, which borders the property on the northeast. During the same period, a portable bulk concrete plant was located north of the site adjacent to the present turnpike interchange. Figure 2.3 indicates the parcels owned or under contract to the Flatiron Companies, and shows current land uses.

## 2.5 MINERAL RESERVES

It is estimated that 7 million tons of coarse gravel underlie the site, with associated sand, silt, and clay making up a relatively small percentage of the total volume of materials. The overburden on this alluvial deposit consists of soil materials which have an average depth of 12 in. The combined thickness of the alluvial materials and the soil mantle ranges from 12-20 ft. The sand and gravel extracted from the site will require some processing, primarily screening, washing, and crushing; a processing plant will be centrally located on the site.

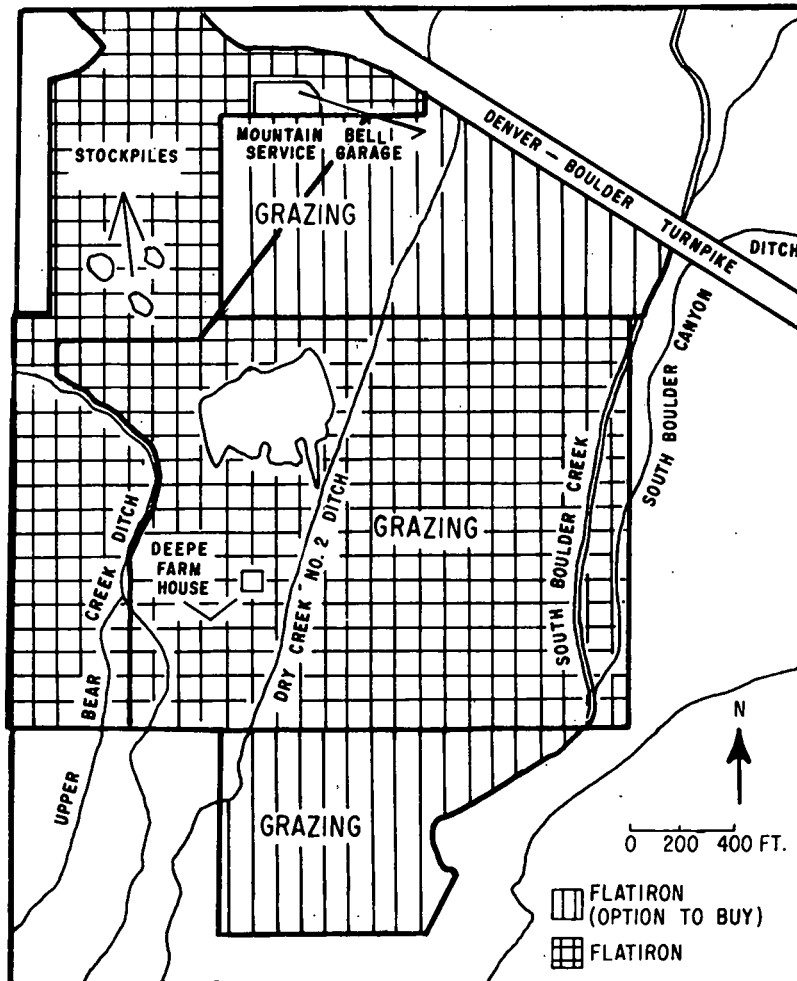


Fig. 2.3. Land Ownership, and Present Land Use, South Boulder Creek Park Project (after EIA, 1975)

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### 3 THE REGIONAL ENVIRONMENT

The South Boulder Creek Park Project and the City of Boulder lie near the western border of the Colorado Piedmont Section of the Great Plains Province as defined physiographically by Thornbury (1965). Since the project is close to the boundary between the Colorado Piedmont and the Rocky Mountain System a few miles to the west, it has characteristics of both. Physically, the site resembles floodplain areas of the Piedmont along the Colorado Front Range. The foothills belt is typified by hogback ridges and gravel-veneered pediments with sedimentary rocks steeply dipping toward the east. At the Rocky Mountain front, the landscape rises sharply from about 5,000-6,000 ft at the edge of the plains to about 8,000 ft on the Front Range. Figure 3.1 indicates terrace and floodplain areas in the vicinity of the project area. Alluvial materials that covered the foothills (Piedmont) area were removed by erosion; occasional alluvium-capped pediments now occur stratigraphically below the main erosion surface. Also, alluvial terraces occur below the pediments, but above present floodplain areas. The highest erosion surface in the locality is about 350 ft above the South Boulder Creek Park Project site and lies a few miles south, at the location of the NRC Rocky Flats nuclear facility (Fogarty, 1951).

Figure 3.2 indicates the basic relationship of materials at the site. The present floodplain of South Boulder Creek is from one-half to one mile wide. Gravel deposits in the creek valley are 10-30 ft thick and directly overlie the truncated Pierre Shale. The floodplain contains materials ranging in age from Pleistocene to Recent (Malde, 1955). Most of the sand and gravel in the floodplain has been derived from parent material in the Front Range, and 10% from sedimentary materials closer to the site (Scott, 1960 and Lovering, 1950).

#### 3.1 SOIL CHARACTERISTICS

The USDA Soil Conservation Service has mapped four soil series on the 432 acres of the South Boulder Creek Park Project site: the Niwot, Loveland, Valmont, and Terrace Escarpment soils (SCS, 1975). Figure 3.3 indicates the distribution of soil types. The Niwot series is most prevalent, covering about 310 acres. Of this approximately 40 acres have been displaced by a small gravel mining operation that is presently inactive.

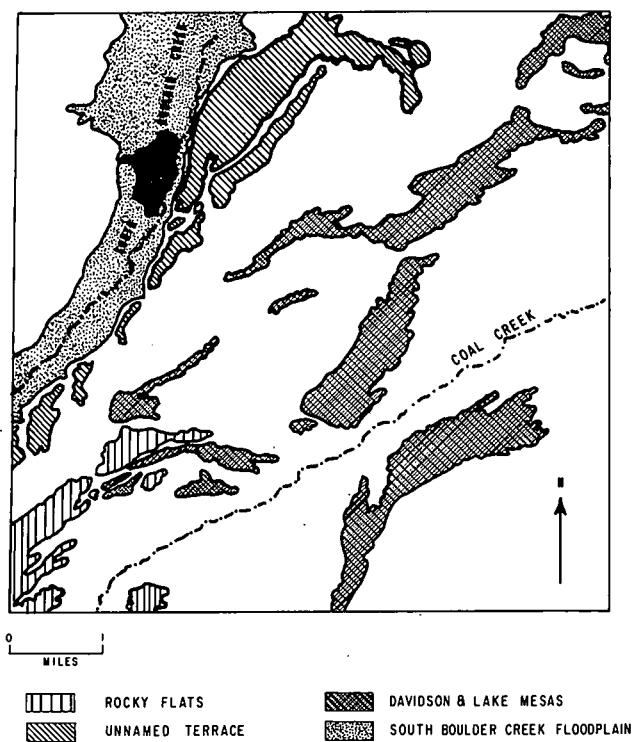


Fig. 3.1. Terrace and Floodplain Areas in the Vicinity of the South Boulder Creek Park Project (after Langdon, 1963).

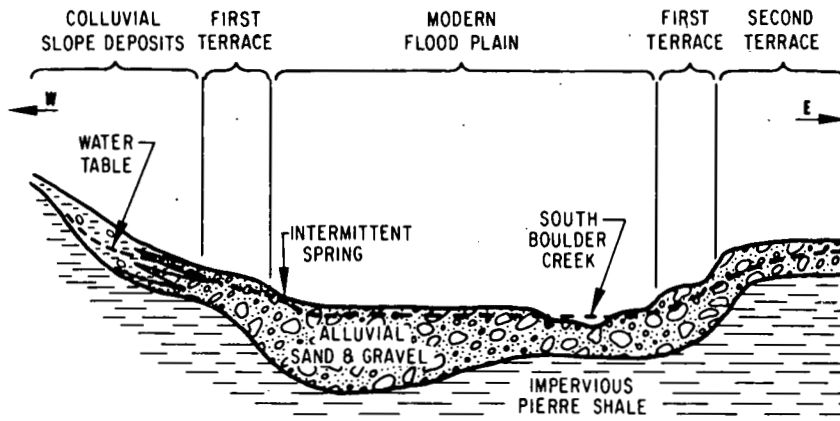


Fig. 3.2. Basic Stratigraphic Relationships at the Site of the South Boulder Creek Park Project (from EIA, 1975)

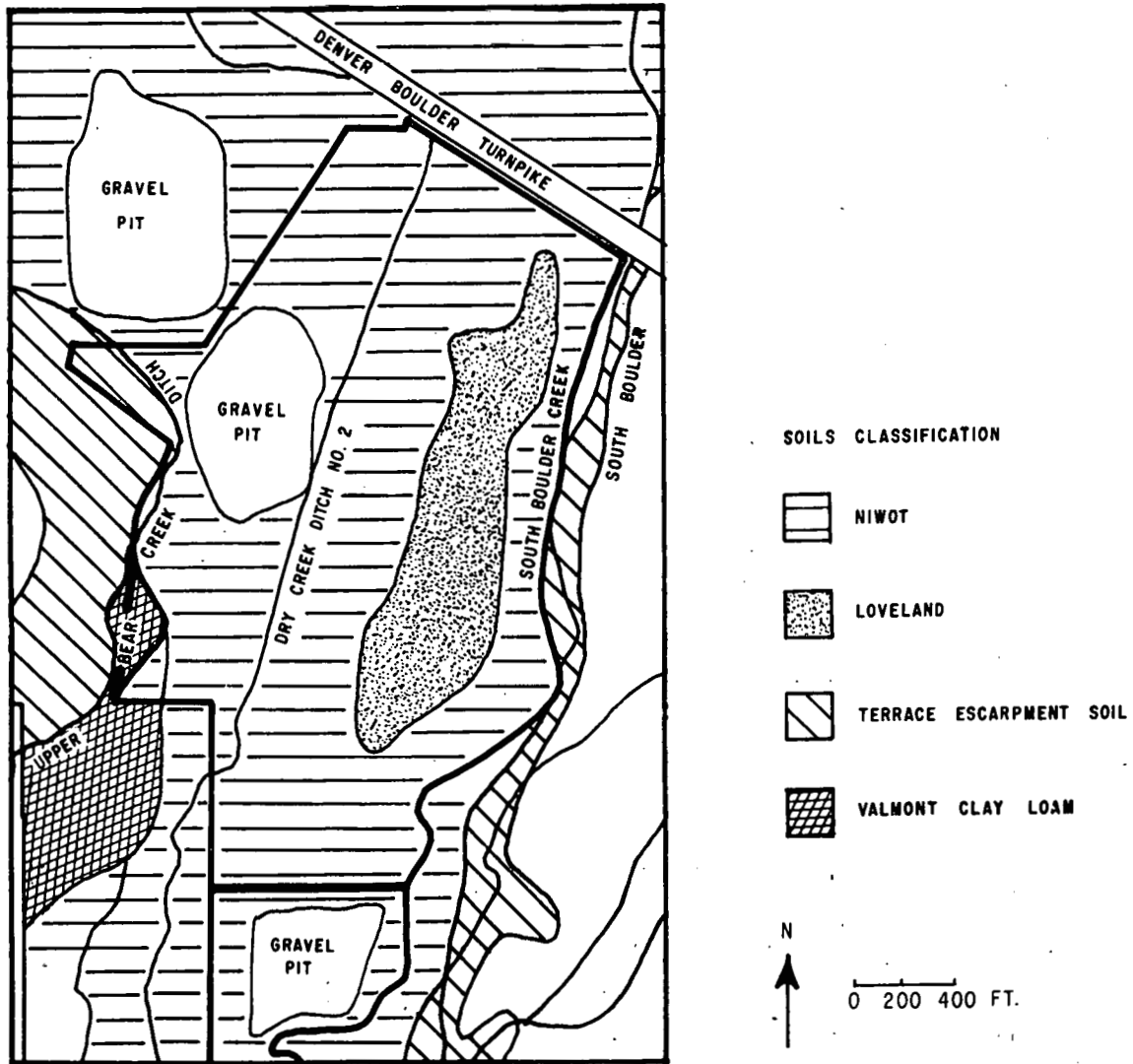


Fig. 3.3. Soil Types at the South Boulder Creek Park Project (after EIA, 1975)

Niwot soils range from fine silty loams to clay loams and are dark to mottled brown in color. Soil characteristics are such that somewhat severe limitations exist for land uses other than pasture and wildlife habitat. Slow run-off causes minimal sheet erosion, but due to their location on floodplains, Niwot soils have seasonally high water tables that frequently leave them flooded in depressions. Niwot soils are best suited for permanent vegetative cover, and are mainly used for pasture, meadow, and limited cropping of water tolerant species. These soils are generally unsuitable for the planting of trees and shrubs. Annual drought conditions make it impractical to install field tile to improve drainage. Extensive leveling or cultivation is difficult because the layer of sand in the C horizon is easily exposed due to a thin A horizon in the Niwot series. The sandy C horizon is very erodible. Pastures require rotation to leave a minimum of 3 in. of grass cover, and creek banks in areas of Niwot soils require protection to prevent erosion during flood periods.

The Loveland series, the second most prevalent soil type, is found in a 40-acre strip along South Boulder Creek. Loveland soils generally exist in association with Niwot soils and have many similar characteristics, i.e., they are generally poorly drained, have been deposited on bottom lands as alluvial loam, and often overlay sand and gravel deposits. However, Loveland soils tend to be generally deeper and less subject to flooding. Careful crop selection and management is required in Loveland soils due to a tendency for salt accumulation. For this reason, salt-tolerant crops such as barley and sugar beets are considered ideal. Frequent light irrigation is necessary to minimize salt content and to prevent excessive water table fluctuations. Poor drainage, however, can also reduce crop yields. These soils are best suited for pasture, but can support cottonwood, willow, and poplar trees, and buffalo berry bushes.

The Valmont soil series, occurring in a small area along the western boundary of the site, is a well-drained clay loam found on high terraces whose slopes range from one to three percent. Permeability is low and water holding capacity is moderate; fertility, runoff, and erosion hazard are rated as medium. Row crops planted in Valmont soils require irrigation after initial surface leveling practices. The rotation of selected species is required to maintain soil fertility and prevent erosion, and crop yields can be improved through the addition of manure and artificial fertilizers. The soil is well-suited for permanent pastureland. Tree species that will grow on Valmont soils include pine, ash, elm, and locust.

The remainder of the site, along the northwest boundary, contains Terrace Escarpment soils, which occur on the steep slopes of old outwash fans and stream terraces, and consist primarily of colluvial materials. Runoff is fast and erosion hazard is great due to the soil's low permeability. Very low water retention capacity limits the amount of moisture available for plant growth. Controlled grazing is possible, but it must be limited to sustain a viable growth of grasses. This is especially important since the terrain on which Valmont soils occur makes reseeding difficult.

The distribution of existing vegetation on the site and those areas which have been used for livestock grazing are shown in Fig. 3.4. Detailed soil analyses and engineering characteristics are provided in Appendix A. Examination of the available data indicates that a seasonally high water table exists under at least 350 acres of the site, with rapid permeability in the surficial

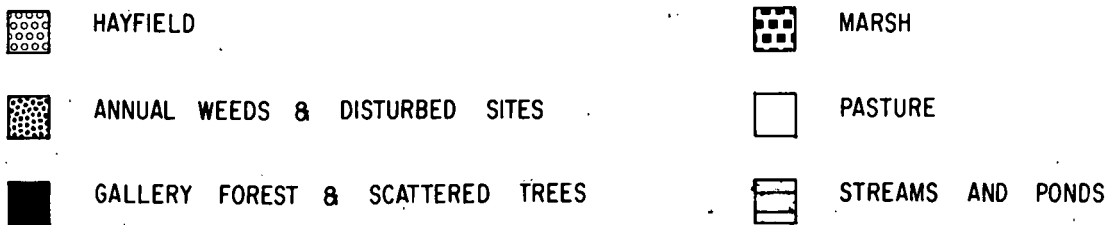
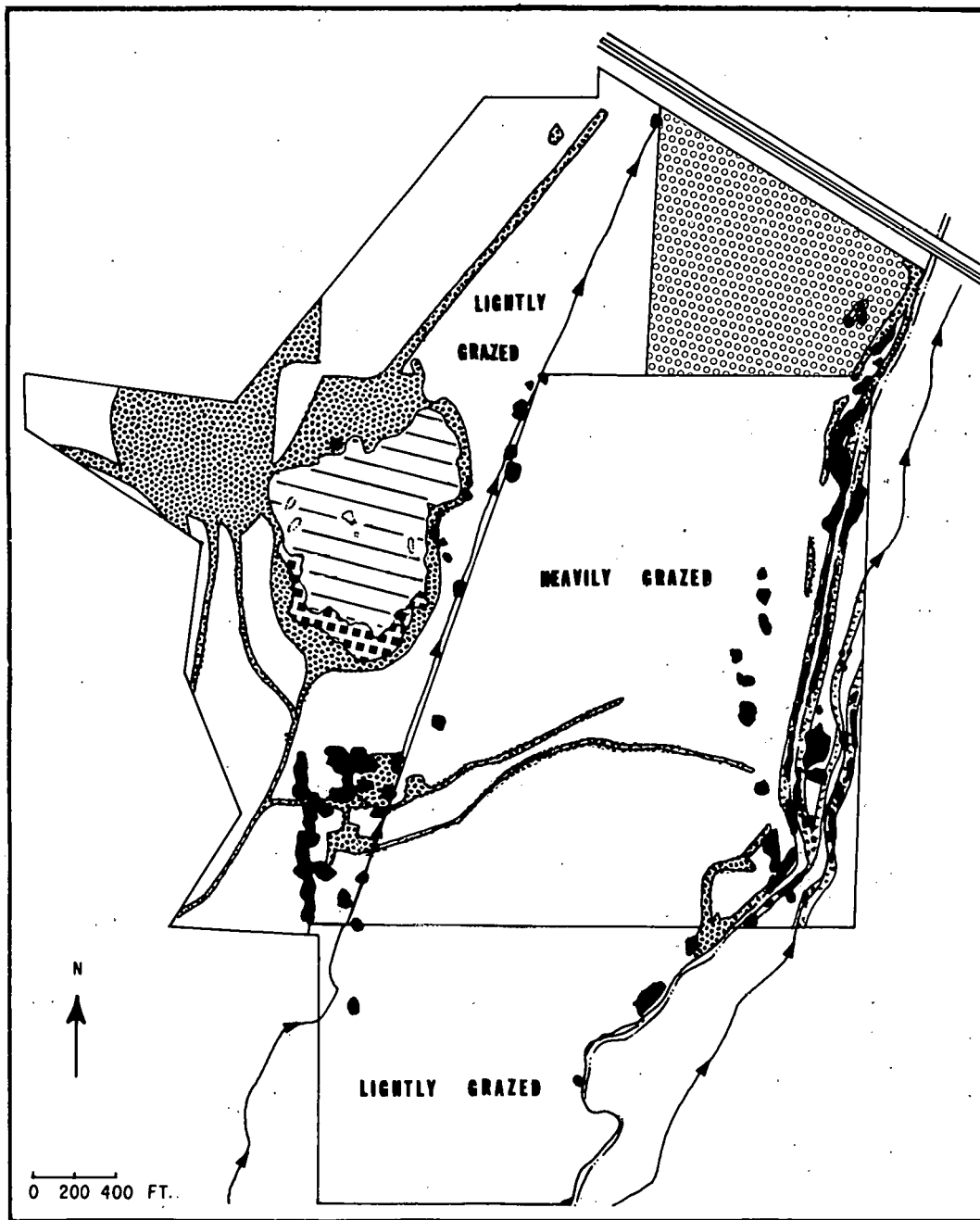


Fig. 3.4. Existing Vegetation at the South Boulder Creek Park Project (after EIA, 1975)

materials. Medium to low bearing strength of soil materials over most of the site serves to limit possible uses of the site for residential or industrial purposes. Limitations also exist in terms of most recreational uses due to poor drainage and low fertility, with limitations classed as moderate to severe by the Soil Conservation Service. It should be noted that this refers to the site as it now stands, before major mining has begun. Irrigation will most likely be required for the initial establishment and growth of grasses, trees, and shrubs at the site. In lower areas, periodic supplemental irrigation may be needed to ensure the proper germination of grass seeds.

