METRO-APEX

1974

A Computerized Gaming Simulation Exercise
For Training in Environmental Management
and Urban Systems

Developed by the
COMEX Project
University of Southern California

through a grant form the
Control Programs Development Division
Environmental Protection Agency.

A revised version of the APEX Air Pollution Exercise
developed jointly by the
COMEX Project, University of Southern California
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PREFACE

PREFACE

METRO-APEX is the result of a long term research and development effort by a number of dedicated individuals. The inspiration, and much of the technical basis evolved from a similar exercise (G.E.T.R.O.) originally developed by the Environmental Simulation Laboratory, University of Michigan. In 1966, a grant from the Division of Air Pollution Control, U.S. Public Health Service was awarded to the COMEX Research Project, University of Southern California, to develop a dynamic teaching instrument, METRO-APEX. Working in close cooperation, the COMEX Research Project and the Environmental Simulation Laboratory successfully developed the initial version of the METRO-APEX exercise in 1971. This computer-based gaming simulation was designed to provide a laboratory urban community in which air pollution management trainees could apply and test the knowledge and skills gained through conventional educational methods.

METRO-APEX has proven to be highly adaptable to training programs dealing with the many aspects of air pollution control including law, management, air quality monitoring, land use planning, budget preparation, citizen participation programs, state and federal grant procedures, and political decision-making processes. As a result, METRO-APEX is in great demand as a valuable supplement to university training programs, and in many cases is being used as a central curriculum focus. Over 60 universities have been trained in the use of METRO-APEX. It has also been translated into French and Spanish and is being used in seven countries outside of the United States.

Based on the success of the initial METRO-APEX program, COMEX was awarded a grant from the Control Programs Development Division of the Environmental Protection Agency to substantially revise and broaden the simulation exercise to encompass the wide spectrum of environmental management issues. This current version, of which this manual is a part, was completed in June 1974 and greatly increases the utility and teaching potential of the exercise. In this version, the interrelationships among air, water and solid waste are demonstrated, the strategies and options available to players have been broadened, new roles have been added, the exercise materials have been updated to reflect the latest technology and nomenclature, and many of the operational problems associated with the earlier version have been rectified.

METRO-APEX is one of, if not the most complex gaming-simulations of an urban area in use today. Although it was designed to supplement standard teaching methods, APEX is far more than an educational tool. It is a communication channel of a new level--capable of providing both the language and the forum for information transfer between persons and groups with different educational and cultural backgrounds as well as different perspectives of the urban situation.

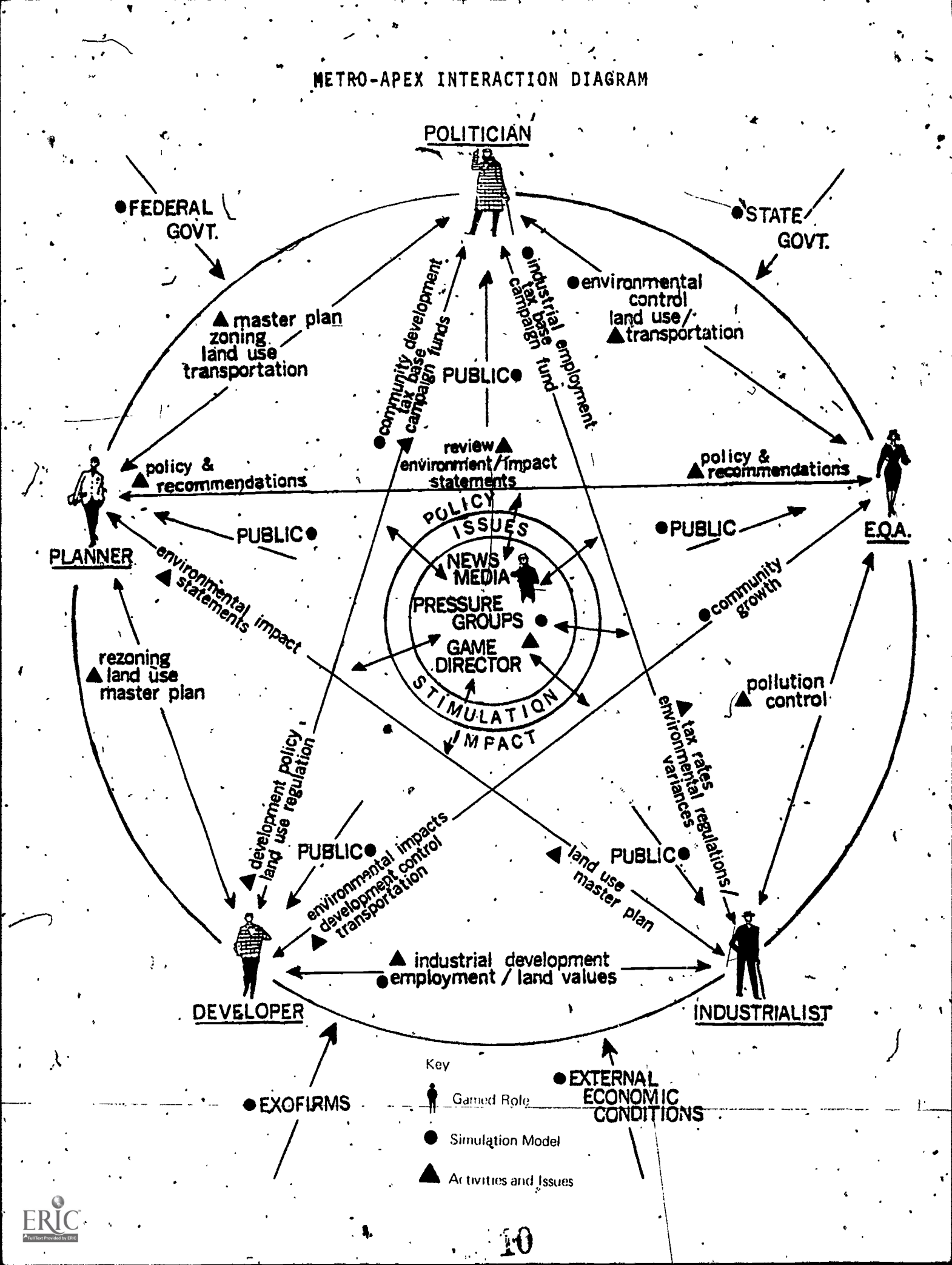
METRO-APEX is composed of two essential components: (1) a computerized system made up of a series of well-integrated simulation models linked to a (2) "gamed" environment encompassing a series of interactive roles. The computerized system predicts the changes that occur in several sectors of the urban system in response to the decisions made by participants in the "gamed" environment, decisions made by persons outside the "gamed" environment (other actors whose behavior is simulated in the computer), and external pressures on the metropolitan area (also simulated in the computer).

The County of APEX is run year by year by principle decision makers performing both the mundane and extraordinary functions of their office in the "gamed" environment. Each cycle or year is condensed in time to a three to eight hour session during which the decision makers formulate their yearly policy. The decisions that emerge out of the "competitive--cooperative" environment of the gaming-simulation are used as priming inputs to the computer simulation. The change in the status of the urban area is calculated by the computer and returned to the decision makers as the primary input to the next cycle of action. Included in the change picture generated by the computer are selected social, economic and physical indicators which show the magnitudes of change in key areas and a newspaper which serves as the focal point of local public opinion.

The key decision makers acting in the gamed environment include an Environmental Quality Agency with departments of Air Pollution, Water Pollution and Solid Wastes; Politicians, Planners and Administrative Officers from a Central City and a County; Land Developers and Industrialists from the private sector; and representatives from the News Media and Pressure Groups. The Politicians are responsible for the administration of their respective jurisdictions and for the formulation and implementation of various programs to upgrade the social status of their constituents. The Planners serve as aides to the Politicians and represent the major long range coordinating force in the community. The Environmental Control Officers are charged with the task of monitoring and alleviating the pollution problems. The private business sectors operate to foster their own interests and frequently those of the community. Pressure Groups and News Media advocate various positions on community issues. Generally, each decision maker finds it to his advantage to coordinate and/or compete with other players in his efforts to promote his strategies. The METRO-APEX General Interaction Diagram included here indicates possible linkages among the roles.