### 3.2 CLIMATE

Mean annual precipitation is 18.57 in. in the Boulder area, with 70-80% of the precipitation occurring in the spring and summer (Berry, 1974). The average monthly precipitation varies from 7.31 in. in April to insignificant amounts during late summer, especially during drought periods. The distribution of mean annual precipitation in relation to major drainage basins in Colorado is indicated in Fig. 3.5. The average length of the growing season in Boulder is 148 days. Late spring frosts occur that can adversely affect vegetation types not suited to the area. Average annual temperature is 45°F.

### 3.3 WATER RESOURCES

South Boulder Creek is a perennial stream that flows along the east boundary of the project site and will play an important role in determining land use potential of the site after reclamation. Figure 3.6 shows the location of the 100-year floodplain in relationship to the project. Most of the site lies within the 100-year floodplain of South Boulder Creek; the site receives additional overland flow from the southwest due to backwatering because the channel and bridge capacities at Marshall Road and State Highway 93 are inadequate to handle high flows (EIA, 1975).

South Boulder Creek receives 75% of its peak flow from spring and early summer meltwater runoff from the Front Range. The period of peak flow is late May to early June; in 1972, peak flow was 406 cubic feet per second (cfs). The major fluctuations in flow rate, measured upstream at Eldorado Springs, are indicated in Fig. 3.7. Flow along the reach that includes the study site is regulated by the City of Denver's Gross Reservoir 11 miles upstream. All of the water flowing in South Boulder Creek is fully appropriated under Colorado water rights laws to serve irrigation purposes in the vicinity. Dry Creek No. 2 Ditch is an irrigation diversion ditch that currently runs through the site to irrigate pastures at the north end of the study area.

Water in South Boulder Creek and Dry Creek No. 2 Ditch is only partially derived from irrigation. Groundwater also contributes to streamflow along a hydraulic gradient from adjacent uplands; the groundwater includes a significant amount of irrigation return water. Groundwater in the sands and gravels of the site have a direct hydraulic connection with South Boulder Creek and irrigation water in Dry Creek Ditch No. 2. There is free interflow movement from the creek to the groundwater system. In the late spring, the water table rises by as much as 5 ft due to precipitation streamflow, and the influx of irrigation water.

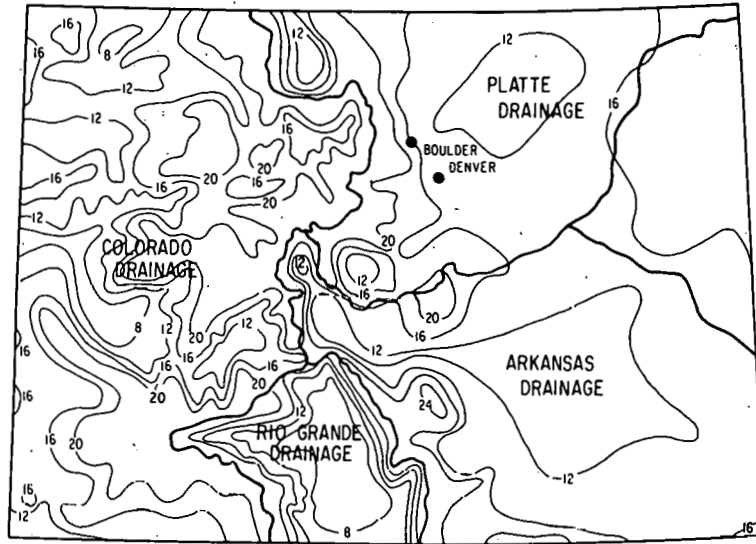


Fig. 3.5. Mean Annual Precipitation (in inches) for Colorado (from Berry, 1974)

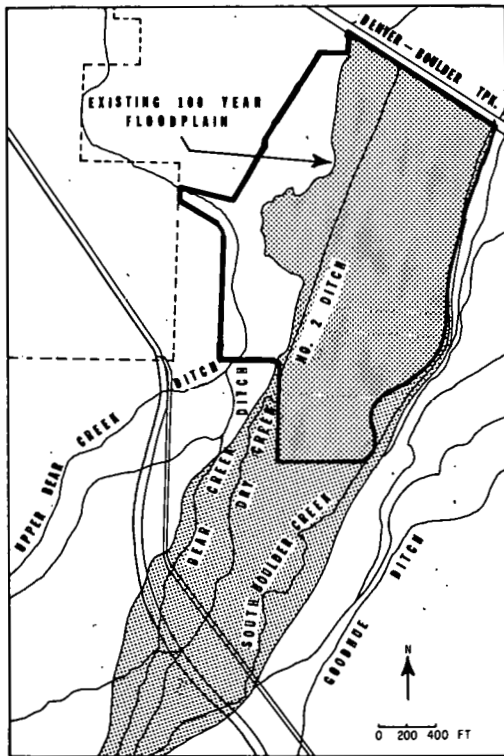


Fig. 3.6. Existing Floodplain at South Boulder Creek Park Project Site (after EIA, 1975)

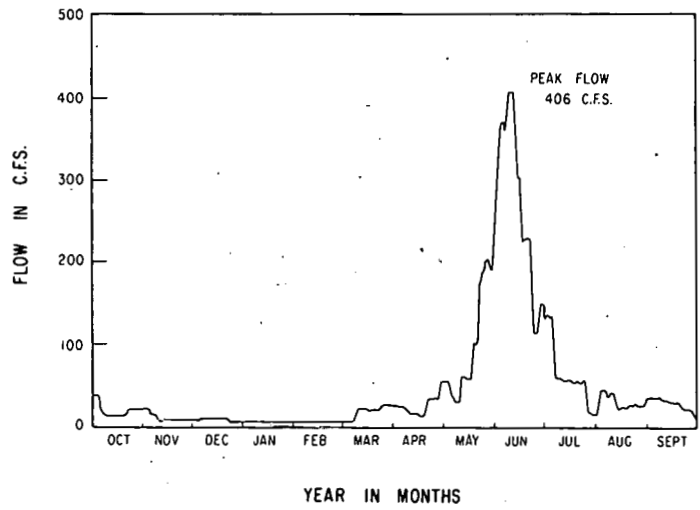


Fig. 3.7. Flow in South Boulder Creek, 1972 (in cubic feet per second) (after EIA, 1975)

The fact that the site lies mostly within the 100-year flood-plain is a major factor in reclamation planning. Along this reach, 100-year flood levels have been calculated as having a discharge rate of 3600 cfs; the channel capacity of the creek is only 1700 cfs. Local flooding occurs about once in three years.

The proposed reclamation plan is shown in Fig. 3.8. This plan calls for converting the site to a park with lakes that will provide additional storage capacity as well as aesthetic enhancement. Low lying areas prone to flooding, designated as marsh in the figure, will not be built upon or otherwise intensively used.

Water quality data for the case study site is provided in Appendix B. Water quality at the site is fairly good, except in the case of total dissolved solids. Total dissolved solids are relatively high but are not considered unusual for the region, since streams along the Front Range normally tend to carry relatively high loads of sediment and dissolved salts. The high dissolved solids content indicated in groundwater at the site is probably due to interflow from irrigation water in Dry Creek No. 2 Ditch and from return flow of irrigation water from higher elevations. Salts in the surficial soil materials are dissolved and carried along in return flows, which increases the total dissolved solids in down-gradient areas. Total dissolved solids in groundwater at the site may represent a potential problem of salt accumulation. Revegetation efforts should include the planting of salt-tolerant species.

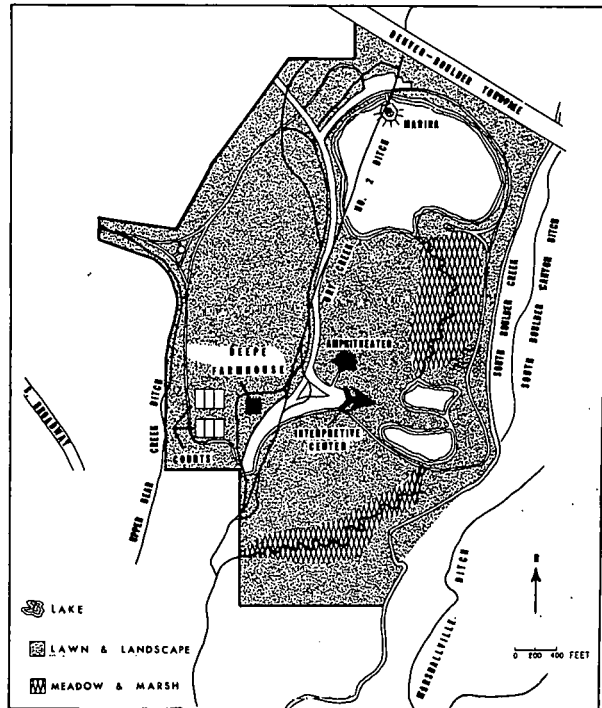


Fig. 3.8. Future Land Use at the South Boulder Creek Park Project Site (after EIA, 1975).

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#### 4 SAND AND GRAVEL EXTRACTION AND RECLAMATION

The extraction and reclamation plan developed for the South Boulder Creek Park Project is the result of close cooperation between the City of Boulder and Flatiron Companies over a period of three years. The primary objectives, as finally agreed upon by the parties directly involved, are:

- Removal of high quality construction aggregate from the South Boulder Creek site by Flatiron Companies,
- Reclamation of the site by Flatiron Companies to accommodate the development of a regional park for public use,
- Gift of an open space easement on the reclaimed land to the City of Boulder for development of the regional park, and
- Development of a regional park on this site for public use.

The site has been subdivided into five operational areas, according to the plan agreed upon, and as indicated in Fig. 4.1. Mining and reclamation must be completed in a given area before initiating operations in the next. Preparatory operations, such as trenching to dewater the area to be mined, and overburden removal and stockpiling, will be allowed before the completion of operations in a previously mined area.

##### 4.1 SAND AND GRAVEL EXTRACTION AND RECLAMATION

Equipment and methods used for sand and gravel extraction vary from one part of the country to another due to differences in terrain, climate, type of deposit, and water table characteristics. In most cases, the specific characteristics of a site determine the mining method and types of equipment employed. Under normal circumstances, three basic steps comprise the mining operation (Newport and Moyer, 1975, and EIA, 1975):

- *Topsoil removal.* Topsoil and other materials overlying the sand and gravel deposit are removed by heavy earthmoving equipment such as pan scrapers or draglines. Removal is

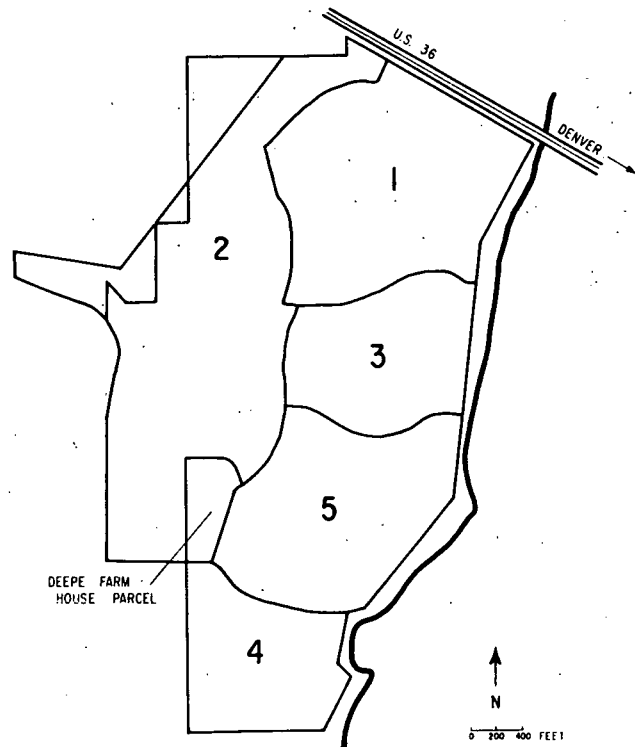


Fig. 4.1. Areas of Proposed Stages of Mining and Reclamation at the South Boulder Creek Park Project Site (after EIA, 1975).

usually scheduled to closely precede the actual sand and gravel extraction, minimizing the amount of surface area disturbed at any one time. With careful planning of this step, soil may be placed in its final location in accordance with the reclamation plan. In this way, reclamation activities are expedited and handling costs reduced.

- *Sand and gravel excavation and removal.* Sand and gravel are excavated and removed by heavy equipment to the lowest level that can be economically mined. Equipment for extraction is selected primarily on the basis of deposit characteristics and water table position.
- *Reclamation.* Disturbed areas are reclaimed to reestablish soil productivity and to make the area available for future land uses. When possible, reclamation proceeds simultaneously with mining in modern operations. Mined-out areas are reclaimed as the next area is being prepared for mining. Using topsoil and overburden removed before extraction, the ground surface is graded to final design contours, reestablishing the original land contours or creating new landscape elements for future purposes. The best growing soils are carefully preserved for use as topsoils to facilitate revegetation of the reclaimed areas. Equipment used in reclamation usually includes that used in mining plus bulldozers and graders, with agricultural equipment used for planting and irrigation (after EIA, 1975).

At the proposed South Boulder Creek site, dry excavation practices will be used for sand and gravel extraction, entailing the dewatering of each stage before actual mining can begin. Each stage will be dewatered by excavating trenches to collect the groundwater and convey it away from the operation. Once the groundwater has been drained, the sand and gravel will be excavated by front-end loaders and loaded into trucks or a conveyor system for transportation to the processing plant.

Upon pit run gravel arrival at the plant site, the sand and gravel will either be transported directly to the processing plant by conveyor or stockpiled. At the processing plant the materials will pass through a series of vibrating screens and crushers which segregate the various size fractions. Washing devices will clean waste material (fines) from the aggregate. From 10-20 different standard products will normally be produced, as well as custom products to meet special requirements. Wastewater will be circulated into settling ponds at the site and suspended material allowed to settle out. It will then be recycled for washing operations rather than released from the plant area into nearby streams.

Finished products will be stored in conical stockpiles of 5,000 to 10,000 tons or more. The amount of material maintained in stockpiles by Flatiron Companies will be held to a minimum in order to reduce inventory costs. A surplus of some products, however, will be unavoidable because of variable market demands for individual products and variations in the percentage of different size fractions produced.

The entire process from initial topsoil removal to final reclamation and delivery of finished products will involve the efficient movement of large quantities of material in a manner that disrupts the surrounding land as little as possible. Pre-operation planning and attention to detail are essential to bring reasonably priced sand and gravel products to the consumer with the least social cost to the community-at-large.

#### 4.2 STAGING OF MINING AND RECLAMATION OPERATIONS

Mining and reclamation will be as concurrent as possible to permit the earliest possible establishment of the proposed regional park. Due to seasonal variations in weather and aggregate demand, mining will not be continuous throughout the year. The highest levels of activity will be during the construction season from mid-spring to early fall. Operating hours will normally be from 8 a.m. to 5:30 p.m. in the spring and fall and 6:30 a.m. to 8:30 p.m. in the summer.

##### *Processing Plant Location*

A fixed processing plant and settling pond will be established during Stage 1 near the Deepe farmhouse in the central portion of the site (Fig. 4.2). Pan scrapers will strip overburden from this area to provide a clean site for stockpiles. The overburden will be placed along the north edge of the area designated as Stage 1 in Fig. 4.1. Some of this overburden will be used to begin construction of a water retention berm and to establish an area for the immediate planting of decorative plant materials for screening the operation. Overburden will also be used in the processing plant area to construct a temporary flood control berm for the plant during its operation.

Fixed plant machinery to be moved in and set up for operation will include the processing plant machinery itself, a scale house, plant office, and other necessary facilities. The settling pond and haul roads will be constructed while the machinery is being set up. Initial water for washing, as well as a small amount of additional water required to make up for water loss during processing, will be provided from surface water in South Boulder Creek. The settling pond will be regularly drained, and the sediment excavated from its bottom will be used for landscaping as part of the reclamation process.

##### *Stage 1*

Mining will begin in the Stage 1 area after the completion of plant, berm, and dewatering trench construction. The operation is designed to minimize the size of the area being disturbed at any one time, and to limit the amount of activity and equipment on the site because of its visibility from the highway. In this stage, the mined area will be allowed to fill with groundwater to the natural water table level; this will create a lake up to 10-15 ft deep.

As stripping proceeds, overburden will be used in the early part of Stage 1 operations to complete the construction of the screening berm along

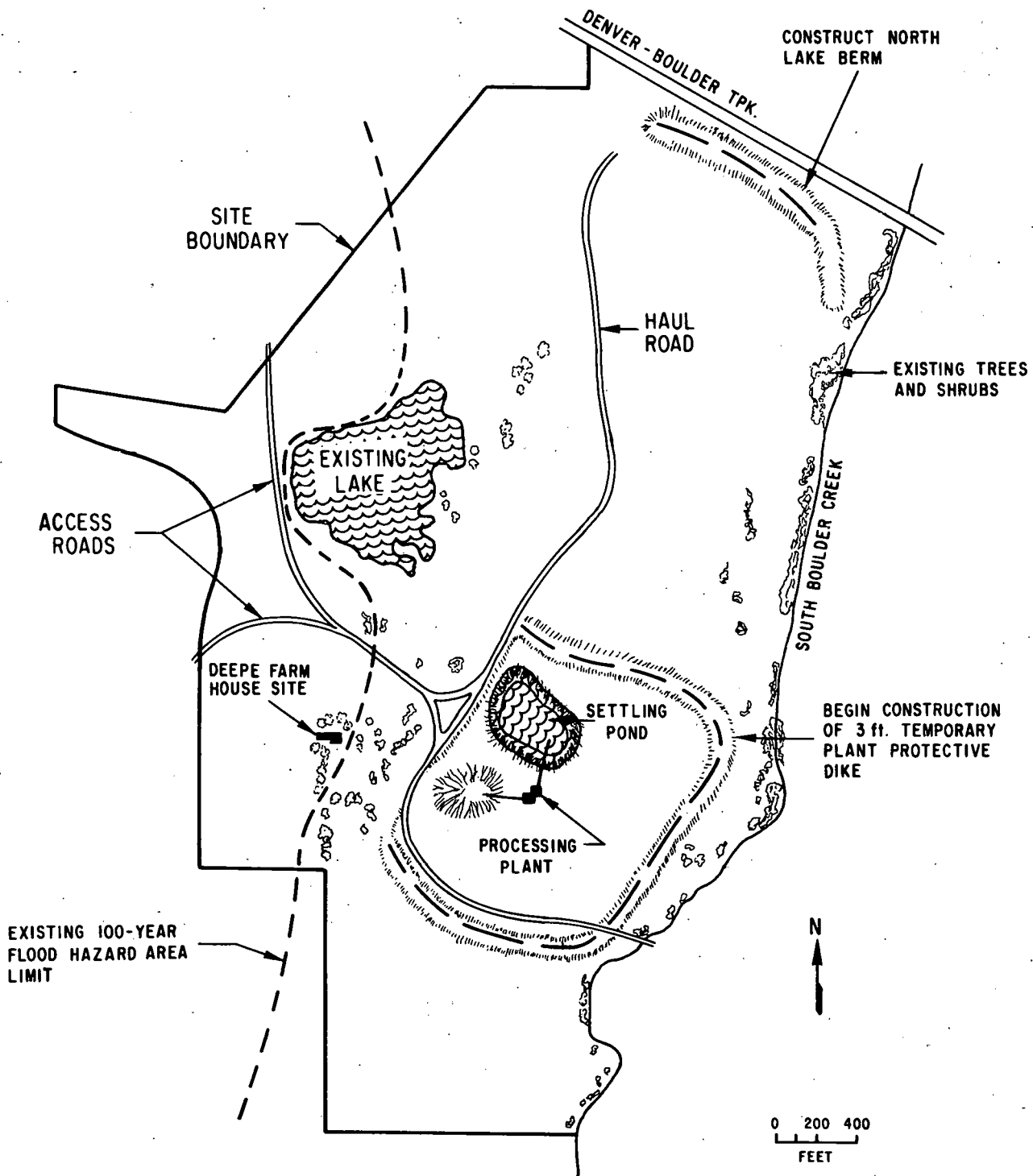


Fig. 4.2. Processing Plant Location, Mining/Reclamation Stage 1, South Boulder Creek Park Project (after EIA, 1975)

the turnpike (Fig. 4.3). At a later time, excavated overburden will be used to construct lake banks and for general landscaping. Portions of the lake bank will be constructed of impervious materials to control groundwater seepage and to maintain historic groundwater levels north of the turnpike. Dry Creek No. 2 Ditch will be temporarily rerouted where it conflicts with excavations; in Stage 2 it will be rerouted to its final location.

### *Stage 2*

Dewatering in the Stage 2 area will begin before the completion of mining and reclamation in Stage 1. The present lake, which was the source of gravel used in construction of the turnpike, will be drained westward into an area already mined (Fig. 4.4). When the lake is drained, the north end of the basin will be used as part of a trench to collect seepage from the south. That seepage, along with groundwater seepage and water from the controlled initial drainage of this stage, will be routed west into the previously mined site. This water will flow north by means of trenches to the Viele Creek drainage system. Other minor trenches will complete the dewatering of the northern portion of the Stage 2 area.

Excavations will be planned to accommodate construction of the major access road for the proposed park, the west bank of the newly created lake, and the permanent future location of Dry Creek No. 2 Ditch. Overburden will be used for construction of most of the designed landscape elements.

### *Stage 3*

When Stage 2 mining nears completion, Stage 3 operations will begin (Fig. 4.5). The Stage 3 area will be dewatered by trenching around the periphery and allowing collected groundwater to drain either into the lake created in Stage 1 or west into the drainage system of Stage 2 operations. Overburden and fine-grained waste material will be used for landscaping.

### *Stage 4*

When Stage 3 mining is completed, the Stage 4 area south of the plant will be mined (Fig. 4.6). In this stage, the dewatering system will be routed to the northern trenches which will drain into the Stage 2 area, flow through the Stage 3 area, and drain into the lake or be pumped into South Boulder Creek. Overburden will be stockpiled as close as possible to where it will be used for reclamation.

### *Stage 5*

When all other mining operations have been completed, the sand and gravel remaining under the stockpile area at the plant site will be mined and processed by a portable plant (Fig. 4.7). Concurrently, the fixed plant will be disassembled and removed from the site. A portable washing plant will then be utilized; the original settling ponds will remain in use until the end of extraction operations. A dry excavation process will again be employed, and

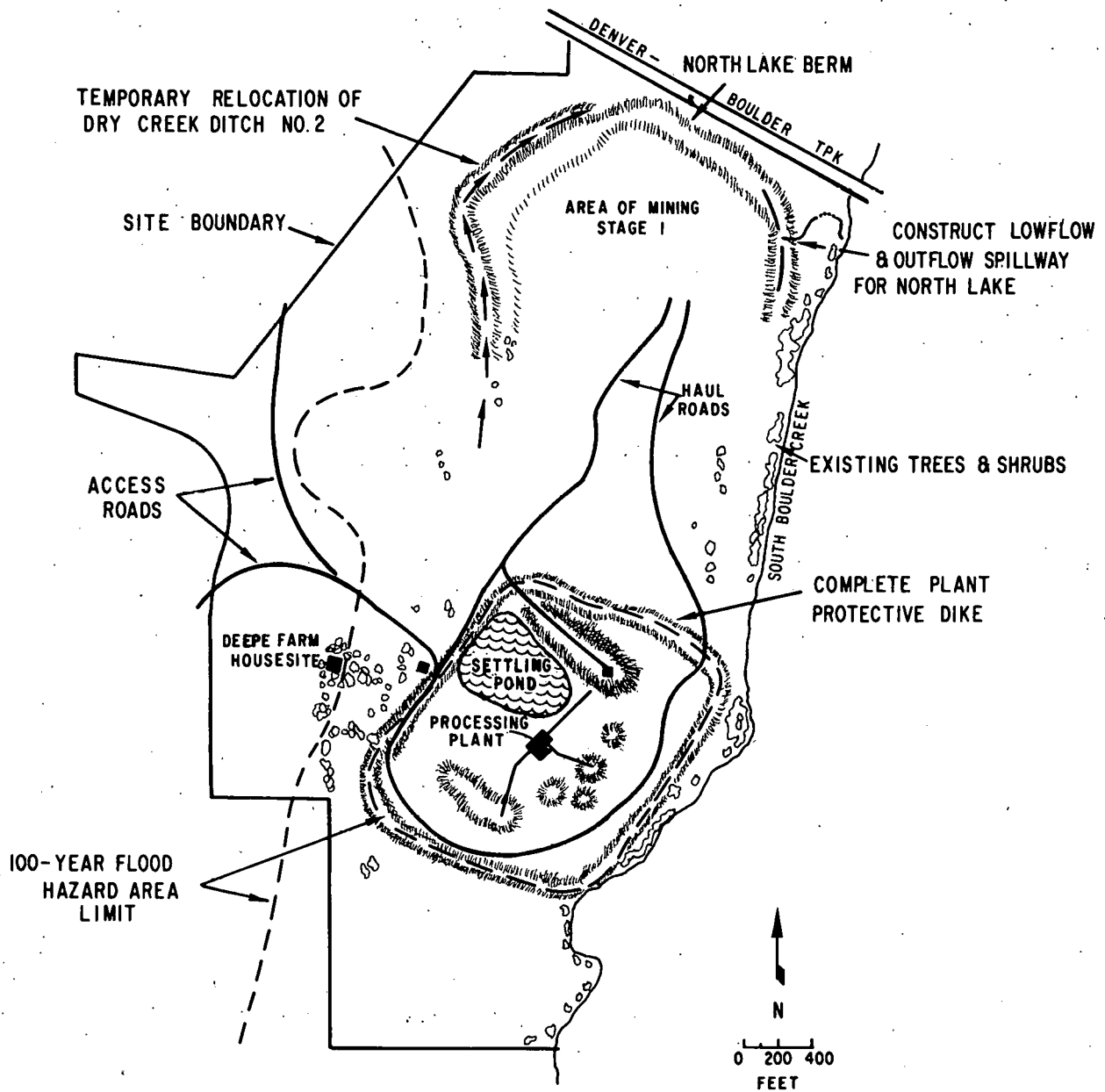


Fig. 4.3. Mining/Reclamation Stage 1, South Boulder Creek Park Project (after EIA, 1975)

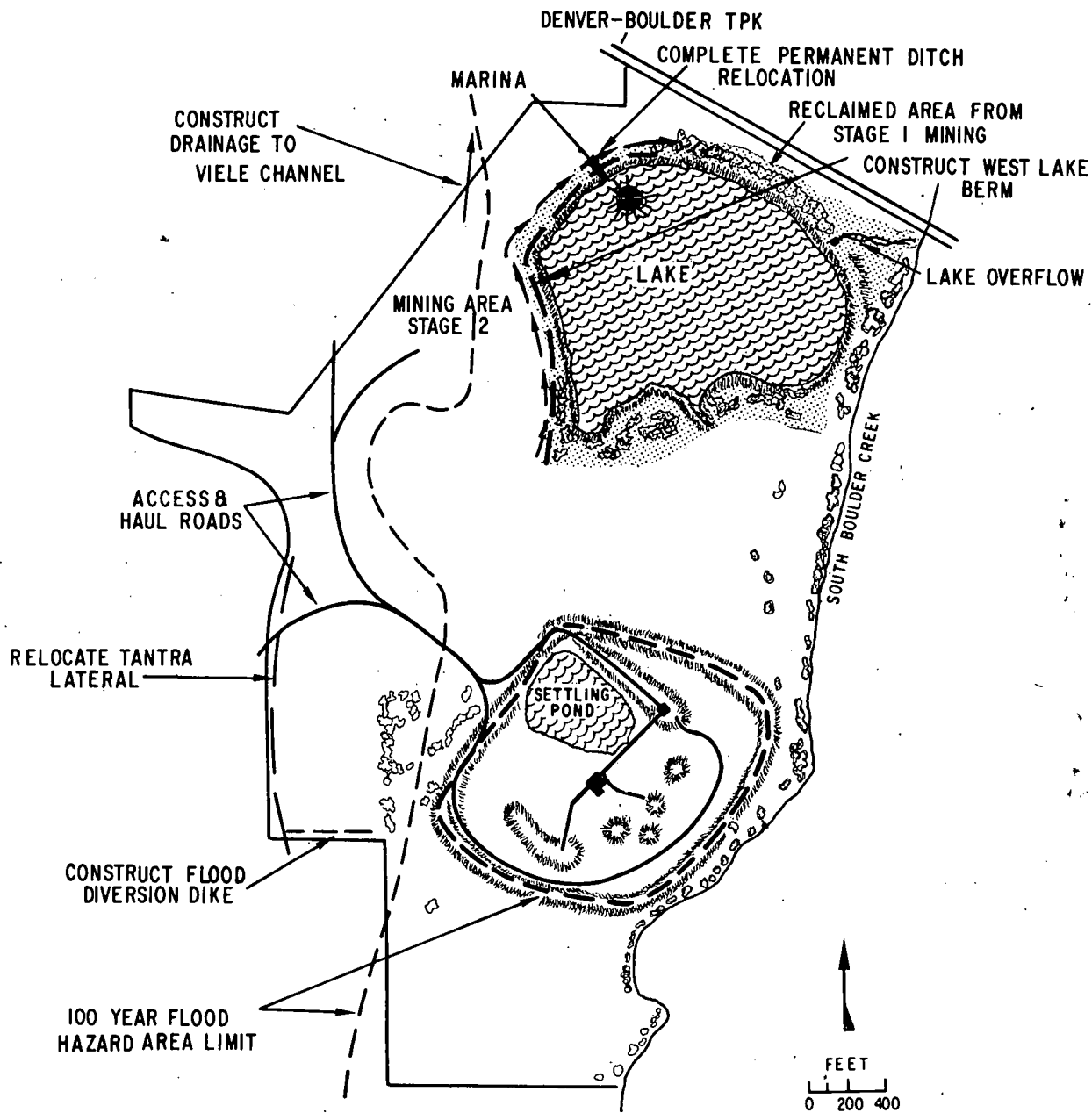


Fig. 4.4. Mining/Reclamation Stage 2, South Boulder Creek Park Project (after EIA, 1975)

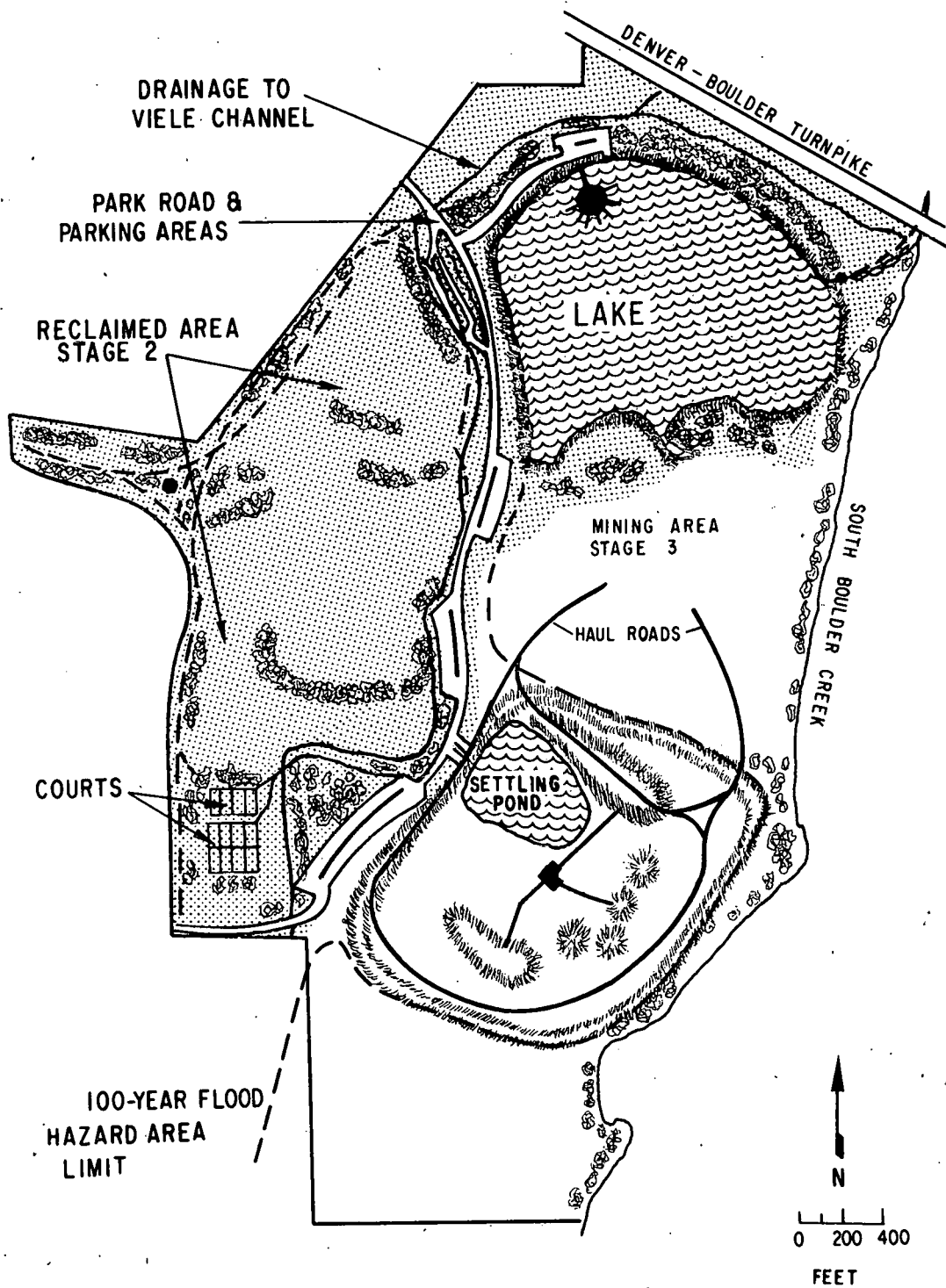


Fig. 4.5. Mining/Reclamation Stage 3, South Boulder Creek Park Project (after EIA, 1975)