In general, people have great difficulty understanding the dynamics of a complex system through traditional means. Gaming-simulation offers participants the opportunity to study, work with, and discuss the structure of such a system and to experiment with intervention strategies designed to change that structure. When used as a teaching device, the strength of a gaming-simulation such as METRO-APEX lies in the opportunity afforded participants for involvement in the system. When compared with the passive observation of the system offered by traditional methods, this approach has had great success.

METRO-APEX INTERACTION DIAGRAM



CHAPTER 1

A Brief Description of APEX County

Chapter 1

A BRIEF DESCRIPTION OF APEX COUNTY

History

The first settlers of APEX County were farm families emigrating from New England and New York State beginning about 1830. During the middle of the nineteenth century, German immigrants continued the settlement patterns of established dispersed family farms. Income to pay for the necessary imports of products from the East was derived primarily from the production of farm crops and, more importantly, timber. Small market towns, often containing milling facilities, developed between 1820 and 1860. At the same time, the County was organized as a unit of government by the State, and the basic network of roads was completed.

The major impetus for the later development of the Central City as a regional center was its selection as the state capitol in 1847. The nation's first land-grant university was established east of the Central City in 1855, further enhancing its growth. Central City was incorporated in 1859 and the Suburb, in which the university was located, was incorporated in 1910. The University's control of a large block of land was to exercise profound influence on the future physical pattern of development. Much of the logical development corridor outward from the City was preempted by this facility.

Steam railroads were first built into APEX County beginning in the 1860's. Those small market-milling communities with stops and depots on the rail lines began to assume a greater importance than the small communities away from the lines. The impact of the railroads on the small communities can be seen from the following description of Central City:

> By the year 1863, the City...was a bustling, urban center. Early accounts tell us that, at that time, the City included eleven churches, five hotels, two flouring mills, three tanneries, two breweries, three saw mills, two sash and blind factories, three iron foundries, two printing offices, several brick yards, and a large number of mechanic shops.*

Although growing, it should be noted that manufacturing was still minimal. Exports were dominated by agricultural and timber products, and most other production was for local consumption only.

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*Tri-County Regional Commission, "History of the Tri-County Region," Information Report 7, updated. pp. 24-25.

Beginning in perhaps 1880, factories producing goods to be exported out of the region were built in the area, fostered by the completion of railroad ties with the rest of the country. These factories, mainly built near railroad depots, stimulated ... ration of factory-worker families into the region. Most of the ... amilies settled near the factories where they were employed, adding further to the growth of the towns near the railroad. Just before the turn of the century the introduction of the automobile industry into Central City gave the final impetus needed to make Central City into the dominant community in the County. Beginning about the same time, electric interurban railways were extended from Central City to the north, east and west, allowing many workers from the new industries in the City to move further away from their place of employment.

By the 1920's, automobiles had become readily available and their use was encouraged by the paving of most of the roads in the County. Those who had formerly lived fairly close to the interurban system began to be dispersed throughout larger areas and to settle in lower density neighborhoods. Until about 1930, most new development was found in the filling-in of the Central City and Suburb. Although the growth of industrial and bureaucratic functions proceeded in the Central City and the area adjacent to it, the more outlying townships remained, and to some extent still remain, predominantly agricultural. The growing urbanization which has occurred more recently in these fringe areas has been primarily stimulated by the construction of the interstate expressway system beginning in the 1950's.

The interstate highway freeway system in APEX County is shown on the map at the end of this chapter. One major expressway comes from the southeast, sweeps around the southern and western fringes of the City and leaves the County from its northwestern corner. A second expressway comes up from the south, intersects the first and continues northward into the Suburb. It is anticipated that in the future this expressway will be continued northwards, then swing west to finish an expressway loop around the City (dashed line).

In addition to the airport, major transportation into and out of APEX County is provided by rail (primarily freight) and expressway. The attached map outlines the routes of the three rail lines, which generally follow the river valleys and intersect in Analysis Area ...

A local APEX bus line serves the Central City, with some service extended into the Suburb and nearby areas of the County.

Most travel in APEX is currently by private automobile. There are approximately 2.1 people per registered automobile in APEX. This amounts to approximately one billion automobile miles per year. The automobile is the cause of substantial congestion, property damage, death and air pollution in APEX. Further information about the contribution of the automobile to pollution can be obtained from the Air Pollution Control Officer.

The automobile represents an immense financial burden to owners, political jurisdictions, employers and commercial establishments. Taxes to expand and maintain the road network are constantly expanding. Vast areas of land are required for parking. At the same time, bus ridership is decreasing.

Political Jurisdictions

In the METRO-APEX game, the County is composed of four autonomous jurisdictions: The Central City, Suburb, Township 1 and Township 2. The County has been further divided into 29 "Analysis Areas", each resembling a census tract. The Central City comprises Analysis Areas 1 through 13; the Suburb, AA's 17 through 19; Township 1, to the west, contains AA's 23 through 28 and Township 2, to the east, contains AA's 14-16, 20-22 and 29. (See map). In addition to analysis areas, the Central City is politically divided into Wards:

Ward 1 -- AA's 1-4
Ward 2 -- AA's 5-8
Ward 3 -- AA's 9-13

Each Ward is the electoral district for one of the three City Council seats represented in the game. The County government (Board of Supervisors) is comprised of members elected from the Suburb, from the Townships, from the County-at-large and the Central City-at-large.

The City Council and County Board of Supervisors are the only two local governmental units actively represented in the game. Other local governments, including the school boards, are simulated. In some cases, City and County governments have parallel functions; e.g. they both provide police services, planning and capital improvements. The County however, has area-wide responsibility for three major services not provided by the City government: public health, welfare and pollution control. In these three areas, County actions, directly affect Central City residents as well as residents in the outlying areas. Both the municipal and County governments derive their primary financial support from the same tax base--real property. County property taxes are paid by land-owners, in addition to property taxes collected by the municipal government and the school board in each political jurisdiction.

Data provided to players in the game are nearly always given by analysis area--this is also the smallest unit of scale in referring to locations; that is, a project or house or industry is located in "Analysis Area X" rather than on a particular street or a particular intersection. Characteristics of each individual analysis area, including the socio-economic composition of the residents and the proportions of land area devoted to particular land uses, may be found in the Planners data.

A few analysis areas are almost completely chacterized by one or two major features which are often referred to throughout play. These major features are given in the following list, with their analysis areas indicated:

Central Business District (CBD) -- nearly all of Analysis Area 8

State Capitol -- Analysis Area 8

Ghetto -- Analysis Area 4 and Analysis Area 8

University -- Analysis Area 19 (all)

"Best" residential areas -- Analysis Areas 9 (all) and 17 (most)

These features are not only unique in the County, but they also dominate the analysis areas in which they are located; in the game they are likely to be referred to as locations in themselves, with no further locational explanation given.

A list of other important man-made features of the County; and their locations, is given later in this chapter.

Geography and Climate

APEX County is located nearly at the center of an industrialized northern State, some 85 miles northwest of one of the largest metropolitan areas in the United States. The once heavily forested land, extending roughly 320 square miles, is quite flat and for the most part adequately drained for agriculture.

The Great River, a major watercourse in the State, enters the County from the south in Analysis Area 23, meanders north and west, then back to the east and north as it passes through Analysis Area 8. There it is joined by the Red Oak River, which comes in from the east. The enlarged Great River exits from the County in Analysis Area 26, from which it continues west for some 85 miles before emptying in to the Great Lakes. Major drainage of the County is through the Great River system.

Just before it empties into the Great River, the Red Oak River is joined by Sycamore Creek, which wanders up from the southeast. Much of the area in Analysis Areas 11 and 13, near this creek, is low and somewhat marshy, not ideal for heavy development. The other major marshy area in the County is in Analysis Area 14, to the northeast in Township 2. There are also several small lakes in this analysis area and quite a large State Park. The largest lake

in the County is located in Analysis Area 16. This was a primary recreation area in the early part of this century but is less ideal now, due to heavy pollution loads and deteriorating shoreline development. There are small creeks which wander through many analysis areas in the County. The only other river of any significant size, however, is Looking Glass River, which runs east and west through the northern portion of the County, primarily in Analysis Areas 28 and 29.