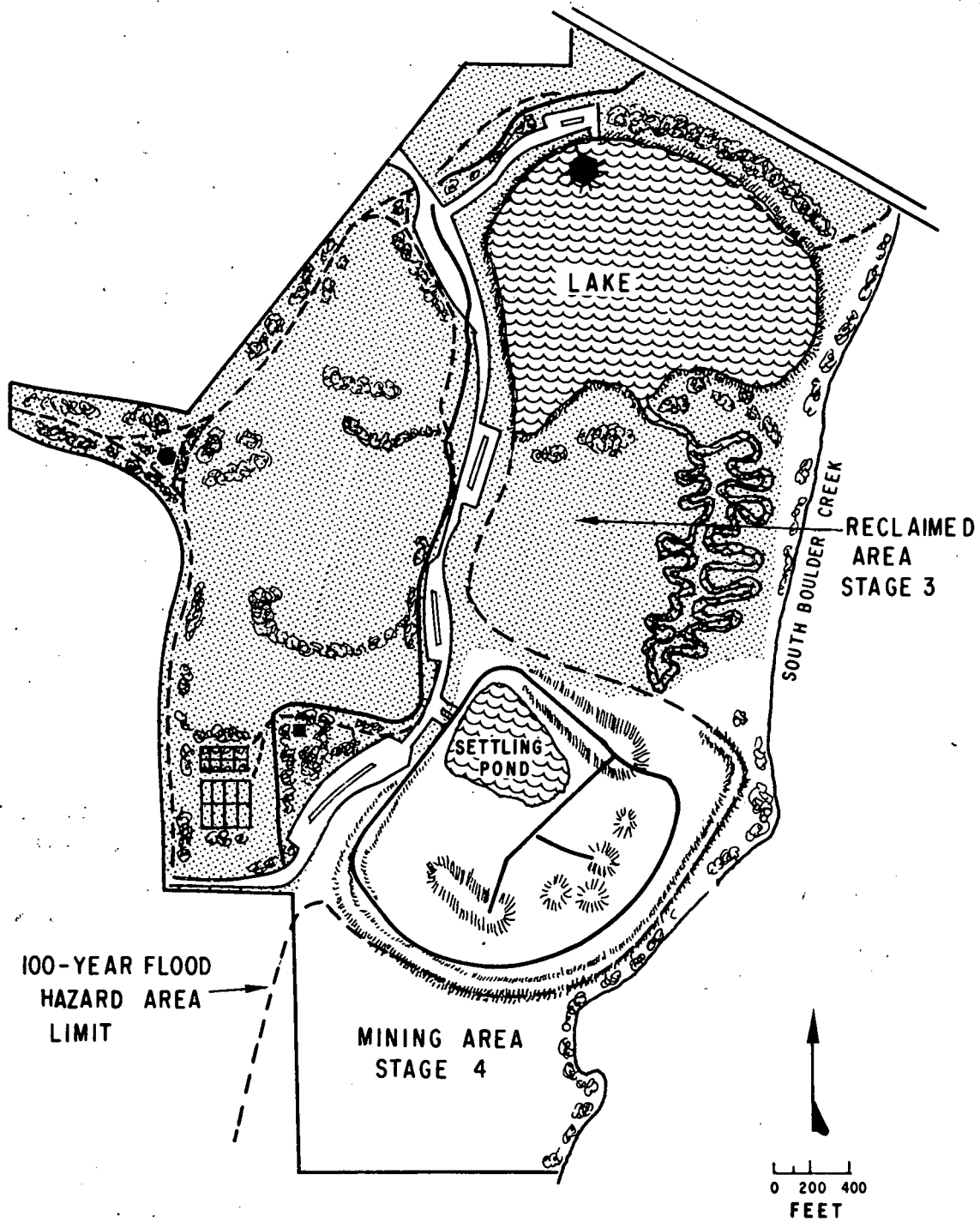


Fig. 4.6. Mining/Reclamation Stage 4, South Boulder Creek Park Project (after EIA, 1975)

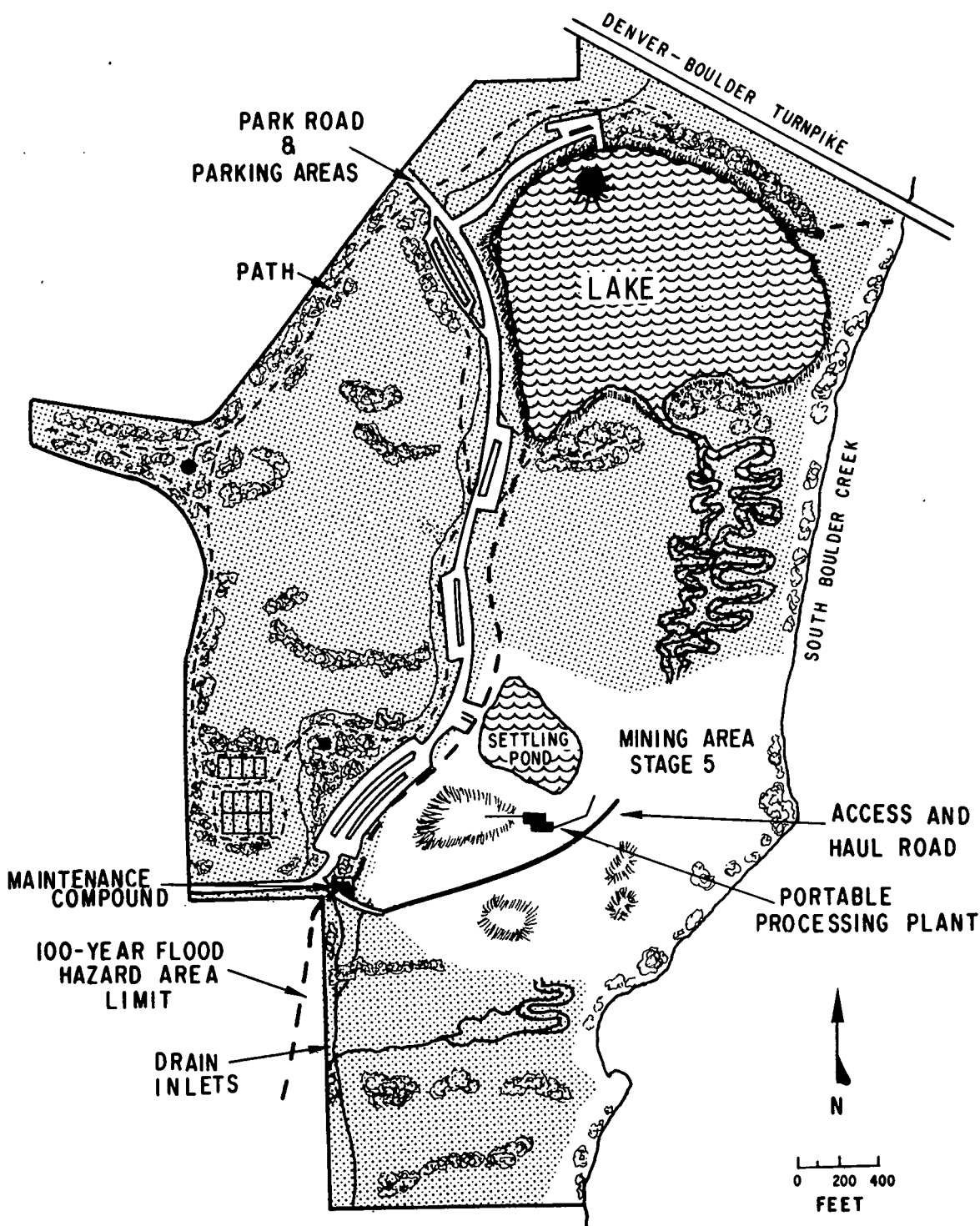


Fig. 4.7. Mining/Reclamation Stage 5, South Boulder Creek Park Project (after EIA, 1975)

the collected groundwater will be used in the complete park area or drained off into South Boulder Creek. Carefully planned mining and stockpiling of waste material will provide enough material for the last major landscaping efforts in the area that will contain the major park facilities.

#### 4.3 RECLAMATION

As described above, reclamation will proceed at the same time as mining. Grading will begin as soon as possible, using overburden from the mined area. Revegetation efforts will be initiated during the following planting season. The Stage 1 area is expected to be available for limited recreational use during the latter part of Stage 2. As each stage is completed, the previous stage is expected to easily accommodate park and recreational development. The final park development plan is shown in Fig. 4.8.

Since the first area to be mined is easily visible from the Boulder-Denver Turnpike, a prime consideration is the establishment of a berm along the turnpike using overburden from mining. The recontoured areas will be seeded with native grasses and other types of vegetation that are hardy in the Front Range area (see Table 4.1); specific plant species have not yet been selected. Ditches disturbed during mining will be realigned so that normal downstream use of the water will not be interrupted. At no time will the natural course of South Boulder Creek be disturbed. The Creek itself, and adjacent vegetation, will be protected during mining, to preserve the riparian (riverbank) habitat and prevent the loss of fish and wildlife species.

Table 4.1. Suggested Dominant Species for Revegetation

Plant Community	Dominant Species	
Marshes and Sloughs	<i>Typha latifolia</i>	Cattail
	<i>Scirpus</i> spp.	Bulrushes
	<i>Carex</i> spp.	Sedges
	<i>Spargania</i>	Burreed
	<i>Beckmannia syzigachne</i> <i>Sagittaria cuneata</i>	Sloughgrass Arrowroot
Tall Grass Prairie	<i>Andropogon gerardi</i>	Big Bluestem
	<i>Panicum virgatum</i>	Switchgrass
	<i>Sorghastrum nutans</i>	Indiangrass
Short Grass Prairie- Mixed Grass Prairie	<i>Bouteloua gracilis</i>	Blue Grama
	<i>Bouteloua curtipendula</i>	Side Oats Grama
	<i>Buchloë dactyloides</i>	Buffalograss
	<i>Stipa comata</i>	Needle-and-Thread Grass
	<i>Agropyron smithii</i>	Western Wheatgrass
	<i>Andropogon scoparius</i>	Little Bluestem
Stream and Pond Margins	<i>Populus angustifolia</i>	Narrowleaf Cottonwood
	<i>Populus sargentii</i>	Plains Cottonwood
	<i>Salix</i> spp.	Willows
	<i>Typha latifolia</i>	Cattail
Sedge Meadows	<i>Carex</i> spp.	Sedges
	<i>Spartina pectinata</i>	Prairie Cordgrass
	<i>Juncus</i> spp.	Rushes

\*From South Boulder Creek Park: Environmental Impact Assessment, 1975.

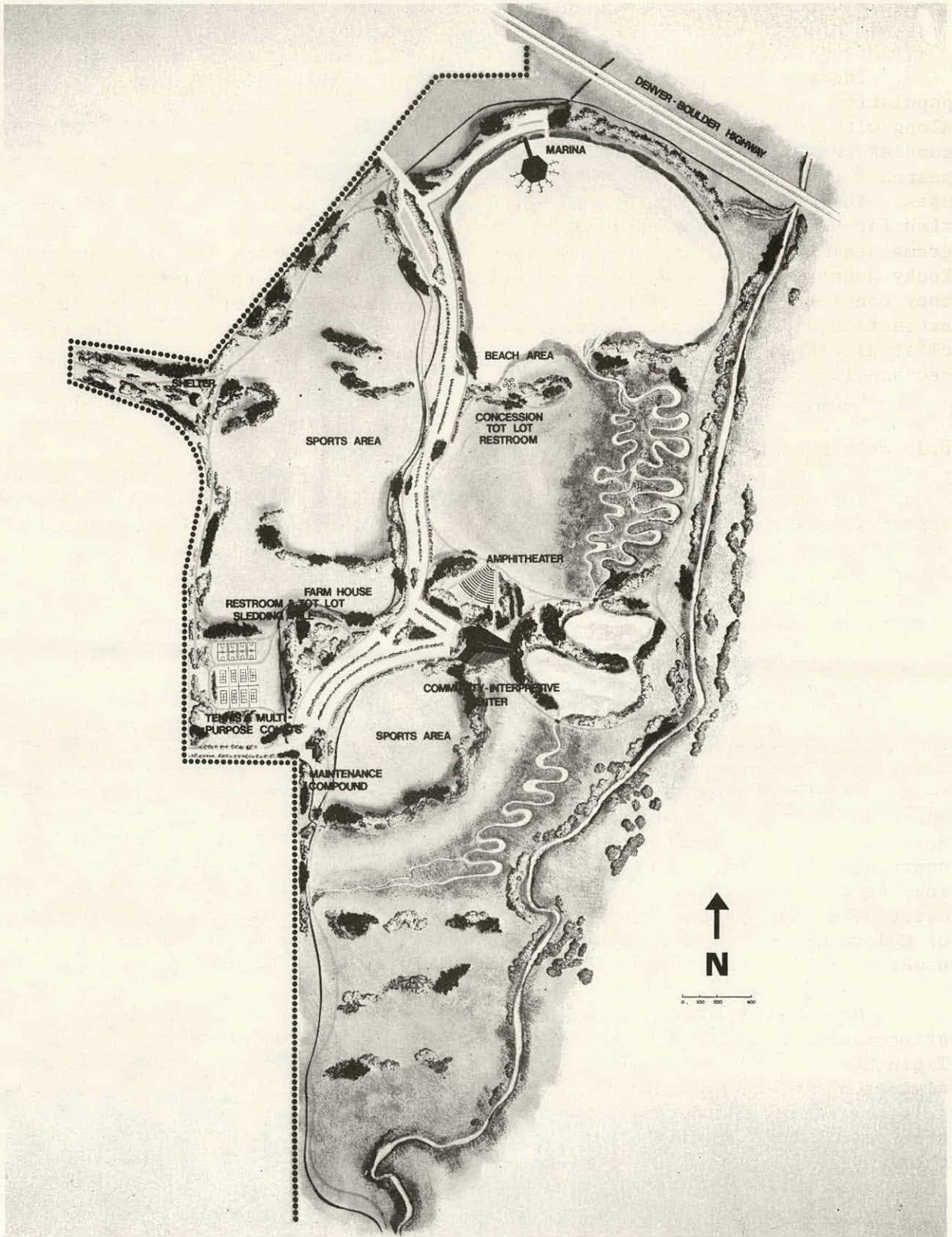


Fig. 4.8. Park Development Plan, South Boulder Creek Park Project (after EIA, 1975)

## 5 PUBLIC PLANNING ASPECTS OF THE SOUTH BOULDER CREEK PARK PROJECT

Increased demand for energy and minerals has contributed to recent population growth in Colorado, especially in the Denver Metropolitan Area. Along with increased demands for housing and public services, greater and more complex conflicts in land use have arisen. These conflicts have led to a search for devices to effectively settle disputes involving disparate land uses. The search is marked by considerable experimentation in state legislation for planning and plan implementation. Colorado statutes, and the programs stemming from them, are considered by many to be representative of the Rocky Mountain-Great Plains region as a whole. They are innovative because they consider land-use planning in relation to mineral resource protection and extraction (Imhof, 1976). This section discusses state, local, and site-specific planning in Colorado, providing essential background information on reclamation planning at the case study site.

### 5.1 SELECTED STATE PROGRAMS FOR MINERAL RESOURCES PLANNING\*

The American Institute of Planners (AIP) lists the following functional types of land use planning programs in Colorado (Malone, 1975):

...growth policies, state land use planning, water management, critical areas designation, surface mining regulations, power plant siting, new towns legislation, areas of statewide concern (greater than local concern), citizen involvement, determining existing land use, projecting land and resource needs, analysis of housing needs, and impact of policies on land resources.

The AIP study fails to specifically list another important category of state and local planning activity which Colorado is being forced by circumstances to pursue, namely: *mineral resources planning*. An analysis of state statutes and regulations indicates that in regard to mineral resources planning, the State of Colorado (with a few exceptions) is restricted to the important but nonregulatory functions of technical assistance, funding, monitoring, reviewing, recommending, and reporting. Thus, the state has only limited powers to override decisions made by local governmental bodies. Essentially, the State of Colorado has extended the right to make public planning decisions and the power to implement primary plans to local governments.

Programs of the State of Colorado having the potential to significantly affect surface mining are: mineral resources extraction planning under Title 34-1-304, CRS,\*\* 1973; mineral resources protection (preservation) provisions of the surface-mined-area reclamation program; critical areas and critical activity designations under the House Bill 1041 program; and the state regulatory provisions of the Mined-Area Reclamation program. In addition, surface mining will be affected by HB 1065, Mined Area Reclamation Act, which was passed and signed into law in May 1976.

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\*From information provided by E.A. Imhof, 1976.

\*\*Colorado Revised Statutes.

In mineral resources extraction planning the Colorado Geological Survey provides the criteria and technical assistance necessary to enable the more populous counties to meet the state planning requirements for mineral extraction (Schwochow, et al., 1974). Counties with a population in excess of 65,000 (eight of 63 Colorado counties) are required under Title 34-1-304, CRS, 1973, to develop a plan for the extraction of commercial mineral deposits. For each commercial mineral deposit, these counties are required to evaluate (1) commercial value, (2) potential for effective multiple sequential use of the site (including off-site effects), (3) effect on quality of life, (4) relationship to other plans, (5) potential for full extraction, and (6) potential for mined land reclamation. The plan for park development at the South Boulder Creek Park Project site is closely related to the city's goals for open space acquisition. According to the Area Priority List in Boulder's *Open Space Plan* (1974), the site is one of several areas given first priority. The Colorado Geological Survey established criteria for site classification (Rogers, et al., 1975) and in most cases will conduct the legally required mineral inventories and analyses.

The Colorado Geological Survey is also a key agency in a second important state program: subdivision plat review.\* The Survey is responsible for reviewing requests for plat approval to determine if the completed development would interfere with the potential extraction of commercial minerals on or near a platted development site. According to an agent of the state monitoring agency (the Colorado Land Use Commission), subdivision plat review authority has been successful in discouraging the preemption of sand and gravel deposits.

House Bill 1041 of 1974 created a complex interrelationship of state and local participation in the designation and regulation of critical areas and activities of greater than local concern. The state provides technical guidance, legal authority, and funds to enable local governments to designate and regulate the following types of land-use areas and activities:

...mineral resource areas, natural hazard areas (flood, geologic, and wildlife risk areas), historical and archeological sites, wildlife habitats, airports, public utilities, highways, mass transit facilities, solid waste sites, new communities, water resources development projects, and nuclear detonations.\*\*

The reaction of the individual counties to the state mandates was reported to have been sluggish during the first year after House Bill 1041 became effective. This raised questions regarding the state's ultimate recourse if counties cannot or do not act in regard to the designated land-use planning activities of statewide concern. Arnold and McDonald (1976) observed that if the Colorado Land Use Commission "finds that if a locality fails to make a reasonable designation, it can ask the locality to reconsider or it can take local officials to court." Such a power may have the effect, under HB 1041, of creating a moratorium on all development (i.e., -- shutting off building permits, sub-

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\*A subdivision occurs in Colorado when land is divided into two parcels, or, with the development of any one tract of land under 35 acres in size.

\*\*From Colorado House Bill No. 1041.

division plots, zoning permits, and the like). In one such action to date, intergovernmental litigation led to a state-local conference to resolve which critical areas and activities should be subject to public controls.

HB 1041 has the potential of both preventing mining and protecting mineral deposits. Mining may be banned, for example, by the designation that a particular archeological site has statewide significance. Protection of mineral resources could occur through the identification and designation of "mineral resource areas" provided for in HB 1041.

As of May 25, 1976, 28 of Colorado's 63 counties had declared to the Colorado Land Use Commission their intentions to designate "mineral resource areas." These areas will be subject to a variety of local land-use controls, particularly zoning and subdivision regulations. Recently (1976), the State of Colorado enacted a mined-land reclamation bill (HB 1065) that requires all mine operators and prospectors to obtain state permits for overburden removal and mineral extraction. Permit approval is dependent upon the development of an approved mining and reclamation plan that is directed toward an agreed-upon end use of the site.

## 5.2 COUNTY AND LOCAL GOVERNMENT

In Colorado, police powers for plan implementation are vested largely in local governments. Accordingly, most site-specific land use and mineral resource planning occurs at the local level. The state sets forth guidelines for the designation of sites under the HB 1041 program, but the county actually designates specific sites it considers as having statewide significance and has the tools to implement these designations. Similarly, in the Title 34 program, the county prepares and implements mineral resources preservation plans. In regard to sand and gravel extraction, the regulatory powers of municipalities are also significant; the economics of sand and gravel extraction dictate the location of pits in or near the municipality creating the demand.

In 1976, the powers of local government in mineral resources planning were strengthened by the enactment of HB 1706; local governments are authorized to require master plans for the mining and subsequent reclamation of properties overlying commercial mineral deposits. Through HB 1706, county governments also have jurisdiction over mined-area reclamation programs, to wit:

...the Department of Natural Resources shall not grant a permit in violation of city, town, county, or city and county (Denver) zoning and subdivision regulations.\*

## 5.3 COOPERATIVE PLANNING FOR THE SOUTH BOULDER CREEK PARK PROJECT

At an early stage in the development of plans for the South Boulder Creek Park Project, the City of Boulder and Flatiron Companies entered into a cooperative relationship in an effort to ensure that the needs of all concerned parties would be met. Originally, Flatiron Companies had considered

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\*From Colorado House Bill No. 1706.

reclaiming the site for multiple-family housing; however, after lengthy discussions with city representatives, the present arrangement was agreed upon (McDowell, 1976). In the spring of 1976, Boulder's City Council passed an ordinance which annexed the project area to the city and granted a special use permit to Flatiron Companies for sand and gravel extraction and land reclamation. The ordinance, No. 4070, was passed by one vote in a tie-breaking situation. In addition to many meetings, work sessions, and public hearings involving numerous public groups and private citizens, an extensive public relations effort was conducted by Flatiron Companies in an attempt to allay local fears of environmental degradation.

An initial step in the planning process involved the joint development of an environmental impact assessment by the City of Boulder and Flatiron Companies. To counter possible criticism, independent experts were made familiar with the project for the purpose of examining and reporting on the possible impacts of the sand and gravel operation. Although paid as consultants, their findings were reported without change or deletion and acted upon where possible. Although this effort answered the fears and criticisms from a majority of opponents, strong opposition from several persons has continued.

Passage of Ordinance No. 4070 represented one step in a suite of agreements that were designed to benefit the parties directly involved in the planning process for this project. The principal parties are the Flatiron Companies, the City of Boulder, the Colorado Open Land Foundation, and the Federal Bureau of Outdoor Recreation.

#### 5.4 ROLE OF AGREEMENTS RELATED TO CITY OF BOULDER ORDINANCE NO. 4070

As finally agreed upon by the involved parties, each will perform specific tasks and receive specific tangible or intangible benefits as a result of the successful completion of those tasks. This section will consider the role of each party in terms of its relationship to the South Boulder Creek Park Project and outline the anticipated benefits. The respective roles of the principal parties involved are:

- *Flatiron Companies*: sand and gravel extraction; site reclamation, including recontouring, seeding and planting; drainage feature construction; park road construction; gift of scenic easement to city.
- *City of Boulder*: passage of annexation ordinance, environmental monitoring, phased receipt of gift, application for federal funding, park facility construction.
- *Colorado Open Land Foundation (COLF)*: escrow agent for City of Boulder, receives gift of easement from Flatiron Companies, coordinates gift to city with availability of federal funds for park development.
- *Federal Bureau of Outdoor Recreation*: advice on park design and development, funding for park facility construction.

Under the terms of Ordinance No. 4070, the timing of various stages of the mining operation was very carefully set forth, with provision for unexpected

delays, as shown in Table 5.1. In the ordinance, Flatiron Companies acquired the right to mine about 7 million tons of sand and gravel of desirable characteristics over a 28-year period from a site located very close to potential markets.

In an action related to the ordinance, Flatiron Companies had planned to grant over 270 acres of the site to the City of Boulder as a scenic easement. This was to be accomplished indirectly by giving the land to the Colorado Open Land Foundation, which is a non-profit organization which would hold the land in escrow for the city. The value of such a scenic easement is obvious since the property could not then be developed for another purpose at a later date. The scenic easement would also define the possible uses of the site -- that is, open space and/or parkland. In return for granting the scenic easement, Flatiron Companies' original intention was to use the value of the gift for a tax deduction. At the present time, the fate of this aspect of the project is unclear due to the lack of a favorable ruling by the U.S. Internal Revenue Service.

Because Flatiron Companies own mined land adjacent to the proposed park site, the value of that land would be enhanced by an adjacent regional park. The increased land value would be an additional benefit to Flatiron Companies for future development or sale of the property.

As an initial benefit, the City of Boulder will have ready access to necessary construction materials. The site will also generate increased tax revenue for the city during the period of mining. Most importantly the city

Table 5.1. Time Limits for Construction, Mining, and Reclamation, South Boulder Creek Park Project (as set forth by City of Boulder Ordinance No. 4070)

Stage No.	Commencement Time	Completion Period
1	Not later than 24 months after the commencement of construction on the plant site.	Not later than 3 years after mining on Stage 1 was commenced.
2 North	Not later than 3 years after mining on Stage 1 was commenced.	Not later than 6 years after mining on Stage 1 was commenced.
2 South	Open	Not later than 3 years after mining on Stage 2 South was commenced.
3	Open	Not later than 20 years after mining on Stage 1 was commenced.
4	Open	Not later than 20 years after mining on Stage 1 was commenced.
5	Open	Not later than 20 years after mining on Stage 1 was commenced.

will receive a planned park development over a 20-year period. By carefully staging site reclamation and the transfer of ownership the city is placed in a favorable position for obtaining federal matching funds for the value of the land reclaimed in each stage of the operation. In that way, the park can be fully equipped with user facilities as each segment is mined, reclaimed, and becomes available for public use.

In acting as an escrow agent, the Colorado Open Land Foundation will periodically release ownership of segments of the property to the City of Boulder at a rate consistent with the rate at which federal matching funds become available. At the same time, a principal goal of the organization is achieved, because its function is to promote publicly-owned open space in the state. In the South Boulder Creek Park Project, the Federal Bureau of Outdoor Recreation has played an advisory role regarding park design and the procedures necessary to obtain federal matching funds. The principal mission of the Bureau is to assess and meet the nation's outdoor recreational needs. In doing so, one of the Bureau's functions is to administer federal matching funds for land acquisition and to develop public recreational facilities. The successful completion of this project would also be a source of satisfaction to the Bureau in the attainment of its purpose.

The text of the City of Boulder Ordinance No. 4070 is appended to this report. It is especially interesting in its description of performance standards and the monitoring of possible effluents from the site.

The future of the project is not clear as of this writing due to the IRS ruling mentioned earlier. The basis for the IRS not issuing a favorable ruling was, according to a Flatiron Companies representative, doubt raised by dedicatory provisions inserted by the City of Boulder into the agreement between the city and Flatiron Companies. At present, negotiations are underway to resolve differences in order to develop a set of agreements acceptable to the IRS for the purpose of granting a tax deduction to the Flatiron Companies. If this effort is unsuccessful, it does not mean that the site will not be mined; it does mean, however, that Flatiron Companies will probably explore other possibilities for reclamation and future land use.

The cooperative planning effort by the City of Boulder and Flatiron Companies has not as yet yielded a viable, existing sand and gravel operation at the site. Efforts are being made by all parties concerned, however, to resolve potential conflicts and to initiate actual operations within a reasonable period of time.

## 6 OBSERVATIONS FOR PLANNERS

Several conclusions and observations of potential value to land use and mineral resource planners may be drawn from the South Boulder Creek Park Project. Countering opposition by environmental advocacy groups and concerned homeowners requires more than a demonstration of local need for a mineral commodity. Although sand and gravel to be mined from the site would be used for building and road construction or maintenance in Boulder, a significant number of persons in the community were opposed to the existence of a gravel pit, either adjacent to their property or within the confines of the city. Because this opposition was given ample opportunity to be heard, was debated intelligently, and was accommodated as much as reasonably possible, the ordinance allowing the company to mine sand and gravel passed.

When strong opposition to a proposed surface mine exists, months or years may be required to break a deadlock and effect a compromise between real or apparent antagonists (i.e., environmental advocacy groups and mining companies). Many reports, letters, meetings, and hearings may be necessary before a plan acceptable to all of the parties involved can be designed. It is important that there be at least one senior level public official involved in negotiations, an official who is a recognized leader in the community and whose opinion is generally accepted as informed and authoritative. Such a person may not be a local planner, but should be someone who understands and can address the values of the community, and at the same time appreciate the concerns of both industry and public planning.

A thorough environmental impact assessment can meet several needs; the information gathered is extremely useful in evaluating alternative reclamation and land use plans. In addition, while the performance of the assessment indicates the sincerity and good will of the operator (who pays the bill), factual data may be provided to aid in countering opposition based on misconceptions.

The preparation of a public open space plan can serve to indicate areas where surface mining may be allowable with proper reclamation compatible with proposed public land uses. In conjunction with an open space plan, future mineral needs may be estimated, deposits identified, and plans and implementation devices adopted to preserve mineral deposits from preemption by nonmining development.

The following additional observations may be drawn from the case study:

- The institutional arrangements necessary for the success of a project may involve several entities, each with different interests and goals. The mix of contractual understandings in the South Boulder Creek Park Project, for example, included agreements between a county, a city, a nonprofit trust, the state, the mine operator, and a federal agency.
- Annexation can be an effective device for permitting and regulating a surface mine operation. Conditions and performance standards attached to the Boulder annexation ordinance require monitoring and regulation at least as stringent as those found under a state mined-area reclamation program.

- Mining and reclamation may have to be staged in such a way that highly visible and environmentally strategic areas are reclaimed and released for public use while mining continues elsewhere at the site.
- Mine operators seeking a favorable ruling from the Internal Revenue Service of a land donation should view each situation as unique. Tax relief can only be assured when official notice is actually received.

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APPENDICES

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## APPENDIX A

*Soil Characteristics at the  
South Boulder Creek Park  
Project Site\**

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\*Data derived from *Soil Survey of Boulder County Area*, Soil Conservation Service, U.S. Department of Agriculture, Washington, D.C. (Jan. 1975).

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Table A.1. Potential Site Vegetation

Environment	Common Name	Species
Short and tall grass prairie	Big Bluestem	Andropogon gerardi
	Blue Grama	Boutella gracillis
Sedge Meadow	Sedge	Carex spp.
	Prairie Cordgrass	Spartine pectinata
Marshes	Cattails	Typha Latifolia
	Bulrushes	Scirpus lacustris
Galley Forest	Cottonwood	Populus sargentii
	Cottonwood	Populus augustifolia

Table A.2. Classification of Site Soils,  
Seventh Approximation

Series	Family	Subgroup	Order
Loveland	Fine loam over sand and gravel, calcareous, mesic	Typic Haplaquoll	Mollisol
Niwot	Fine loam over sand and gravel, mesic	Typic Haplaquoll	Mollisol
Valmont	Clay over cobbly loam, montmor- illonitic, mesic	Aridic Argiustoll	Mollisol
Terrace Escarpment	-----too variable to be classified-----		

Table A.3. Detailed Representative Soil Profile

Soil	Depth (in.)	Horizon	Color Chart		Segre- gations	Description
			Dry	Moist		
Niwot	0-6	A 11	10 YR 4/2	10 YR 2/2	NA*	Dark gray-brown clay loam, fine grained, soft, friable; mildly alkaline, smooth boundary.
	6-14	A 12	10 YR 5/2	10 YR 3/2	7.5 YR 5/6	Gray-brown loam with strong brown mottles; coarse blocky structure parts to fine grains easily; wavy boundary; mildly alkaline.
	14-60	II C	10 YR 6/3	10 YR 5/3	7.5 YR 5/6	Pale brown gravelly sand with many strong brown mottles; single grain; loose dry or moist; neutral.
Loveland	0-11	A 11	10 YR 4/2	10 YR 2/2	NA	Dark grayish-brown clay loam, very dark when moist; fine and medium grains, very friable; calcareous; moderately alkaline; smooth boundary.
	11-20	A 12	10 YR 4/2	10 YR 2/2	10 YR 5/4	Dark grayish-brown clay loam, very dark when moist with yellowish-brown mottles; weak blocky structure; calcareous, moderately alkaline; abrupt boundary.
	20-30	C 1	10 YR 5/2	10 YR 4/2	10 YR 5/4 & 6/6	Grayish-brown loam, dark grayish-brown when wet, yellowish-brown mottles; hard, friable; strongly calcareous; clusters of gypsum and lime; moderately alkaline.
	30-60	II C	10 YR 5/2	10 YR 6/2	7.5 YR 5/6	Brownish-gray gravelly sand, grayish-brown when wet, strong brown mottles; single loose grains when dry or moist; mildly alkaline.

Table A.3. Detailed Representative Soil Profile (cont'd)

Soil	Depth (in.)	Horizon	Color Chart		Segre-gations	Description
			Dry	Moist		
Valmont	0-9	A 1	10 YR 5/2	10 YR 3/2	NA	Grayish-brown clay loam, darker when wet; fine grains; soft, very friable; 5% gravel; neutral; clear smooth boundary.
	9-15	B 1	10 YR 5/3	10 YR 3/3	NA	Brown clay, darker when wet; weak prismatic parts to moderate blocky structure; hard friable; 10% gravel; neutral; clear smooth boundary.
	15-30	B 2	7.5 YR 6/3	7.5 YR 5/3	10 YR 8/2	Gravelly limy light brown clay loam, brown when wet; weak prismatic parts to moderate blocky structure; very hard; firm; 15% gravel; calcareous, white lime seams; moderately alkaline; gradual wavy boundary.
	30-40	IIC 1	7.5 YR 8/2	7.5 YR 8/4	10 YR 8/2	Pinkish-white very gravelly loam, pink when wet; very hard, very friable; 50% gravel & stones; calcareous, white lime streaks, moderately alkaline; gradual wavy boundary.
	40-60	IIC 2	7.5 YR 6/3	7.5 YR 5/3	10 YR 8/2	Light brown very gravelly loam, brown moist; hard, friable; 50-75% gravel & stones; many white streaks & coatings of lime; moderately alkaline.
Terrace Escarpment	-----Soil profile is non-existent-----					

\*Not applicable

Table A.4. Estimated Soil Properties

Soil	Depth to Water Table (ft)	Depth from Surface <sup>a</sup> (in.)	Dominant USDA Texture	Permiability (in./hr)	Water Capacity (in./in. soil)	Reaction (pH)	Salinity (mmhos/cm)	Shrink-Swell Potential
Loveland	2-4	0-30	Light Clay Loam	0.6-2.0	0.19-0.21	7.9-8.4	2-4	Moderate
		30-60	Very Gravelly Sand	6.0-20.0	0.03-0.05	6.6-7.8	1-4	Low
Niwot	0.5-1.5	0-14	Clay Loam & Loam	0.6-2.0	0.16-0.20	6.6-7.5	2-4	Moderate
		14-60	Gravelly Sand	>20.0	0.04-0.07	6.6-7.5	2-4	Low
Valmont	>5	0-7	Clay Loam	0.6-2.0	0.17-0.20	6.6-7.8	<2	Moderate
		7-24	Clay	0.2-0.6	0.14-0.16	6.6-8.4	<2	High
		24-60	Very Gravelly Loam	2-6	0.07-0.09	7.4-8.4	4-8	Low
Terrace Escarpment	----- Properties are too variable to be estimated -----							

<sup>a</sup>Seasonal High.