The climate of APEX County is temperate, with summer temperatures averaging about 70 degrees and winter temperatures which average about 25 degrees. There is an annual rainfall of roughly 41 inches, with heavy snows to be expected primarily in the months of January and February. Prevailing winds are westerly, swinging to the southwest in summer and northwest in winter.

Major Public Facilities

As might be expected, the Central City and Suburb are significantly better endowed with public capital improvements than are the Townships. The following list includes the most important public structures in the County, and indicates under whose jurisdiction they are operated and where they are located:

Airport (County) -- AA 29, just outside the City limits. The Airport has three runways and a terminal of 27,000 square feet. Two commercial airlines serve the County through this airport; cargo and general aviation are also served.

Boys Training School (State) -- AA 7.

City Hall -- AA 6. This is an old structure, built 80 years ago and considered a scandal. A more central location has been chosen for the new City Hall under construction in AA 8.

Community Centers (City) -- AA's 2, 4, 7, 8, 10, 13. These are mostly old houses purchased by the City to house neighborhood meetings and the operation of special programs.

Community Centers (Township Halls) -- AA's 14 (2), 24, 27, 29.

Community College (County) -- AA 8. The facility is currently housed in an old library and elementary school.

County Building -- AA 8, This includes all County offices and the meeting rooms for, the County Board of Supervisors.

County Court House -- AA 8, adjacent to County offices.

Fire Stations (City) -- AA's 2, 3, 4, 5, 6, 8 (2), 11, 12.

Fire Stations (Townships) -- AA's 20, 23, 25. These are modest stations housing limited equipment. Volunteers provide firefighting manpower.

Hospital (County) -- AA 7. This was built in 1912 and was expanded in 1922, 1942, and 1960. It contains 362 beds, including a 35-bed tuberculosis wing, and caters primarily to the indigent. There are three private hospitals in the County with an additional 650 beds.

Library (City) -- AA 8. This is an old downtown building. There are branch libraries in AA's 1, 5, 11, 12 (2), 13.

Library (Suburb) -- AA 18.

Sewage Treatment Plant (City) -- AA 2. This plant provides both primary and secondary treatment and has a capacity of 34 million gallons per day. It currently averages 22 million gallons daily.

Sewage Treatment Plant (Suburb) -- AA 19. This plant provides primary sewage treatment, with a capacity of 12 million gallons per day; it currently handels an average of 6.75 million gallons daily.

Sheriff Station (County) -- AA 8. This is attached to the County Building.

Water Treatment Plant (City) -- AA 8. Water for the City is derived from the Great River as it exits from Analysis Area 8. Capacity is 42 million gallons per day, with the average daily flow currently being 22 million gallons. Treatment includes filtration, purification, flouridation and lime softening.

Water Treatment Plant (Suburb) -- AA 19. The Suburb's water is drawn from the Red Oak River as it enters AA 19. Capacity is 6 million gallons daily,

with current average flow being 2.5 million gallons per day. Treatment includes chlorination, fluoridation and ziolite softening.

Zoo (City) -- AA 7.

Industry and the Economy

Major employment in APEX County is provided by the State Capitol Complex, the University and a automobile assembly plant, located in Analysis Area 4. While State Government is a stable, slow-growing industry, the University, typical of "research and development" operations elsewhere, is growing at a very rapid rate. The automobile plant exhibits characteristics similar to any large manufacturing operation, fluctuating considerably in response to the national business cycle.

In addition to these "big three" employers, there is a host of industries supplying parts to the automobile industry, as well as independent industries exporting goods which have no relationship to autos. (A map and listing of the major industries in the County are found on the following two pages.) These include the seven gamed industries:

Industry 1 -- Shear Power Company
Industry 2 -- People's Pulp Plant
Industry 3 -- Rusty's Iron Foundry
Industry 4 -- Gestalt Malt Brewery
Industry 4 -- Caesar's Rendering Plant
Industry 6 -- Dusty Rhodes Cement
Industry 7 -- Schick Cannery

Members of the population of APEX County constitute a work force of about 101,000 people, nearly half of them employed by the major "exporting" industries previously mentioned. About 9% of total County employment is found in lighter industry and 41% in commercial and service activities for the resident population. The greatest concentration of manufacturing employment is, as expected, found in the Central City. The highest proportion of white collar workers is in the Suburb, due to the predominance of the University as an employer there. In the futute, it is probable that more and more new industrial growth and employment will occur in outlying areas, particularly among firms requiring significant amounts of land for their plants.

Population

Within the physical and political environment described in the

preceding pages resides a population of some 227,000 persons, a tiny fraction of whom are represented in METRO-APEX as players. The remainder of the population is simulated by the computer in the game. About 63% of the population resides in the Central City, 10% in the Suburb and the remainder in the two Townships.

Only about 9.2% of the County's population is black; however, virtually all of this population is found in the Central City, of which 14.4% of the total population is black, primarily in Ward 1, where the number of non-white households approaches 38%. The only other significant ethnic minority is found in a Mexican-American community in the east-central portion of the city.

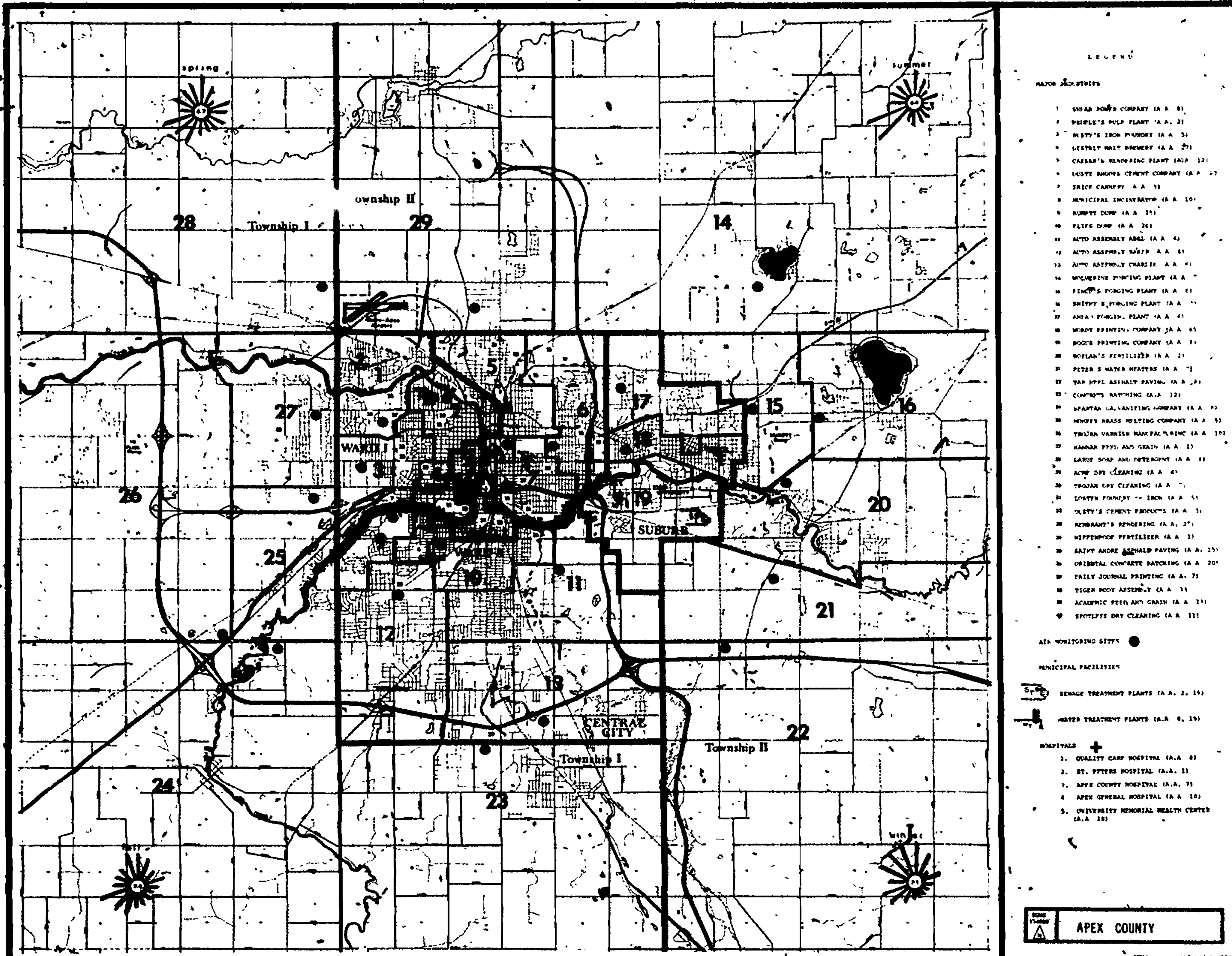
For purposes of the game, the population of APEX County has been divided into five "household types", each representing different occupations and educational achievements, life-styles, voting habits and consumption behavior. These will be described briefly here; more detailed information about each may be found in the Glossary.