Table A.5. Feasibility of Various Engineering Activities

Soil	Pond Reservoir	Type of Construction			Terraces & Diversions
		Embankments and Dikes	Drainage for Agriculture	Irrigation	
Loveland	High water table; rapid permeability below 3 ft.	High permeability below 3 ft; medium to low shear strength.	Rapid permeability below 3 ft; some outlet problems.	Moderate intake rate; moderate water capacity.	Deep clay loam over gravel; high water table; 0-1% slope.
Niwot	High water table; rapid permeability below surface layer.	High permeability; medium shear strength; good compaction.	High water table; subject to flooding; outlet problems.	Low available water capacity; subject to flooding.	Shallow loam over gravel; flooding in places.
Valmont	Slow permeability; 1-3% slopes.	Fair compaction and shear strength above 2 ft; high shear strength below 2 ft.	Slow permeability.	Cobbly surface; moderate intake rate; moderate water capacity; 1-5% slopes.	Cobbly surface layer; 1-5% slopes.
Terrace Escarpment	----- Severe limitations for most activities -----				

Table A.6. Size Distribution of Site Soils

Soil	Depth from Surface (in.)	Percentage Passing Sieve				
		>3"	<3"			
			#4 4.7 mm	#10 2.0 mm	#40 0.42 mm	#200 0.074 mm
Loveland	0-30	0-10	100	100	85-100	50-80
	30-60	10-25	30-50	25-45	15-30	0-5
Niwot	0-14	0-10	100	95-100	80-100	55-80
	14-60	--	90-100	60-70	30-40	0-5
	0-7	0-15	80-95	75-95	65-80	50-65
Valmont	7-24	5-15	85-95	65-95	60-85	50-80
	24-60	10-20	35-50	25-35	20-30	10-20
Terrace Escarpment	----- No Data -----					

Table A.7. Site Soil Analysis of Engineering Uses

Soil	Road Fill	Sand and Gravel	Topsoil
Loveland	Fair: moderate shrink-swell potential.	Good below 3 ft.	Fair: Clay-loam texture.
Niwot	Fair.	Good for sand.	Fair: limited material; clay-loam texture.
Valmont	Poor: high shrink-swell potential in subsoil.	Poor: gravel below 2 ft.	Poor: Clay-loam texture; limited material.
Terrace Escarpment	----- Severe limitations for most uses -----		

Table A.8. Limitations of Site Soils for Recreational Uses

Soil	Surface Description	Camp Area	Picnic Area	Playground	Trails
Loveland	Clay loam or sandy clay loam surface.	Moderate.	Moderate.	Moderate.	Moderate.
Niwot	Somewhat poorly drained.	Moderate.	Moderate.	Moderate to severe.	Moderate to severe.
Valmont	Clay loam	Moderate.	Moderate.	Moderate.	Moderate.
Terrace Escarpment	Steep rocky slope.	Severe.	Severe.	Severe.	Severe.

*APPENDIX B*

*Water Quality Data for  
South Boulder Creek Park  
Project Site\**

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\*Data from *South Boulder Creek Park: Environmental Impact Assessment*, Flat-iron Companies and City of Boulder, Colo. (April 1975).

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Table B.3. Groundwater Analysis Results (from EIA, 1974)

Characteristic	Groundwater from Site, 4/73	Residential Well Above Site, 9/74	Well at Deepe Homesite, 10/74
pH	7.5	7.2	7.2
Turbidity (units)	--	<1	3.2
Dissolved Oxygen (mg/l)	--	5.0	2.0
Total Dissolved Solids (mg/l)	710	210	198
Suspended Solids (mg/l)	--	2	7
Oils and Grease (mg/l)	--	7.5	<1
MB-AS (mg/l)	--	<0.5	--
Nitrate (mg/l)	0.06	4.7	1.1
Phosphate (mg/l)	0.1	0.1	<0.01
Sodium (mg/l)	--	<1	--
Sulfate (mg/l)	210	4.1	--
Chloride (mg/l)	30	19	--
Soluble Iron (mg/l)	--	<0.05	--
Calcium (mg/l)	89	--	--
Magnesium (mg/l)	36	--	--
Carbonate (mg/l)	<0.1	--	--
Silicon Dioxide (mg/l)	10	--	--
Flouride (mg/l)	0.2	--	--
Copper (mg/l)	--	0.17	0.12
Hexavalent Chromium (mg/l)	--	<0.01	0.01
Cyanide (mg/l)	--	<0.01	0.001
Lead (mg/l)	--	<0.05	0.05
Selenium (mg/l)	--	<0.01	<0.01
Mercury (mg/l)	--	<0.01	<0.001
Cadmium (mg/l)	--	--	0.001
Arsenic (mg/l)	--	--	<0.5
Barium (mg/l)	--	--	<0.1

*APPENDIX C*

*Appendix B of  
Ordinance No. 4070\*  
City of Boulder, Colorado*

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\*The text of the ordinance reproduced here does not contain the pertinent property descriptions, statement of annexation, or preamble. The materials included here relate to conditions of use, performance standards, environmental monitoring, and provisions for shutdown of operations for cause.

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APPENDIX B<sup>1/</sup>

EXCERPT OF ORDINANCE NO. 4070, CITY OF BOULDER, FEB. 23, 1976

AN ORDINANCE ANNEXING TO THE CITY OF BOULDER CERTAIN TERRITORY, ZONING AND INCLUDING THE SAID TERRITORY IN A-E, AGRICULTURAL-ESTABLISHED, AND ISSUING A SPECIAL REVIEW USE IN PART OF SUCH TERRITORY FOR GRAVEL EXTRACTION AND RELATED ACTIVITIES THEREFORE, AMENDING THE ZONING DISTRICT MAP TO INCLUDE THE SAID TERRITORY IN THE ZONING DISTRICT HEREINABOVE MENTIONED: AND SETTING FORTH DETAILS IN RELATION THERETO.

Section 1. A public hearing was duly held in all respects according to law before the City Council on June 17, 1975, and the City Council considered the evidence presented at the said hearing, and based thereon, the City Council, as contained in Resolution No. 186, found and does hereby find and determine: that the territory proposed for annexation pursuant to the Petition for Annexation meets the applicable requirements of C.R.S. 1973, § 31-8-104 and 31-8-105, and further, that:

(a) Not less than one-sixth of the perimeter of the territory proposed to be annexed is contiguous with the City of Boulder.

(b) The territory proposed to be annexed shares a community of interest with the City of Boulder, is urban or will be urbanized in the near future, is integrated or capable of being integrated with the City of Boulder.

(c) In establishing the boundaries of the territory proposed to be annexed, no land held in identical ownership, whether consisting of one tract or parcel of real estate, or two or more contiguous tracts or parcels of real estate, has been divided into separate parts or parcels without the written consent of the landowners thereof, unless such tracts or parcels are separated by a dedicated street, road, or other public way.

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<sup>1/</sup> Various appendices to the ordinance, cited herein, have been deleted to reduce the size of copy.

(d) In establishing the boundaries of the territory proposed to be annexed, no land held in identical ownership, whether consisting of one tract or parcel of real estate, or two or more contiguous tracts or parcels of real estate, comprising twenty acres or more which, together with the buildings and improvements situated thereon, have a valuation for assessment in excess of \$200,000 for ad valorem tax purposes for the year next preceding the filing of the petition, has been included within the said territory without the written consent of the landowners.

(e) The territory proposed for annexation does not include an area included in another annexation proceeding involving the City of Boulder or a city other than the City of Boulder.

(f) Inasmuch as the present proceedings are pursuant to a Petition for annexation, which petition contains the signatures of all the landowners involved, an annexation election pursuant to § 31-8-107 (2) and 31-8-112, C.R.S. 1973, is not required.

Section 2. The City Council in addition finds, determines and concludes:

(a) The Planning Board after holding a public hearing has duly submitted to the Council an advisory report and recommendation for the annexation, A-E, Agricultural-Established, zoning, and special review use permit for the territory, and recommends affirmatively thereon;

(b) The area proposed for annexation is in the immediate environs of the City and activity on the land should be subject to City control, and annexation is therefore appropriate;

(c) That a large portion of the area proposed for annexation has a gravel deposit of high quality. It is now available for extraction and there is a need for gravel. It is a reasonable certainty that the gravel will be extracted now or in the future. It is preferable to permit the extraction now rather than later when the surrounding area will have developed further;

(d) The terms and conditions on the special review use are designed to minimize the impact upon the neighborhood and community as a whole;

(e) The extractive use, and the open space use of the land after reclamation, will be of optimum benefit to the landowner, the neighborhood and surrounding area, and the community as a whole;

(f) The zoning of the entire area being annexed is consistent with the planning therefor;

(g) Approval is consistent with the policy of state law to see that commercial mineral deposits are extracted and put to beneficial use, and the land then reclaimed;

(h) All documents necessary to protect the public interest have been executed and delivered and the City Council approves the same;

NOW, THEREFORE, BE IT ORDAINED BY THE CITY COUNCIL OF THE CITY OF BOULDER, COLORADO:

Section 3. The following territory, situated in the County of Boulder, State of Colorado, be, and the same hereby is, annexed to, and included within, the corporate boundaries of the City of Boulder:

(land description deleted)

Section 4. Chapter 37, "Land Use Regulations," of the Revised Code of the City of Boulder, 1965, as amended, and the zoning district map forming a part thereof, be, and the same hereby are, amended to zone and include the territory described in Section 3 hereof from its present zoning to A-E, Agricultural-Established, as provided in Chapter 37.

Section 5. Pursuant to Chapter 37, "Land Use Regulations," of the Revised Code of the City of Boulder, 1965, as amended, approval for a special review use to conduct an extractive industry is hereby granted, subject to the conditions set forth in Section 6 through 9, inclusive, on the following-described land:

(land description deleted)

Section 6. Conditions to Which the Use Will Be Subject.

6.1 Conditions Applicable to the Mining Process.

6.1.1 Mining to be Conducted in Stages.

Mining will be conducted in various geographical portions of the premises, which geographical portions are referred to as stages. The various stages are set forth in Appendix A, (deleted from this report). Stage one will be the first stage to be mined, and stage two north will follow, stage two south will follow stage two north, stage three will follow stage two south, stage four will follow stage three, and stage five will follow stage four.

Mining and reclamation shall be conducted to substantial completion within each stage before mining is commenced in any other stage; except that operations preparatory to mining may be commenced in the next stage when mining and reclamation in the previous stage are within 180 days of substantial completion. Such preparatory operations include, but are not limited to, trenching and the removal of overburden. The term "completion of mining" shall mean excavation of all reasonably available sand and gravel within the area to be mined to within eight inches above the underlying shale. Reclamation shall be deemed substantially completed when all grading, initial seeding and initial planting in that stage have been completed, except for the construction, seeding, and planting of landforms and areas to be reclaimed by use of overburden from the next subsequent stage. If the City Manager, with the concurrence of the City Council, determines that mining and reclamation on the preceding stage have not been substantially completed prior to the commencement of mining on the next stage, the City Manager may issue a "shutdown of operations" order as to this next stage in accordance with paragraph 9.3.3 to prevent any further mining operations until the substantial completion of mining and reclamation on the previous stage.

Each stage shall be mined and reclaimed in sequence, with reclamation of areas mined, within the stages, to be carried out as set forth in paragraph 6.2.1. Reclamation shall occur concurrently with mining, to the extent practical. The term "reclamation" shall mean and include all steps, processes, activities and results set forth in paragraphs 6.2.1 to 6.2.4, inclusive, plus construction of the improvements set forth in paragraph 6.10. Should the reclamation of the preceding stage not be proceeding in accordance with all plans, timing and specifications contained herein, the City Manager may issue a "shut-down of operations" order in accordance with paragraph 9.3.3 to prevent any further mining operations until the reclamation on the previous stage is brought into compliance.

Prior to the commencement of any mining or preparatory operations in stage one, Flatiron shall completely construct the berm along the Turnpike located in stage one, according to the plans and specifications set forth in paragraphs 6.2.1, 6.2.2 and in compliance with paragraph 6.2.4. The plant and settling ponds may be constructed on stage five prior to the commencement of the mining on stage one.

## 6.1.2 Timing for Mining.

### 6.1.2.1 Time Limit for Initial Construction.

Construction of the plant site, settling ponds and the visual screening referred to in paragraph 6.2.3 shall be commenced prior to the first October 1st following approval of the use by special review and all related permits or termination of any litigation contesting the validity of same, whichever is later.

### 6.1.2.2 Time Limits for Each Stage.

Following are the time limits for mining on each stage:

<u>STAGE NO.</u>	<u>COMMENCEMENT TIME</u>	<u>COMPLETION PERIOD</u>
1	Not later than 24 months after the commencement of construction on the plant site as described in paragraph 6.1.2.1	Not later than 3 years after mining on stage one was commenced.
2N	Not later than 3 years after mining on stage one was commenced.	Not later than 6 years after mining on stage one was commenced.
2S	OPEN	Not later than 3 years after mining on stage two south was commenced.
3	OPEN	Not later than 20 years after mining on stage one was commenced.
4	OPEN	Not later than 20 years after mining on stage one was commenced.
5	OPEN	Not later than 20 years after mining on stage one was commenced.

#### 6.1.2.3 Overall Time Limit.

Except as hereinafter set forth, mining shall be concluded not later than 20 years after mining on stage one was commenced. All equipment, stockpiles and plant buildings shall be removed from the premises no later than 22 years after mining on stage one was commenced. Reclamation of the premises shall be promptly completed in accordance with paragraphs 6.2.1 and 6.2.2 of this permit.

It is understood that this permit is expressly contingent upon issuance of, and compliance with, all applicable state permits with respect to each and every stage of this proposal. Flatiron shall commence immediately and diligently process the applications for all such permits.

#### 6.1.2.4 Extensions of Time--Market Conditions

The time limits contained herein are specific and must be conformed to; however, the City recognizes that market conditions beyond Flatiron's control may prevent it from being able to sell all the sand and gravel to be excavated from the premises within 20 years from the commencement of mining on stage one. Therefore, the City Manager, with the concurrence of the City Council, upon petition by Flatiron and presentation of sufficient evidence of the conditions set forth below, may grant an extension of time during which the permitted use shall be allowed for the mining and reclamation of stages two south, three, four or five, but in no event shall the period of use be extended beyond two years from mining and removal termination dates as referred to in paragraph 6.1.2.3. The City Council may, however, by motion or resolution, grant up to an additional three years beyond the said two years on the same terms and conditions.

#### 6.1.2.5 Conditions for Extension of Time.

If less than 10.5 million tons of sand and gravel, excavated from Flatiron pits in the production areas, are sold between January 1, 1976, and January 31, 1990, then Flatiron shall be granted an extension of 180 days for each full 350,000 tons by which the actual sale figure is less than 10.5 million, but in no event shall the period of use be extended by the City Manager with the concurrence of the City Council beyond two years from mining and removal termination dates as referred to in paragraph 6.1.2.3. The City Council may, however, by motion or resolution, grant up to an additional three years beyond the said two years on the same terms and conditions.

"Flatiron pits" as used herein shall be defined as sand or gravel deposits or mines now or hereafter owned by Flatiron or leased by Flatiron as the operator; the term "Flatiron" shall include entities controlled by or under common control by Flatiron.

"Production area" as used herein shall be described as that portion of Boulder County, Colorado, lying between the county line on the south and west, on the north; and the county line on the east.

"Sand and gravel excavated and sold or used from Flatiron pits" as used herein shall include sand and gravel used or sold as part of concrete and road construction or surfacing materials and asphalt paving or other products, as well as sand and gravel sold without combination with other materials.

Nothing herein is intended to limit Flatiron's market area for sand and/or gravel mined on the premises.

#### 6.1.2.6 Extension of Time--Natural Catastrophe.

The City Manager, with the concurrence of the City Council, upon petition by Flatiron and presentation of sufficient evidence, may extend the dates by which Flatiron is required to complete any item required herein because of delays caused by flood, fire, strike, windstorm, war, civil disorder, national or local emergency, inavailability of fuel or materials, or other cause of catastrophe beyond the reasonable control of Flatiron, if such delay affects the premises. In no event shall the period of use be extended beyond two years from mining and removal termination dates as referred to in paragraph 6.1.2.3. The City Council may, however, by motion or resolution, grant up to an additional three years beyond the said two years on the same terms and conditions.

#### 6.1.3 Method of Mining.

All stages will be mined using a dry excavation process. Dry excavation and dewatering are defined as follows:

Dry Excavation: Mining within a site having been dewatered. After stripping, the pit run gravel is excavated by means of equipment working into the unmined face of gravel, loaded into trucks, scrapers, or conveyor system, and carried to the processing plant. Gravel strata is excavated down to within approximately 0.8 feet from underlying shale so that a tractable running surface for loaders and other wheeled equipment can be maintained.

Dewatering: Removal of ground water from gravel strata by draining it into a peripheral dewatering trench. The trench is excavated below the gravel strata into shale and is sloped to drain to one point, or sump, where the collected water is pumped into the nearest receiving water body or used for reclamation or dust abatement. The dewatering trench "cuts off" the flow of ground water into the mining site and allows the interior to drain.

Following the completion of mining in each stage, Flatiron shall modify, as necessary, the dewatering facilities to accomplish the reclamation plan for that stage. In no event and at no time shall the City be obligated to operate and/or maintain and ground water pumps or pumping station.

## 6.2 Reclamation of Mined Area, and Visual Screening of the Areas to be Mined.

### 6.2.1. Landforms to be Completed Within Each Stage After Completion of Mining Within that Stage; Time Limits for Completion of Landforms.

Flatiron shall construct within each stage in areas, which have been mined, those landforms described in Appendix B (deleted from this report). The landforms which are to be constructed on areas on which mining has been completed as of any November 30 shall be constructed on or before the following June 1; except for landforms on areas used as roads, landforms in areas which will necessarily be disturbed by future mining in the same stage, and landforms which cannot be completed because the necessary overburden must come from future mining within the same or next stage. Landforms shall be covered with topsoil in the manner and amount set forth in paragraph 3 of "Planting Instruction for Native Grass Areas" contained in Appendix C (deleted from this report). All landforms shown in connection with a particular stage shall be completed within 180 days after actual completion of mining in that stage, or 180 days after the date when mining is required to be completed in that stage (if mining has been commenced in that stage), whichever sooner occurs.

All completed landforms shall be planted in accordance with paragraph 6.2.2. Flatiron shall use its best efforts and diligence to ensure that mining in the area of a particular landform is completed by November 30, so that landforms can be promptly constructed and planted in accordance with this paragraph.

See paragraph 9.3.3 concerning shutdown of mining operations (and other sanctions) if reclamation requirements are not met.

6.2.2. Landscaping Materials to be Planted Within Each Stage; Time for Completion of Landscaping; Replacement of Plants Which do not Survive.

Flatiron shall supply and plant within each stage which has been mined and on which landforms have been constructed, the landscaping materials described in Appendix C. Flatiron and the City Manager, or his delegate, with the concurrence of the City Council, by mutual agreement, may vary the species to be originally planted or used as a replacement in light of survival experience and availability of the various species and hybrid species which may be developed. Landscaping materials shall be planted within the following time limits: Landscaping materials which are to be planted on areas on which mining has been completed as of any November 30 shall be planted on or before the following June 15; except for materials to be planted on landforms which are not required to be completed on that June 15.

All landscaping materials required to be planted within a particular stage will be planted on or before that June 15 which next succeeds the first November 30 as of which mining has been completed in the particular stage.

All trees and shrubs which are not alive or have not "broken bud" on the first June 16 which is more than one year after date of planting will be replaced by Flatiron on or before the following June 16. Bare spots in grass plantings which exist on the first March 30 which is more than three months after date of planting shall be appropriately reseeded by Flatiron on or before the following June 16. Flatiron will make only one such replacement of any required tree, shrub or grass planting. Flatiron will install, operate and maintain an adequate drip irrigation system irrigating planted trees and shrubs for three years after date of initial planting, to maintain vitality of trees and shrubs. All replacements shall be of equal size as those being replaced. At the end of the three-year period, Flatiron shall leave in place any buried piping which is part of the system, but shall have no further obligation to operate or maintain same.

Replacements required pursuant to the preceding paragraph will be of the same species and size as originally required, unless mutually agreed by Flatiron and the City Manager with the concurrence of the City Council; provided, however, that if any *juniperus virginiani scopulorum* or *p.j. juniperus cheninsis pfitzer* is required to be replaced in stage one, Flatiron may replace *juniperus virginiani scopulorum* with any of the following: cottonwood, Russian olive, green ash, or New Mexico locust; and may replace *p.j. juniperus cheninsis pfitzer* shrubs with a specimen of any of the following: chokecherry, smooth sumac, or skunkbush. If Flatiron elects not to replace with evergreens, then the City Manager, with the concurrence of the City Council, shall determine which of the alternate species shall be used. Replacements shall be of a size similar to that of the specimen being replaced.

In addition to the replacement requirements set forth above, Flatiron shall replace dead trees and shrubs so as to meet the following requirement. On the first June 16 which is more than three years after the date when mining is completed in any stage, the number of trees and shrubs required to be planted in that stage which have "broken bud" shall be counted. If the number of trees or shrubs which have broken bud is less than 80% of the number of trees or shrubs required to be planted in that stage, then Flatiron will replant the number of trees equal to the deficiency from 80%, and in addition, Flatiron will replant a number of trees which is equal to the deficiency from 80% multiplied by the percent of the total required trees which died after planting or had not broken bud at date of count. For example, if 200 trees were required to be planted on a particular stage, on date of count 140 trees had broken bud and 10 trees had previously died and been replaced, the Flatiron would replant that number of trees which is calculated as follows:

Required Plantings:	200
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80% of required plantings:	160
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Trees which had broken bud on date of count:	<u>140</u>
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Deficiency of Trees which had broken bud from 80% of those required:	20
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Percent of trees planted  
which previously died or  
had not broken bud on  
date of count:

Had not broken bud on date of count	60
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Previously died and were replaced:	<u>10</u>
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Total:	70
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70 is 35% of 200, the  
required number.

35% of 20 (the deficiency from 80%) is	7
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So total trees replanted would be 20 plus 7, or	27
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The number of shrubs to be replanted will be similarly calculated.

The replanting shall be accomplished on or before that June 15 which next follows the June 16 when the count is to be made. Flatiron may perform any or all of the replanting in advance of the date when the count is to be made. Flatiron will choose which trees and shrubs are to be replaced in order to make the required number of replantings.

See paragraph 9.3.3 concerning shutdown of mining operations if reclamation requirements are not met.

### 6.2.3 Visual Screening.

#### 6.2.3.1 Screening along U.S. 36

Prior to commencement of preparatory operations or mining within stage one, Flatiron will construct the berm on stage one described in Appendix B. The landforms shall be covered with sufficient topsoil which is removed in the process of removing overburden. Flatiron will plant thereon the landscaping materials described in Appendices B and C within the time limits hereinafter set forth. Flatiron and the City Manager, or his delegate, may, by mutual agreement, vary the species to be originally planted or used as replacements, in light of survival experience and availability of the various species and any hybrid species which may be developed. Construction will be completed prior to commencement of mining (except such mining as is necessary for construction of the landforms). All provisions of paragraph 6.2.2 relating to planting and replanting of landscaping materials shall apply to the landscaping requirements of this paragraph 6.2.3.1.

#### 6.2.3.2 Screening of Hy View and Trantra Subdivisions.

Upon the written request of the City Manager, with the concurrence of the City Council, Flatiron will construct any one of the following devices intended as a visual screen between the premises and Hy View Subdivision and Tantra Subdivision: (a) a fence no more than seven feet in height; constructed of wood, to be reasonably maintained by Flatiron so long as mining is being carried on within the premises; or (b) an earthen berm no more than seven feet in height, which shall be planted to grass in the same manner as reclaimed areas which are to be planted to grass; or (c) not more than thirty clumps of trees, with no more than five trees per clump, each tree to be not more than 2" caliper when planted, trees to be cottonwoods, Russian olives, elms, or a mixture of same. Flatiron will construct an adequate drip irrigation system for the trees and operate and maintain same for three years after date of planting. Planting will be performed in the same manner as required for planting of trees in areas to be reclaimed.

The visual screen will be located on west boundary of the Flatiron property where same is immediately east of the easterly boundary of Lots Ten through Thirty, Block One, Hy View Subdivision, and immediately east of the eastern boundary of same extended south 300 feet, and on the west boundary of the Flatiron property where the same is immediately east of the east boundary of Tantra Subdivision, for a distance of about 1,500 feet, or such lesser area is designated by the City Manager with the concurrence of the City Council.

#### 6.2.4 Bonding of Landform Construction and Landscaping.

Prior to commencement of mining or preparatory operations in any stage, Flatiron shall provide to the City and pay the premium for a performance bond in the form set forth in Appendix D (deleted from this report), or substantially similar form reasonably satisfactory to the City Manager. The bond shall be issued by a surety company authorized to do business in the State of Colorado, or other surety reasonably satisfactory to the City Manager of the City. The performance bond shall cover all Flatiron's obligations to complete its obligations pursuant to paragraphs 6.2.1 and 6.2.2 and the appendices associated therewith. The bond for stage one shall also cover Flatiron's obligations in paragraph 6.2.3 and appendix associated therewith.

The amount of the bond shall be 110 percent of the cost of construction of the improvements, including the landforms and cost of purchasing and installing the drip irrigating system, plus 15 percent of the cost of purchasing and planting replacement materials, as estimated by an independent consulting engineer duly registered to practice in Colorado, proposed by Flatiron and approved by the City Manager, which approval shall not be unreasonably withheld. The City shall conduct inspections of the work as from time to time requested by Flatiron, and shall authorize releases or reduction in the amount of the bond commensurate with the proportion of the work completed at the time of the inspection.

The bond may cover a period of time less than the maximum permissible time for mining and reclaiming the stage in question, but since the bond obligation includes any necessary replanting, it shall continue in sufficient amount and time after the initial planting of each stage as set forth in paragraph 6.2.2 to cover replantings, and the bond may be extended by payment of additional premiums or providing of a substituted bond. If no such extension or substitution is made, Flatiron shall be in default under bond.

### 6.3 Processing, Sale and Removal of Extracted Materials Plant Sites; Stockpiles; Accessory Uses.

#### 6.3.1 Plant Permitted.

Flatiron shall be permitted to have and operate on stage five, equipment for crushing, screening, sorting, washing, stockpiling, weighing and loading extracted materials, and such equipment may include, as part thereof, equipment for the extraction of placer gold or other incidental materials association with the sand and gravel. Flatiron shall also be permitted to protect the plant site and remove it from the floodway with a dike pursuant to paragraph 6.10. Flatiron will not process through the plant on the premises more than 15,000 tons per year of materials which are hauled in from outside the premises, except for materials excavated from the existing sand and gravel mine now operated by Loveland Ready Mix, Inc., located immediately south of the premises.

Overburden will be stripped from the plant area to create a clean site for the plant, stockpiles, and vehicular movement. This overburden will be used along the north edge of the future lake site in stage one to construct the visual screen referred to in paragraph 6.2.3. Any remaining overburden will be used in stage five to provide a temporary flood control berm for protection of the plant site during its operation.

#### 6.3.2 Settling Ponds Permitted.

Flatiron shall be permitted to construct and operate settling ponds on stage five as shown on Appendix B for the purposes of settling out sediment from water used to wash gravel or reduce dust.

A dewatering trench will be constructed to drain the ground water from the area of the settling pond. When dewatered, this area will be mined and mineral processed by a portable plant and stockpiled in the area established for stockpiles. This mined area will then become the settling pond for the rest of the mining operation. Initial water for washing, as well as a small amount of additional water required to make up for water loss during processing, will be provided from surface water rights or ground waters now utilized on the premises.

The settling pond will be drained as needed and deposited sediment excavated from its bottom. The sediment may be used in constructing the various landforms required by Appendix B.

### 6.3.3 Stockpiles Permitted.

Stockpiles shall be permitted within stage five, except for stockpiles of material to be used in the reclamation process on any stage, which stockpiles may be located on that stage, and except that until completion of reclamation of stage three, temporary or "surge" stockpiles of unprocessed raw material may be located in the southernmost 20 acres of stage three and the northernmost one-half of stage four. Mining of stage two south will not be commenced until the stockpiles have been removed from stage three. Height of stockpiles shall be limited to a maximum of 35 feet. No materials from off the premises will be stockpiled on the premises, except materials excavated from the existing sand and gravel mine now operated by Loveland Ready Mix, Inc., located immediately south of the premises.

### 6.3.4 Accessory Uses Permitted.

Flatiron shall be permitted to have and operate within stage five, an office (where sales of extracted material may be made), a scalehouse, a scale, and buildings for storing and maintaining equipment.

### 6.3.5 Fencing and Security Required.

Fencing and security shall be provided as described in Appendix E (deleted from this report).

### 6.3.6 Site Plan Review Required.

At the time that the plant design is completed, but prior to the start of construction of plant, Flatiron shall submit plant drawings showing location and elevation, maximum height of all fixed buildings and structures, location of stockpiles and permanent processing equipment, and details of proposed signs and lighting.

The uses set forth in paragraphs 6.3.1 to 6.3.5, inclusive, are subject to all City codes, ordinances, and regulations, as such may be adopted and amended from time to time.

The special use review drawings dated May, 1975, as revised on September 5, 1975, October 16, 1975, and November 26, 1975, comprise the site plan drawings for this project concerning topography, land use, traffic and circulation systems, intersections with public rights-of-way, dedications, flood and drainage systems, and general and detailed landscaping.

## 6.4 Air Quality.

### 6.4.1 Air Quality Maintenance Procedures.

Roads from the plant site to be paved public road system will be paved or chip sealed and maintained in an appropriate manner. Roads from the stage being mined to the plant site, and areas within the plant site which are regularly traveled by vehicles, will be adequately sprayed with water during each working day, at least prior to 9:00 A.M., and again prior to 1:00 P.M., so as to thoroughly wet the surface and prevent excessive dust emission, unless the surface is already wet from natural precipitation, and unless the temperature at the time when spraying would occur is below freezing.

Water spray bars will be installed and operated on crushing and screening equipment as follows. There will be two adequate spray bars on the intake conveyor belt of the equipment (the point at which raw material enters the system), one on each end of the belt. Spray bars will be operated whenever the water content of the raw material is less than 7-1/2 (.075) percent, unless the temperature at the time when spraying would occur is below freezing. Flatiron may make tests for the purpose of demonstrating that significant dust is not generated at a lesser water content than 7-1/2 percent and apply to the City Manager (or his delegate) for a determination that the lesser standard shall apply, which determination shall not be unreasonably withheld.

### 6.4.2 Air Quality Standards.

Flatiron shall comply at all times with all applicable state and federal air pollution regulations, and with the terms and requirements of the applicable "Fugitive Dust Emission Permit" as issued by the Colorado Air Pollution Control Division, Department of Health, under terms of Regulation No. 1, Part II. D.4, D.6, D.7, D.9, which state:

No land developer of a new, or owner of an existing construction or land development project shall throughout the duration of the project, disturb or contract or disturb by grading, excavating or depositing on more total surface area than five (5) acres of land (in the aggregate) unless abatement and preventive measures as outlined in Section II. D.9 are being met continually.

Section II D.7: When a complaint of dust or fugitive dust is registered with the Division by a single complainant or multiple complainants who allege that any dust or fugitive dust obstructs or interferes with the reasonable and comfortable use of his or their property, the Division shall investigate and if the Division finds that such conditions exist, the Division shall issue a citation to the person or persons from whose land or activity the objectionable emission emanates and shall require a fugitive dust control plan containing reasonable control measures where appropriate according to the abatement and preventive measures as outlined in Section II D.9.

Complaints regarding dust or fugitive dust may be registered with the Boulder City-County air pollution control officer at the Boulder City-County Health Department.

#### 6.4.3 Air Quality Monitoring Procedures.

In the event that complaints of dust or fugitive dust are registered with the Colorado Air Pollution Control Division, City of Boulder, or Boulder City-County air pollution control officers, Flatiron shall cooperate with the appropriate agency in their investigations of the source of the alleged emissions, as provided for in Regulation No. 1, Part II D.7 of the Colorado Air Pollution Control Act.

To contribute to this investigation and provide quantitative data on dust additions to the ambient air, Flatiron will, upon formal request of the City of County, monitor the concentration of airborne particulate matter at requested locations. Monitoring locations shall be chosen to provide representative samplings of air quality.

Monitoring will be performed by high volume sampler using the approved EPA reference method. Results of the monitoring will be transmitted to the Boulder City-County Health Department until the source of excess emissions is determined and appropriate remedies are applied.

#### 6.4.4 High Winds.

Flatiron will install and operate an anemometer for continuous measurement and recording of wind speed at the plant site. At any time when the mean wind speed, as determined visually from the recorded wind speed trace over the most recent 10-minute period, exceeds 30 miles per hour, then mining, earth moving, and hauling of materials to the plant site will be shut down within stages one and two north. Such operations may be resumed only when the mean wind speed, determined as above provided, has been less than 30 miles per hour for a continuous period of at least 10 minutes. These provisions are in addition to those contained in paragraph 9.3.3.

#### 6.5 Water Quality.

##### 6.5.1 Water Quality Maintenance Procedures-- Mining Operations.

During dewatering operations required for the dry mining process, ground water which is pumped or otherwise discharged from dewatering trenches may be discharged into South Boulder Creek. No other discharges will be made from areas being mined (temporary erosion may occur in the event of flooding, however). Oil, grease, human wastes or other deleterious substances shall not be left on the surface of the ground, or placed on or into the ground in such a fashion that they could enter the ground water or be carried into the stream or lake by surface or subsurface runoff.

##### 6.5.2 Water Quality Maintenance Procedures-- Plant Operations

No discharges into South Boulder Creek will be made from the plant site (temporary erosion may occur in the event of flooding, however). Oil, grease, human wastes or other deleterious substances shall not be left on the surface of the ground, or placed in the ground in such a fashion that they could enter the ground water or be carried into the stream by surface or subsurface runoff.