Household type 1 is a combination of upper and upper-middle class families whose head of household are likely to be employed in the professions and business management. Household type 2 is typical middle class, occupations usually clerical and lower-level public service areas. Household type 3 includes very low white-collar workers and skilled craftsmen and shop foremen, the latter two predominately. While members of household types 1 and 2 have attended college, some with advanced degrees, household type 3 members are typically high school graduates. In outlying areas, farmers are included in this latter type. In household type 4 are found semi-skilled workers and non-domestic service workers. Usually household heads have not completed high school, and while many household type 4's are homeowners, the value of their housing is quite low. Household type 5 includes laborers, domestic workers and the unemployed, with a large number of the elderly. A majority of these households live in rental units of low value.

Initially, about 17.5% of the County population is found in household type 1, 16% in household type 2 and 27% in type 3; about 32% is of household type 4 and 7.5% fall into household type 5. The household composition of a particular analysis area, and of an entire jurisdiction, will affect significantly the demand for both public and private goods and services. It will also affect voting behavior on financial issues and in elections.

List of Major Industries

1. Shear Power Company (A.A. 8)
2. People's Pult Plant (A.A. 2)
3. Rusty's Iron Foundry (A.A. 5)
4. Gestalt Malt Brewery (A.A. 27)
5. Caesar's Rendering Plant (A.A. 12)
6. Dusty Rhodes Cement Company (A.A. 23)
7. Schick Cannery (A.A. 3)
8. Municipal Incinerator (A.A. 10)
9. Humpty Dump (A.A. 15)
10. Flies Dump (A.A. 26)
11. Auto Assembly Abel (A.A. 4)
12. Auto Assembly Baker (A.A. 4)
13. Auto Assembly Charlie (A.A. 6)
14. Wolverine Forging Plant (A.A. 7)
15. Finch's Forging Plant (A.A. 6)
16. Smithy's Forging Plant (A.A. 2)
17. Ahead Forging Plant (A.A. 6)
18. Wordy Printing Company (A.A.6)
19. Bogus Printing Company (A.A. 6)
20. Boylan's Fertilizer (A.A. 2)
21. Peter's Water Heaters (A.A. 7)
22. Tar Heel Asphalt Paving (A.A. 8)
23. Concrete Batching (A.A. 12)
24. Spartan Galvanizing Company (A.A. 8)
25. Monkey Brass Melting Company (A.A. 5)
26. Trojan Varnish Manufacturing (A.A. 10)
27. Hannah Feed and Grain (A.A. 1)
28. LaRue Soap and Detergent (A.A. 1)
29. Acme Dry Cleaning (A.A. 4)
30. Trojan Dry Cleaning (A.A. 7)
31. Losten Foundry -- Iron (A.A. 5)
32. Dusty's Cement Products (A.A. 3)
33. Rembrants Rendering (A.A. 27)
34. Wiffenpoof Fertilizer (A.A. 1)
35. Saint Andre Asphalt Paving (A.A. 15)
36. Oriental Concrete Batching (A.A. 20)
37. Daily Journal Printing (A.A. 7)
38. Tiger Body Assembly (A.A. 3)
39. Academic Feed and Grain (A.A. 13)
40. Spotless Dry Cleaning (A.A. 11)


LEGEND
MAJOR INDUSTRIES
PEOPLE'S PULP PLANT
CAESAR'S RENDERING PLANT
MUNICIPAL INCINERATOR
AUTO ASSEMBLY ABLE
FINCH'S FORGING PLANT
BOOK'S PRINTING COMPANY
BOYLAN'S FERTILIZER
PETER'S WATER HEATERS
CONCRETE BATCHING
TROJAN VARNISH MANUFACTURING
ACME DRY CLEANING
TROJAN DRY CLEANING
REMBRANDT'S RENDERING
ORIENTAL CONCRETE BATCHING
DAILY JOURNAL PRINTING
TIGER BODY ASSEMBLY
ACADEMIC FEED AND GRAIN
SPOTLESS DRY CLEANING
AIR MONITORING SITES
MUNICIPAL FACILITIES
SEWAGE TREATMENT PLANTS
WATER TREATMENT PLANTS
HOSPITALS
QUALITY CARE HOSPITAL
ST. PETERS HOSPITAL
APEX COUNTY HOSPITAL
APEX GENERAL HOSPITAL
UNIVERSITY MEMORIAL HEALTH CENTER
APEX COUNTY
spring
summer
fall
winter
Township I
Township II
CENTRAL CITY
SUBURB
WARD I

CHAPTER 2

Glossary and Reference Terms

Chapter 2

GLOSSARY AND REFERENCE TERMS

ABATEMENT

Abatement is the reduction of pollutant emissions from a source or sources.

AEROBIC

A process taking place in the presence of oxygen; or a state of liquid containing free dissolved oxygen.

AIR POLLUTION

Air pollution is the presence in the outdoor air of substances which, when present in a sufficient quantity or over a period of time, can cause an undesirable effect upon man, property, or the environment.

AIR POLLUTION REGULATIONS

Air pollution regulations are legal constraints on pollutant emissions, production processes, or control systems. State regulations and County regulations are enforceable by legal sanctions, while recommendations are not.

AIR QUALITY (See NATIONAL AMBIENT AIR QUALITY STANDARDS)

Air quality refers to the pollution concentration characteristics of the atmosphere or ambient air in a given area. It is usually stated in terms of the levels of concentration of specific pollutants, in micrograms of pollutant per cubic meter of air (Mgm/m3) (See CONCENTRATION).

Air Quality Goals are expressions of desirable maximum pollutant concentrations to be achieved through a pollution control program.

Air Quality Criteria - The basic medical and technical information which forms the rationalization from which Air Quality Standards are set. This information is published for each major pollutant by EPA in Air Quality Criteria Documents.

Air Quality Standards are quantitatively-specified maximum levels of pollutant concentrations or dosages, as more precise statements of air quality goals.

AIR QUALITY CONTROL REGION

One of the approximately 250 geographic areas covering the United States which form the basic units for air pollution control activities. These areas were designated by EPA (with the states) and are based on considerations of climate, meteorology, topography, urbanization and other factors affecting air quality.

ALERT STAGES

Alert Stages refer to critical levels of concentration or dosage signaling potential disastrous pollution effects and requiring emergency abatement and control measures.

ANAEROBIC

A process taking place in the absence of oxygen; or a state of liquid containing no free dissolved oxygen.

ANALYSIS AREA (A.A.)

Analysis areas are used as the primary areal reference units for the data and issues throughout the game. The County is divided into a number of analysis areas, each of which is the approximate size of several census tracts. The analysis areas included in the five jurisdictions are as follows:

Jurisdiction 1-- Central City: Ward 1 = AA 1 through AA 4
Ward 2 = AA 5 through AA 8
Ward 3 = AA 9 through AA 13

Jurisdiction 2-- Suburb: AA 17 through AA 19

Jurisdiction 3-- Township 1: AA 23 through AA 28

Jurisdiction 4-- Township 2: AA's 14-16, 20-22, 29

Jurisdiction 5-- County: AA's 1-29

See APEX Analysis Area Map

ANNUAL WAGE

This is the annual cost to the Industrialist of one worker and is an average of the various rates of pay applicable to the different types of workers in the firm. The applicable average wage rate for each firm is reported in the Industrialist's printout each cycle under cost factors. This wage rate may be subject to negotiations with the labor representative and this new negotiated wage rate will supercede the rate found under cost factors on his printout.