The system for washing extracted sands and gravels and spraying of materials being processed will consist of a series of settling ponds and the recirculation of wash water in a closed system so that none of the water is discharged directly to South Boulder Creek. Deposited sediments will be periodically removed from the settling ponds and may be used for reclamation.

### 6.5.3 Water Quality Monitoring Procedure.

Monitoring of water quality will be done as set forth in "Standard Methods of Examination of Water and Wastewater," latest edition or succeeding publication, published by the American Public Health Association, or equivalent procedures.

Results of this monitoring shall be transmitted to the Boulder City-County Health Department.

### 6.5.4 Water Quality Standards for all Operations.

Water discharged into South Boulder Creek, excluding agricultural waste water and storm runoff, will meet the following standards:

a) The settleable solids in any water discharged into South Boulder Creek shall not exceed 0.5 milliliters per liter (ml/l) (sic)

b) Suspended solids (S.S.), including settleable solids, shall not exceed the following limits after the following dates, in milligrams per liter (mg/l):

<u>Date</u>	<u>S.S.</u>
July 1, 1975	25 mg/l
July 1, 1978	20 mg/l

c) The turbidity in any water discharged into South Boulder Creek shall not exceed the following limits after the following dates:

<u>Date</u>	<u>Turbidity</u>
July 1, 1975	25 Jackson Units
July 1, 1978	20 Jackson Units

d) The color in any water discharged into South Boulder Creek shall not exceed the following limits after the following dates:

<u>Date</u>	<u>Color</u>
July 1, 1975	25 Units
July 1, 1978	20 Units

e) Total oil and grease in any water discharged into South Boulder Creek shall not exceed 10 mg/l.

The foregoing standards shall be interpreted as provided by regulations of the Colorado Department of Health.

Flatiron shall install a monitoring system in accordance with the principles set forth in Appendix F (deleted from this report) to observe the water quality of discharges from the mining and reclamation operations. The monitoring program shall be approved in advance by the City, which approval shall not be unreasonably withheld.

These standards are to be achieved by Flatiron regardless of compliance with paragraphs 6.5.1 and 6.5.2.

These requirements are in addition to, and not in lieu of, state and/or federal water pollution requirements, as such may be established or amended from time to time, and should they be, or become, in conflict with state or federal requirements the more stringent shall apply and, if not contained herein, are made substitute herefor.

#### 6.6 Acoustical Controls.

The City noise control ordinance (Section 21-14 of the City Code, as amended from time to time) and related sections, or any succeeding sections of the Code, shall govern noise generated on the premises. For purposes of Section 21-14 (c)(1), the "property on which noise source is located" shall include the property annexed and set forth in Section 3. Areas shall cease to be included within the "property" referred to in Section 21-14(c)(1) when either construction of structures thereon is begun in compliance with Section 7 hereof, or the areas cease to be owned by Flatiron or related entities.

#### 6.7 Traffic, Roads and Bridges.

##### 6.7.1 Traffic and Roads within the Plant Site, Mining Areas and between Mining Areas and Plant and Stockpile Sites.

Regular traffic in the premises will be restricted to roadways which are treated for dust control in the manner set forth in paragraph 6.4.1 Regular traffic is that vehicular movement which occurs on numerous occasions on each day between two well-defined points, such as the place where mining is occurring and the stockpile area.

### 6.7.2 Roads Between Plant Site and Public Throughfares.

Roads between plant sites and public throughfares shall be located as shown on Appendix G (deleted from this report) and shall be surfaced in the manner set forth in paragraph 6.4.1.

### 6.7.3 Creek Crossing.

A crossing across South Boulder Creek shall be permitted or required in the discretion of the City Manager with the concurrence of the City Council. If required, it shall be constructed by Flatiron, as shown in Appendix H (deleted from this report).

### 6.7.4 Intersections.

Intersections in Appendix I (deleted from this report) will be constructed by Flatiron after review and approval of the intersection plans, design and materials by the City Manager of his representative.

### 6.7.5 Traffic onto Public Throughfares.

In view of possible congestion of Table Mesa Drive where the haul road meets Table Mesa Drive/South Boulder Road, the following restrictions are imposed on trucks hauling material from the premises over the haul road which intersects Table Mesa Drive and thereafter proceeding on Table Mesa Drive:

Not more than 10 loaded single axle, tandem, or dump trucks will travel the route described above per hour which falls within the periods between the hours of 7:30 A.M. to 8:30 A.M. and 4:00 P.M. to 5:30 P.M. Truck traffic during these time shall be spaced to that there is a minimum interval of at least five minutes between trucks entering onto Table Mesa Drive.

### 6.8 Plant Operating Hours.

Normal plant operating hours will be from 7:30 A.M. to 6:30 P.M., Monday through Friday.

Normal hours for sale of materials and hauling of materials from plant site to public streets will be from 7:00 A.M. to 6:30 P.M., Monday through Saturday. No vehicle in excess of one-ton capacity will be permitted to enter or leave the site on Saturday.

Normal hours for mining and related operations will be from 7:30 P.M. to 6:30 P.M., Monday through Friday.

Except as provided below, the operations referred to above (sale and hauling of materials, plant operations and mining operations) will not be conducted between 6:30 P.M. and 7:00 A.M.

Normal hours for maintenance, repair and cleaning of buildings and equipment shall not be restricted so long as all applicable City ordinances are complied with.

Flatiron may operate at times other than normal hours whenever reasonably necessitated by fire, flood, windstorm, civil disorder, or local or national emergency, or other casualty or emergency beyond the control of Flatiron, or substantial risk thereof. In such event, Flatiron shall apply to the City Manager for permission to operate outside the hours set forth above, which permission shall not be unreasonably withheld, considering the public health, safety and welfare. In the event of immediate hazard from flood, fire or windstorm, Flatiron may proceed to operate outside the hours set forth above without first obtaining permission, but shall apply for permission as soon as practical.

Flatiron may also be given permission to operate at times other than the required and normal hours herein set forth in the event of unusual scheduling operations due to market conditions and the press of construction schedules. An application will be made by Flatiron for the exception to the City Manager. The exception will be granted if the City Manager and the City Council in their sole and absolute discretion deem it appropriate in the circumstances.

### 6.9 Water Distribution and Useage.

The water supply plan for the reclaimed area shall be based on retaining water rights presently used for pasture irrigation on the existing site, and converting their application to irrigation, stream and lake preservation and recreation. Stream depletions will be equated to historic depletion by balancing land use under critical and average-year conditions. Water supply to maintain lake levels and circulation within the lake system will be derived from ground water and surface runoff of portions of the area tributary to the site, and from irrigation water historically used on the premises. In addition, some return flow from irrigation by water from the Dry Creek No. 2 Ditch will be available to the lake. Inflow/outflow studies for the critical period 1953 through 1955 indicate that sufficient ground water and surface water runoff was available to maintain an adequate flow through of water in the lake to be constructed in stage one. It is anticipated that in periods of less than average moisture, lake levels and marsh areas may decrease somewhat in accordance with the natural cycle common to a semi-arid climate such as exists in Boulder, Colorado. Water use areas will be balanced so there is no net increase in stream depletion or adverse effect on other water rights. Lake levels will be established and maintained so as to prevent significant interference with historic ground water flow patterns to South Boulder Creek or loss of water from South Boulder Creek to excavated areas.

Dewatering operations during gravel extraction will be conducted in such a manner as to not interfere with wells on adjacent property. Flatiron shall install an approved monitoring system in accordance with paragraph 6.5.4 to determine whether its operations are adversely affecting such wells. The monitoring system shall be approved in advance by the City, which approval may not be unreasonably withheld. In the event the monitoring system indicates any significant adverse effect on any existing, off-site wells, Flatiron shall immediately take appropriate measures to insure and sustain the affected water level in those wells.

Dewatering, mining and reclamation will result in periodic or permanent lowering of ground water levels in areas mined and in some areas adjacent to those mined.

All necessary measures as shown on Appendices B and H (deleted from this report), including construction of impervious areas and shale layers on embankment slopes, will be undertaken to correct any significant adverse effect on water levels in South Boulder Creek. Underground flow and leakage from the main lake will be reduced by construction as shown on Appendices B and J (deleted from this report).

The Dry Creek No. 2 Ditch will be relocated in accordance with Appendices B and K (deleted from this report), subject to approval by the ditch company.

A portion of the water historically used on the premises will be used for washing of sand and gravel and dust control measures.

#### 6.10 Flood Control and Drainage.

The historic flow patterns of South Boulder Creek and Dry Creek No. 2 Ditch downstream of the site and adjacent to the site will not be significantly altered by the mining and reclamation activities. Gravel excavations and final land configurations will create temporary flood storage that will moderate peak flood flows. A series of channels, ponds and lakes will carry ground water from the reclaimed land areas to South Boulder Creek. Mining and plant facilities, including stockpiles, will be placed above the 100-year flood elevation or protected by berms. None of the on-site activities will add to debris accumulation during flooding.

Flatiron shall construct, as part of the reclamation of the relevant stages, the following structural improvements as shown on Appendices B and K: The low flow discharge and overflow spillways for each of the two ponds and lake, the lake berm, internal drainage facilities (but no culvert crossings or crossings over overflow structures); the Dry Creek Ditch relocations, the flood diversion dikes and the drain inlets. Structural improvements as part of the drainage plan include only those improvements or facilities necessary for flood control or drainage.

A temporary flood control measure is a protective dike around the plant site and wash water settling ponds to remove them from the 100-year flood plain. The Dry Creek No. 2 Ditch will require a temporary relocation during the early stages until completion of the north and west lake berms, and will then be relocated by Flatiron to its permanent position as shown in Appendices B and K.

## Section 7. Restrictions and Requirements on Adjacent Property.

### 7.1 Restrictions on Construction of Structures on Adjacent Property.

No applications and plans for construction of new structures will be processed on the property described on Appendix L (deleted from this report), until completion of mining and reclamation on stage two north. No applications and plans for construction of new structures will be processed on the property described on Appendix M (deleted from this report), until completion of mining and reclamation of stage two north. No applications and plans for construction of new structures will be processed on the property described on Appendix N (deleted from this report), until completion of mining and reclamation of stage two south.

Roads described herein, alterations of the contour of the land and flood control or drainage facilities shall not be deemed to be structures.

### 7.2 Reclamation of Adjacent Areas.

On or before June 15 which follows granting of this approval by 45 or more, Flatiron will plant Foothills Mix grass seed on the area described in Appendix O (deleted from this report), except for areas then covered by stockpiles of material, roadways, and areas used for loading and removal of stockpiled material. When stockpiled material have been removed, Flatiron will similarly plant remaining unplanted areas on the first June 15 which follows such removal by 20 days or more. Bare spots which exist on the first March 30 which is more than three months after date of planting will be appropriately reseeded by Flatiron on or before the following June 16.

The air quality maintenance procedures set forth in paragraph 6.4.1 shall apply to the area described in Appendix O until reclaimed as above described.

### 7.3 Irrigation of Deepe Farm Site.

During dewatering and mining of stage four, Flatiron will adequately irrigate the trees and shrubs on the Deepe farm site.

Section 8. Insurance.

Until completion of all mining and reclamation, Flatiron will name the City as an additional insured on its public liability insurance policies with regard to the subject property, which policies shall be made available to the City Manager. Said policies shall have coverage and limits reasonably acceptable to the City Manager, and in any event, limits no less than \$500,000 per person, per accident.

Section 9. Enforcement of the Conditions of the Approval.

9.1 Conditions of Approval to be Part of the Zoning Map and Ordinance Applicable to the Premises.

The conditions imposed herein upon the use permitted are imposed under the provisions of Section 37-402(d), 37-402(f) and 37-403(b) of the City Code, are a part of the site plan of the premises, and become a part of the zoning map and zoning ordinance applicable to the premises pursuant to Section 37-402(h) of the City Code.

9.2 Inspections of the Premises.

9.2.1 Regular Annual Inspections.

The City Manager or his delegate shall make regular, annual inspections of the premises between May 15 and June 16 of each year and advise Flatiron of any deficiencies noted and the results of the inspection shall be made available to the City Council and the public.

9.2.2 Discretionary Inspections.

Upon complaint of any citizen, or upon the initiative of the City Manager, the City Manager or his delegate or representatives of the Boulder City-County Health Department may inspect the premises at any time.

9.2.3 Inspections for Purposes of Release from Bonds.

Upon request of Flatiron, the City Manager or his delegate shall promptly inspect reclaimed areas for purposes of determining whether any bond should be released in whole or in part (see paragraph 6.2.4).

Section 8. Insurance.

Until completion of all mining and reclamation, Flatiron will name the City as an additional insured on its public liability insurance policies with regard to the subject property, which policies shall be made available to the City Manager. Said policies shall have coverage and limits reasonably acceptable to the City Manager, and in any event, limits no less than \$500,000 per person, per accident.

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Upon request of Flatiron, the City Manager or his delegate shall promptly inspect reclaimed areas for purposes of determining whether any bond should be released in whole or in part (see paragraph 6.2.4).

### 9.3 Sanctions for Violations of Conditions.

#### 9.3.1 Fines.

Fines for violation of any of the conditions imposed by this approval may be imposed under Sections 37-901 and 37-902 and related provisions of the City Code, as from time to time amended or superseded, such fines to be imposed in the same manner as fines for other violations of the zoning ordinance.

#### 9.3.2 Injunctive Relief.

The City may seek injunctive relief against any violation of any of the conditions imposed by this approval under Section 37-901 (a) (4) and (f) and related provisions of the City Code, as from time to time amended, such injunctive relief to be obtained in the same manner as injunctive relief for other violations of the zoning ordinance.

#### 9.3.3 Shutdown of Operations.

In the event of a violation of any of the conditions set forth herein which by its nature is continuous (such as but not limited to failure to properly perform reclamation within required time limits, mislocation of a plant site, or failure to install proper dust-control equipment), the City Manager, upon receiving the concurrence of the City Council, may order some or all of the operations on the premises to be shut down, in the following manner: The City Manager shall hold a hearing on the proposed shutdown, at which Flatiron shall be permitted to present evidence and cross-examine witnesses. Flatiron shall be given a written notice of the hearing at least 20 days in advance of the hearing. This notice shall state with particularity the alleged violation or violations which will be raised at the hearing. Testimony at the hearing shall be given under oath. In the event that the City Manager determines upon substantial competent evidence that a continuing violation exists, the City Manager, upon receiving the concurrence of the City Council, may order the offending portion of the operations or any relevant portion thereof shut down until the violation is corrected. In the event of a violation which consists of failure of Flatiron to comply with its obligations to construct landforms or drip irrigation systems or plant or replace landscaping materials, mining operations may be shut down until the violation is corrected. Work necessary to correct the violation may proceed, however. In the event of a continuing violation which constitutes an immediate and serious threat of bodily injury, damage to public health or safety, unforeseen environmental impact or property damage, the 20-day notice need not be given and the City Manager will not need the concurrence of the City Council, and only such notice need not be given and the City Manager will not need the concurrence of the City Council, and only such notice need be given as is reasonable in view of the nature of the threat of bodily injury, damage to public health or safety, unforeseen environmental impact or property damage.

Any shutdown pursuant to this paragraph shall not alter the time schedule set forth in paragraph 6.1.2.

These provisions are in addition to those contained in paragraph 6.4.4.

**9.3.4 Provisions and Sanctions not Exclusive.**

Nothing herein shall operate to release or excuse Flatiron from complying with the provisions of the Revised Code of the City of Boulder, 1965, as amended, and as it may be amended from time to time. In the event that Flatiron violates any provision of the Code which gives rise to civil or criminal remedies different from those set forth in paragraphs 7.3.1 to 7.3.3, inclusive, the City may elect to proceed under this permit or under the relevant section or sections of the Code.

Section 10. Such part only of said Chapter 37, "Land Use Regulations," of the Revised Code of the City of Boulder, 1965, as amended, in conflict herewith, be, and the same hereby is, superseded.

Section 11. It is the intention hereof that this ordinance not be severable. Therefore, should any part of parts hereof be for any reason held to be invalid, such shall defeat the entire ordinance.

Section 12. The City Council finds that this ordinance is necessary to and for the benefit of the public interest, public health, safety and welfare; under Charter Section 18 (a) it is deemed by the City Council that publication be by title of the ordinance only together with a short outline of topics therein and a statement that the published text is available for public inspection and acquisition in the office of the City Clerk.

(Attesting and signatures omitted)

## APPENDIX C

EXCERPT FROM CLEAR CREEK COUNTY ZONING RULES  
AND DESCRIPTIVE REGULATIONS,PHILLIPS, BRANDT, REDDICK, CONSULTANTS

## Section 17. M-1 MINING ONE DISTRICT

## A. USE REGULATION

No building or land shall be used and no building shall be hereafter erected, converted or structurally altered, unless otherwise provided herein, except for one or more of the following uses;

1. Any use specifically required for the mining, prospecting, exploring, milling and/or placering of mineral resources upon property defined by a patented mining claim or mill site, or identified by a location certificate recorded in the County Clerk and Recorder's Office, all as represented by maps approved by the Board of County Commissioners.

2. Any use specifically required for the mining, prospecting, exploring, milling and/or placering of mineral resources upon property or adjacent to property defined in Section 17 A. 1. above and classified according to Section 25 C. 15, or upon property identified by a location certificate and classified according to Section 25 C. 15.

3. Such other uses which are not more detrimental to the highest and best uses of land in said district than are the uses hereinbefore enumerated.

## B. HEIGHT REGULATION

None.

C. AREA REGULATION

Property abutting Residential Uses Subject to the provisions of Section 25 C. 12. No use causing an objectionable odor, noise or dust shall be permitted within five hundred (500) feet of the property boundary of: (1) a residence existing as of September 20, 1976; (2) property for which a residential building permit has been issued on or before September 20, 1976; or (3) a residential subdivision which has received final plat approval on or before September 20, 1976.