ASSESSED VALUE

Assessed value is the value assigned to real estate property for purposes of assessing taxes owed to each of the jurisdiction County and school districts. Governments are required by law to maintain an assessed value of 50% of market value for propert in their jurisdiction, although this requirement is often not met. (E.g. if a residential property is valued on the market at $20,000, its assessed value is $10,000.) (See STATE EQUALIZED VALUE.)

BACKGROUND LEVEL

The amount of pollutants due to natural sources such as marsh, gas, pollen, conifer hydrocarbons and dust.

BOARD OF DIRECTORS

Each Industrialist acts as a Plant Manager and is responsible to the Board of Directors of his plant for his decisions and actions. The Board has the ultimate decision-making power in plant affairs and may approve, amend or reject the manager's fiscal policy proposal. The Board also sets the amount of dividends to be paid to the stockholders.

BONDING

Bonding is the process of incurring public debt to finance some capital improvement project. It is a device used to extend the incidence of costs over a long period of time, rather than have costs met out of current revenues while the project is under construction. Politicians may issue two kinds of bonds general obligation bonds and revenue bonds. These differ in three respects: (1) the need for voter concurrence, (2) how they are paid off, and (3) the kinds of projects for which they are appropriate. Before Politicians may float general obligatio bonds to finance projects, voters must approve this action in a referendum. There is a State-imposed limit on the indebtednes that a jurisdiction may incur through general obligation bonds. The amount of additional bonded indebtedness that can be sought is indicated in the Politician's output as "$ Limit on Next G.O. Bond Sought". (See DEBT RETIREMENT for the process of financin general obligation bonds.)

Revenue bonds are not submitted to a referendum and are appropriate only for particular projects. (Projects for which they may be used are noted in the Project List.) They are paid off thro fees collected for the service provided by the facility, rather than by taxes.

CAPITAL PLANT INDEX (C.P.I.)

The capital plant index is a ratio of the present dollar value of public capital facilities (sewers, water lines, streets, parks and miscellaneous public holdings) to population equivalents. This number reflects the load imposed on facilities by residents, employees and clients, and this is considered an indication of the relative level of adequacy of these facilites. Present dollar value is calculated each cycle on the basis of depreciated value of existing facilities plus new facilites. (Facilities depreciate at about 5% of original value per year.) (See POPULATION EQUIVALENT.)

CASH CARRYOVER

This is the cash reserve which an Industrialist or Developer carries over to the next cycle after making all his expenditure including those for capital plant. It represents uncommited funds, which the player is free to use in the next cycle.

CASH TRANSFER

A cash transfer is used for loans or gifts of cash between players when the reason for the exchange is unspecified. Revenues made, or expenditures incurred, through an exchange of cash between either the Government, Industrialist, or Developer, are recorded in the budget section of their printout. When applicable, cash transfers are also used to cover the cost of television time and newspaper articles.

CLEAN AIR ACT AMENDMENTS OF 1970

(See LEGAL REFERENCE MANUAL.)

COLLECTION/DISPOSAL STUDY

Studies of municipal house-to-house refuse collection using combinations of different truck types, crew sizes, container locations, transfer stations and disposal sites to determine the capital and operating costs of alternative systems.

COLLOIDAL PARTICLES

Very fine particles of material in fluid suspension; particles will not settle out and can pass through a semipermeable membra

COMBUSTION

Combustion is the process of burning.

CONCENTRATION

Concentration is the ratio of pollutants to effluent gases or ambient air, measured in micrograms per cubic meter (MG/cubic meter) as a weight to volume ratio. Data on mean concentration per quarter, concentration on worst day, and number of days above a specified concentration can be obtained by the APCO, through the installation and operation of monitoring stations.

CONTAMINANT

(See POLLUTANT)

CONTROL EFFICIENCY

Control efficiency refers to the ratio of the amount of a pollutant removed from effluent gases by a control device to the total amount of pollutant without control.

CONTROL STRATEGY

A comprehensive plan designed to control or reduce the level of a pollutant or pollutants in the environment.

CONTROL SYSTEM

Control system refers to equipment and/or procedures intended to reduce the amount of a pollutant, or pollutants, in effluent gases. Each gamed industrial firm has a limited set of control system options for each production process and combustion proces:

DEBT RETIREMENT (Debt Service)

Debt retirement, or debt service, is a term used to describe the process of paying off long-term general obligation bonds sold by public agencies. Debt retirement is a budget category of the Politician which includes expenditures for both principal and interest on general obligation bonds. Financing of these expenditures may be with either normal millage or debt retirement millage.

DEMOLITION COSTS (Clearance Costs)

A demolition cost of 5% of the assessed value of developed PROPERTY must be paid when developed land is rezoned.

DENSITY

In residential areas, density is the term used to express the number of dwelling units per acre of land. In APEX County a different density is associated with each of the five residentia.

development types, with the lowest density found in land use category R-1 and the highest in category M-2.

The table on the following page expresses housing density in housing units per acre, and in acres per housing unit.

DEPRECIATION ALLOWANCE

Each cycle, the total value of industrial capital facilities, (building and equipment) depreciates at 8%. A tax credit of 5% of the capital value of these facilities is allowed the Industrialist to compensate for this depreciation. The amount is deducted before Federal and State income taxes are paid. The Industrialist may claim any part of his maximum allowance; any portion of the allowance not taken will accumulate. The maximum depreciation allowance is listed under cost factors in the Industrialist's printout.

DEVELOPMENT TYPES AND COSTS

A. Residential

In APEX County there are various levels of cost and density associated with different qualities and sizes of housing which may be built by Developers. These costs are for structures, exclusive of land and site improvements.

Single Family

Three different development-cost levels are applicable to APEX County single-family housing units, ranging from the highest construction cost of $40,000 (designated as R-1) to the lowest cost housing, built at $15,000 per unit (designated as R-3). Any one of these types may be built on land which, when vacant, is zoned R.

Multiple Family

Units of two different cost levels, M-1 and M-2 are available for construction of multi-family housing in APEX County. The highest cost per unit, for M-1, is $30,000 and the lowest, for M-2, is $12,000. Either of these types may be constructed on vacant land zoned M.

Residential Development Costs Per Unit

R-1	R-2	R-3	M-1	M-2
$40,000	$22,500	$15,000	$30,000	$12,000

HOUSING DENSITY

AA	R-1		R-2		R-3		M-1		M-2	
	Units Per Acre	Acres Per Unit	Units Per Acre	Acres Per Unit	Units Per Acre	Acres Per Unit	Units Per Acre	Acres Per Unit	Units Per Acre	Acres Per Unit
1	1.4	.714	3.5	.286	5.6	.179	11.2	.089	21.0	.048
2	2.4	.410	6.0	.167	9.6	.104	19.2	.052	36.0	.028
3	2.0	.500	5.0	.200	8.0	.125	16.0	.063	30.0	.033
4	2.8	.357	7.0	.143	11.2	.089	22.4	.045	42.0	.024
5	2.1	.476	5.25	.190	8.4	.119	16.8	.060	31.5	.032
6	1.6	.625	4.0	.250	6.4	.156	12.8	.078	24.0	.042
7	2.5	.400	6.25	.160	10.0	.100	20.0	.050	37.5	.027
8	3.0	.333	7.5	.133	12.0	.083	24.0	.042	45.0	.022
9	1.2	.833	3.0	.333	4.8	.208	9.6	.104	18.0	.056
10	2.5	.400	6.25	.160	10.0	.100	20.0	.050	37.5	.027
11	1.0	1.000	2.5	.400	4.0	.250	8.0	.125	15.0	.067
12	1.0	1.000	2.5	.400	4.0	.250	8.0	.125	15.0	.067
13	1.0	1.000	2.5	.400	4.0	.250	8.0	.125	15.0	.067
14	.5	2.000	1.25	.800	2.0	.500	4.0	.250	7.5	.133
15	.6	1.667	1.5	.667	2.4	.417	4.8	.208	9.0	.111
16	.8	1.250	2.0	.500	3.2	.313	6.4	.156	12.0	.083
17	1.2	.833	3.0	.333	4.8	.208	9.6	.104	18.0	.056
18	2.3	.435	5.75	.174	9.2	.109	18.4	.054	34.5	.029
19	3.0	.333	7.5	.133	12.0	.083	24.0	.042	45.0	.022
20	.8	1.250	2.0	.500	3.2	.313	6.4	.156	12.0	.083
21	.5	2.000	1.25	.800	2.0	.500	4.0	.250	7.5	.133
22	.4	2.500	1.0	1.000	1.6	.625	3.2	.313	6.0	.167
23	.7	1.429	1.75	.571	2.8	.357	5.6	.179	10.5	.095
24	.3	3.333	.75	1.333	1.2	.833	2.4	.417	4.5	.222
25	.4	2.500	1.0	1.000	1.6	.625	3.2	.313	6.0	.167
26	.3	3.333	.75	1.333	1.2	.833	2.4	.417	4.5	.222
27	.6	1.667	1.5	.667	2.4	.417	4.8	.208	9.0	.111
28	.3	3.333	.75	1.333	1.2	.833	2.4	.417	4.5	.222
29	.5	2.000	1.25	.800	2.0	.500	4.0	.250	7.5	.133

B. Commercial

Two types of commercial land use are allowable in APEX County. These relate to local neighborhood shopping facilities and to regionally-oriented commercial and service facilities. Both may be built only on zoning category "Commercial" land. Each is developed on a cost-per-acre basis, as follows:

Commercial Development Costs by Type

CL	CR
$100,000	$125,000

C. Industrial

Endogenous industrial development permitted Developers in APEX County is on a per-acre basis, the cost being $100,000 per acre. Zoning category I land may be developed into this land use.

(See ZONING CATEGORY.)

DOSAGE

The accumulated exposure of a person, plant, material, etc., to a particular concentration of pollutant for a specified period of time.

DUMP

A site where uncontrolled disposal of solid waste occurs.

EFFLUENT

An effluent is a gaseous or liquid discharge or emission.

EFFLUENT SAMPLES

An effluent sample is an industrial outflow water sample and analysis which provides data on seven water pollutant parameters. A sample may be ordered by the Water Quality Manager and is taken at the source specified by the WQM.

ELITE OPINION POLL (E.O.P.)

The Elite Opinion Poll calls for a vote of all game players on certain major policy issues in the community. These issues appear as headlines in the METRO-APEX NEWS, which ask for either a deciding or advisory vote. The results of the Poll affect public officials' chances of reelection, as well as the probability of passage of general referenda, specific bond issues and special millage requests.

EMERGENCY EPISODE

An air pollution incident in which high concentration of pollutant(s) occur in the ambient air contributing to a significant increase in illness or death.

EMISSIONS

Emissions are pollutants in effluent or exhaust gases which are released into the air.

EMISSION FACTORS

Emission factors are estimates which can be used to approximate the rate of emissions of specific pollutants from generalized sources.

EMISSION INVENTORY

A compilation of the rate of pollution emissions in a given area by source type.

EMISSION MEASUREMENT

Air pollution emissions are measured in pounds per hour for particulates, sulfur dioxide (SO2), carbon monoxide (CO), nitrogen oxides (NOx), and hydrocarbons (HC); in Ringelmann number for smoke; and in Stinkelmann number for odor. The emissions measured are of specific pollutants from specific sources.

EMISSION RATE

Emission rate refers to the amount of pollutant emitted per unit of time or throughput. Maximum allowable emissions will be specified in pounds per hour (or pounds per 1000 pounds of process rate) if they refer to emission rates.

EMISSIONS SOURCE

An emission source is the origin of some specific air pollutants. In the game there are several gamed point sources, about thirty non-gamed point sources, plus motor vehicles and space heating as line and area sources, respectively.

ENVIRONMENTAL IMPACT STATEMENT

The results of a study which identifies and evaluates the adverse or beneficial environmental effects of pursuing a proposed action, pursuing an alternative action or not pursuing the proposed action.

EXOFIRM (EXOGENOUS FIRM)

An Exofirm is an industry or bureaucratic firm that depends primarily upon markets outside the local area for its growth and vitality. These firms are usually classified as Exofirms on the basis of their being net importers of dollars and net exporters of products or services to these outside markets. Jobs created by Exofirm growth spur additional growth of households and jobs oriented to the local market. (Exofirms are also often referred to as basic firms).
In APEX County, Exofirms locate in industrial and office zoning categories. Periodically, the newspaper will note the opportunity for Developers or Industrialists to invest, in a speculative way, in the entry of new Exofirms into the metropolitan area, with a variable probability of success attached to such investments. Occasionally, these Exofirms require rezoning of land and/or installation of special capital improvements. Requirements for such special public action and requests for private investment will be noted in the newspaper announcement of the firm's interest in locating in the area.

FEDERAL WATER POLLUTION CONTROL ACT AMENDMENTS OF 1972

(See LEGAL REFERENCE MANUAL)

FUEL RATE

The amount of fuel consumed by each industry per unit of time is specified in tons/hours for coal, in barrels (bbl)/hour for oil, in thousand cubic feed (MCF)/hour for natural gas, and in megawatts (MW) for electricity.

FUEL TYPE

The fuel types for industry include: low-grade coal (Lo-Coal), high-grade coal (Hi-Coal), low grade oil (Lo-Oil), high-grade oil (Hi-Oil), natural gas, and electricity. The fuel option for each plant is listed in the Industrialist's printout. The fuel grade refers inversely to the air pollution potential of the burining fuel, i.e., Lo-Grade has higher pollution potential, and Hi-Grade fuels have low pollution potential.

GARBAGE

The food waste portion of solid waste.

HAZARDOUS AIR POLLUTANTS

Air pollutants not covered by the Air Quality Standards but which, in EPA's judgement, "may cause, or contribute to, an increase in mortality or --- serious illness." These pollutants generally are toxic substances such as mercury, cadmium, asbestos and beryllium.

HAZARDOUS WASTE

(See "SOLID WASTE TYPE")

HOUSEHOLD/COMMERCIAL REFUSE

(See "SOLID WASTE TYPE")

HOUSEHOLD TYPES

The five household types used in APEX County are characterizations of families belonging to fairly homogeneous socio-economic groups. These characterizations reflect life style, political involvement and voting habits, general consumption behavior and preference for public goods. There is substantial overlap of income levels for all status groupings; hence income, alone, is a weak indicator for characterizing households.

Household Type I -- is upper class and upper-middle class combined. Occupations of the heads of households are: professionals, technical workers, managers, officials, and proprietors. One-half of the family income levels are in excess of $15,000 and the other half are in the $10,000-$15,000 range. Value of housing is in excess of $20,000, and if they rent, rentals are over $150 per month. This is the group which is most concentrated in residential locations. Education of the head of the household is at least college graduate, often with post-graduate study. Interest group membership for this household type is found in the Business Community and Effective Government Groups.

Household Type II -- is the typical middle-class household in which the head of households occupation is clerical, sales, or kindred types. Income of the family is primarily in the $7,000-$10,000 range. Education of the head of the household is some college or at least high school graduation.

Housing value is primarily in the $15,000-$25,000 range, and gross rentals would usually be from $100 to $149 per month, though they may be somewhat lower. Interest group affiliations for this type are with the Effective Government Groups on the one hand, and with the Right-wing Conservatives on the other.

Household Type III -- the most numerous and widely-distributed of the five types is characterized by a mixed membership of very low income white collar workers, skilled craftsmen, and foremen, though the latter two predominate. In the outlying areas, farmers fall into this category. Family income is primarily in the $5,000-$9,000 range. The Head of the household's education is typically high school graduation. Housing value is usually in the $12,000-$20,000 range and rentals are from $80-$125 per month. Members of this group are apt to belong to the Labor Vote and/or the Right-wing Conservative interest groups.

Household Type IV -- is composed of semi-skilled workers, industry operatives and non-household service workers, such as waiters, barbers and parking-lot attendants. Family income is in the lower portion of the $4,000-$7,000 range. Housing values range from $10,000 to $14,000 with gross rentals being $70 to $90 per month. Education of the head of the household is usually 9 to 11 years. Interest group membership for this household type is found in the Labor Vote and among the Civil Rights Groups.

Household Type V -- is the lowest stratum of society, and heads of households are laborers or household service workers. The vast majority of the area's unemployment are of this type and roughly half of all members are elderly and retired. Family income is less than $5,000 annually and the value of housing is less than $10,000, with rentals primarily $50-$75 per month. Heads of households have usually not been educated beyond the eigth grade. Membership in interest groups is found in the Labor Vote and Civil Rights Groups.

Political involvement of the five household types declines from Type I (the highest) to Type V, the latter being generally apathetic. Likewise, concern with government operation and provision of public services is highest in Type I households and declines steadily through Type V families.

The five household types will tend to demand housing of the five residential development types according to the following percentages:

Household Type I -- 50% will choose R-1; 30% R-2 and 20% M-1

Household Type II -- 20% will choose housing in each of the five development types

Household Type III -- 10% prefer R-1; 30% prefer R-2; 20% choose R-3; 25% take M-1, and 15% M-2

Household Type IV -- 20% will choose R-2; 40% R-3; 10% M-1; and 30% M-2

Household Type V -- 40% will be in R-3; 60% in M-2

IMPLEMENTATION PLAN

Under the 1970 Clean Air Act, each state must prepare and have approved by EPA an Implementation Plan which details the methods, strategies and timetable which the state and its jurisdictions will employ to meet and maintain the Air Quality Standards within the control region(s) within its jurisdiction.

IMPROVEMENT COSTS

Improvement costs are fees to prepare raw land for development, including subdivision costs, sewer and water connections, drainage and engineering. Developers are required to pay improvement costs on all land on which they build structures. For residential property, improvement costs are on a per unit basis as follows:

R-1	R-2	R-3	M-1	M-2
$1,000	$800	$700	$600	$400

For commercial and local industrial land uses, improvement costs are on a per acre basis; for each the fee is $5,000 per acre.

These fees are automatically applied to all land on which the Developer builds.

INTEREST GROUPS

In APEX County there are 5 major political interest groups that take stands on public policy issues and have a significant impact upon voting behavior. The more extreme the position assumed by one of these interest groups (as indicated on a scale of +4 to -4), the greater will be the voter turnout surrounding any particular referenda or election. Each of these interest groups derive their constituency from among two or more of the "Household Types" (See HOUSEHOLD TYPES)

1. CIVIL RIGHTS GROUPS: The orientation of these groups is primarily towards issues such as fair employment, neighborhood improvement, and problems that affect minorities. Their leadership is drawn from the elite liberals or the ghetto activists, their membership from the lower social strata. Their mode of operation is typically public protest and demonstrations centered around a very specific policy issue or community problem, and their influence on the system as a whole is moderate.

2. EFFECTIVE GOVERNMENT GROUPS: Are overwhelmingly middle class, composed primarily of professional people, a large percentage of them women. These groups are interested in a wide range of issues, on which they exert moderate influence. their orientation is towards governmental efficiency and towards community growth and image.

3. BUSINESS COMMUNITY: Draws from the whole range of commercial and mercantile interests, as well as some from the professional areas such as law, engineering and medicine. The business community exerts the highest degree of power of all politically oriented interest groups; their interest is directed primarily at community image, growth, and "BOOSTERISM".

4. LABOR VOTE: Are more conservative locally than nationally and exhibit some divergency between craft unions and industrial unions, the former being more conservative. The labor vote exert moderate influence on a range of issues somewhat less broad than those of interest to the "Effective Government Groups". The conservatism of the labor vote is especially apparent in the opposition of some of its constituency to public spending for social welfare.

5. RIGHT-WING CONSERVATIVES: Draws its membership primarily from people who resist change and advocate conserving the "traditions of Americanism--God and Country." They are generally against social change, increases in government influence in local affairs and public spending on social programs. Since these groups do not advocate change, they usually only become actively involved in public issues as a reaction to public programs proposed by other groups.

INTEREST RATE

The cost of borrowing money will vary for the Industrialists and Developers according to both their credit rating and the length of the loan, i.e., how many years will be taken to repay it. The maximum number of years on any loan by an Industrialist or Developer is 20 years. Applicable interest rates as follows:

Years to Repay	Credit Rating A-1	A-2	A-3
1-2	4%	6%	8%
3-5	6%	8%	12%
6-10	8%	12%	16%
11-20	12%	16%	20%

The cost of borrowing money for governmental agencies, the interest rate on bonds, will vary according to the credit rating of the jurisdiction, and will differ between general obligation and revenue bonds. Since revenue bonds are not backed by governmental taxing power they are riskier and therefore carry higher interest rates than general obligation bonds. As a jurisdiction's credit rating falls from A-1 to A-3, the interest rate on general obligation bonds will increase from 4.5% to 6%.

INVERSION

A layer of air trapped near the ground by a layer of warmer air above it.

ISSUE

Issue is used to refer to a problem situation presented to players in the METRO-APEX NEWS. Following each issue are two to four alternatives one of which must be selected by the player.

(See ELITE OPINION POLL)

JURISDICTION

Jurisdiction refers to one of the political units in APEX County. Abbreviations used in the game are:

(Jurisdiction 1) CC - Central City
(Jurisdiction 2) SUB - Suburb
(Jurisdiction 3) TW 1 - Township 1
(Jurisdiction 4) TW 2 - Township 2
(Jurisdiction 5) Co - County

(See ANALYSIS AREA.)

LAND USE

Land use is a term used to refer to the spatial distribution of City and rural functions--its residential communities or living areas, its industrial, commercial and retail business districts or major work areas and its agricultural, institutional and leisure time functions.

(See DEVELOPMENT TYPE and ZONING CATEGORY.)

LEACHATE

Water moving vertically through the soil of a landfill that may become contaiminated from the waste material in the fill.

MAXIMUM PRODUCTION CAPACITY

This is the maximum number of units which can be produced by a gamed industry in a cycle, with the plant and equipment in existence during that cycle. Maximum capacity may be increased by making capital expenditures for building and equipment. New productive capacity becomes available only in the cycle following that in which money is budgeted for plant expansion.

MEAN PROBABLE NUMBER PER 100 ml (MPN/100 ml)

A measure of the amount of coliform organisms per unit volume. By using quantities of sample varying in geometric series i.e., 0.01, 0.1, 1.0 milliliters, and by applying the usual test for coliform organisms, it is possible to determine a statistical estimate or "most probable number" of coliform organisms per 100 ml of water.

MICROGRAMS PER CUBIC METER

The weight of a substance in 1/1,000,000 of a gram contained in one cubic meter of volume.

MILLAGE

Millage is the tax rate, in mills, which is applied to State equalized property value to generate property tax revenue. One mill is equal to a $1 charge on each $1000 of value, or one tenth of one percent of the State equalized value. There are three types of millage:

A. Normal Operating Millage is determined by local Politicians and is applied to standard operating costs of government by State and local law -- the local limit can never be higher than the limit set by the State.

B. Special Millage, which is not subject to State and local limits, can be used for financing special programs. It must be voted and passed on in a referendum.

C. Debt Retirement Millage is not subject to the State and local limits but it can be used for retiring general obligation bonds. This millage requires a favorable vote in a referendum.

Total millage is the sum of operating millage, any special millages and the debt retirement millages which may be in effect during the year.

MILLIGRAMS PER LITER (mg/l)

Weight per unit volume. For water effluents, milligrams per liter is used to express the concentration in terms of the weight in milligrams of a dissolved or suspended pollutant in one liter of water.

MONITORING STATION

A monitoring station is a facility that houses air quality monitoring equipment for measurement of ambient air quality. One air quality monitoring station may be installed and operated in any analysis area. The pollutants measured at each monitoring station are:

Particulates, SO2, CO, NOx, and Hydrocarbons

Each pollutant is measured by a different type of monitoring equipment.

(See AIR QUALITY)

NATIONAL AMBIENT AIR QUALITY STANDARDS

EPA has set Primary and Secondary Air Quality Standards which are the maximum concentration of air pollutants allowable by federal law. Primary Standards are based on protection of the public health and are to be achieved as a first priority. Secondary Standards are based on the public welfare and will be achieved as a second priority.

NATIONAL ENVIRONMENTAL POLICY ACT (NEPA)

(See LEGAL REFERENCE MANUAL)

OFF GASSES

Gasses arising from landfills or other solid waste conversion (such as thermal) operations and leaving the site of generation.

PLANNED UNIT DEVELOPMENT

A planned unit development is an allocation of density to a development site such that the overall density meets the zoning requirements, but within the site certain areas may be of a higher concentration than those other developments around this site. This allows the Developer more flexibility in designing planned neighborhoods.

(See DENSITY)

PLANT INSPECTION

A plant inspection is an "on-site" examination of production and pollution control equipment, processes and procedures. Plant inspections ordered by the APCO will provide him with information on the production processes; production capacity; fuel and process rates; control systems; smoke code (Ringelmann number); and odor code (Stinkelmann number) for each process of a specific gamed or non-gamed emission source.

PLANT MANAGER

The player in the role of Industrialist is acting as a Plant Manager.

(See BOARD OF DIRECTORS.)

POLLUTANTS

Air Pollution:

(1) Particulates: particulate matter is any material (except uncombined water) which exists in a finely divided form as a liquid or solid at standard conditions.

(2) Sulfur Dioxide (SO_2) is a pungent colorless gas which is commonly emitted from the combustion of sulfur containing compounds, especially fuels such as coal and fuel oil. Sulfur dioxide can also be emitted from chemical process plants, metal process plants and trash burning incinerators.

(3) Carbon Monoxide (CO) is a colorless, odorless, very toxic gaseous product of the incomplete combustion of common fuels. It can also be generated by metabolic processes and the partial oxidation of carbon-containing compounds such as limestone. Carbon monoxide adversely affects human respiration by interferring with the body's ability to assimilate oxygen.

(4) Oxides of Nitrogen (NOx) are formed when oxygen and nitrogen are heated to a high temperature. Sufficiently high temperatures to produce significant amounts of NOx are normally only reached in modern efficient combustion processes such as electric power plants and automobile engines. Oxides of nitrogen in combination with hydrocarbons and sunlight are major constituents of photochemical smog.

(5) Hydrocarbons (HC) are compounds containing combinations of hydrogen and carbon. Gaseous hydrocarbon air pollutants are most commonly emitted from the incomplete combusion of fuels such as gasoline, coal, oil and gas from the production, handling and evaporation of gasoline, paint thinners, solvents, etc. Hydrocarbons along with oxides of nitrogen and sunlight are important in the generation of photochemical smog.

Water Pollution:

(1) Biological Oxygen Demand - B.O.D. is the amount of oxygen needed by any polluted water or sewage to allow micro-organizms to consume the suspended and dissolved biodegradable organic material found in the liquid under aerobic conditions.

(2) Coliform Bacteria - Micro-organisms found in sewage serving as the indicator of bacterial contamination in water quality.

(3) Dissolved Oxygen (D.O.) is the amount of oxygen found and available for biochemical activity with a given volume of water (mg./1.). The saturation point is dependent upon temperature, chemical characteristics of the water, and barometric pressure.

(4) Nutrients - Nutrients are phospates, nitrates, nitrogen and phosphorus released as waste from certain industries or produced from agricultural and urban runoff.

(5) Thermal Pollution - The increase in temperature of surface waters as a result of the use of these

waters for cooling purposes by industry or public facilities. The heat accelerates biological processes in the stream, resulting in reduction of oxygen content of the water.

(6) Total Dissolved Solids (T.D.S.) - The amount of solids, dissolved in a given volume of water (mg./l).

POPULATION EQUIVALENT

The population equivalent is a means of converting (a) residents, and (b) employees and clients of industries and commercial facilities into a standard measure of the demand placed on such public capital facilities as sewers, streets, and water supply. The population equivalent of an area (analysis area or jurisdiction) is computed as follows:

P.E.= [Total households]+[.3 x all employees of commerce and industry]

For use of population equivalents in APEX County, see CAPITAL PLANT INDEX.

PROCESS RATE

Process rate refers to the amount of materials processed by an Industrialist per unit time. The measure is specified in tons, pounds, barrels, per minute, per hour, etc.

PRODUCTION LEVEL

This is probably the key item determined by an Industrialist each cycle. It is the number of units of a product his plant will produce in that cycle. The Industrialist is free to set his production at any level he chooses, as long as the figure he sets does not exceed his maximum production capacity.

PRODUCTION PROCESS

A production process is a definable part of the overall production system of a given firm. Each gamed industrial firm may have up to five production processes, while each non-gamed industrial firm is assumed to have only one process.

PROMPT SCRAP

Wastes that are recycled for direct reuse without entering the solid waste stream.

QUASI-PUBLIC LAND

This is land owned by tax-exempt organizations such as churches and fraternal organizations. Such land includes church buildings and schools, cemeteries and such miscellaneous buildings as Elks lodges, etc.

REACH

A reach is a generally homogeneous segment of a river or stream. Often in water quality management typical measurements of water quality from any point in the reach are used as representative of the entire reach.

REFERENDUM

A referendum is a vote of the (simulated) population of a jurisdiction on some issue presented to the people by the Politician. Most usually referenda are called to approve (or reject) a general obligation bond issue or a request for special millage, although they may be called to approve some legislative matter, such as open housing.

REFUSE

A term applied broadly to mixed solid waste including food waste, trash, street sweepings, and non-toxic solid industrial wastes.

REZONING APPLICATION FEE

The rezoning application fee is a charge of $100, which is assessed for each rezoning request submitted by a Developer or Industrialist. It is included in that player's financial statement for the next cycle.

RINGELMANN NUMBER

The Ringelmann Number is a scale for measuring the blackness of smoke fumes and is equivalent to the opacity. Ringelmann Numbers and opacities are used for specifying allowable smoke emissions (Ringelmann for black and opacity for other colors). #0 = zero opacity #1 = 20%, #2 = 40%, #3 = 60%, #4 = 80%, #5 = 100%. In APEX County, all smoke readings are reported as Ringelmann Numbers.

SALVAGE

The recovery for reuse of any valuable component from the solid waste stream.

SANITARY LANDFILL

An operation where solid waste is deposited in the ground in a controlled manner. The waste is compacted when delivered and covered daily. APEX County can have three classes of sanitary land fills. (See below.)

SANITARY LANDFILL--Class I

A site where disposal of toxic or hazardous industrial waste (solid waste type 1) is permitted due to the geology and soil characteristics. Solid waste type 2 and 3 may be deposited in this class site.

SANITARY LANDFILL--Class II

A site where only non-toxic or non-hazardous waste may be deposited. These sites receive primarily mixed municipal refuse (solid waste type 2). Solid waste type 3 may also be deposited in this class site.

SANITARY LANDFILL--Class III

A site where only solid fill (solid waste type 3) may be deposited.

SEWAGE TREATMENT LEVELS

Primary Treatment - A series of mechanical treatment processes including screening and sedimentation, which removes most of the floations and suspended solids found in sewage, but which have a limited effect on colloidal and dissolved material.

Secondary Treatment - A series of biochemical, chemical, and/or mechanical processes which remove, oxidize or stabilize nonsetteable, colloidal, and dissolved organic matter following primary treatment.

Tertiary Treatment - Any sewage treatment process that has the capability to remove over ninty-nine percent of the pollutants in sewage if it follows secondary treatment.

SOIL PERMEABILITY

A measurement of the water porosity of soil; soil porosity measured in gallons per day of water which will be absorbed by one square foot of soil surface.

SOIL SURVEY

An engineering/geological survey of an analysis area which provides data on the water table level, soil type, and soil permeability. These parameters are important criteria to determine the suitability of an A.A. for Class I, II, or III sanitary land fills.

SOIL TYPE

Three predominent soil types are found in APEX County--clay, sand or gravel.

SOLID WASTE

Any waste that can be handled as a solid rather than a liquid.

SOLID WASTE DISPOSAL

The end point of solid waste handling; may include open dumps, sanitary land fills, incinerators, composting, hauling out of APEX County by contract, salvage and recycle, etc.

SOLID WASTE SOURCES

Solid wastes are generated from various sources as --

Household - Solid wastes from residences.

Commercial - Solid wastes derived from non-industrial commercial operation.

Industrial - Wastes produced as a result of manufacturing or related industrial operation.

Municipal - Mixed Household and Commercial waste that may contain some street cleaning wastes and industrial solid wastes.

Agricultural - Wastes derived from basic crop or animal operation including waste vegetables, minerals and animal manure.

SOLID WASTE TYPE

APEX County solid wastes are specified as one of three following types--

S.W. Type 1 - Hazardous Wastes; includes sewage sludge, pesticides, industrial chemicals, etc., (Only small quantities of high toxic wastes and radioactive wastes are generated in APEX County and these are not included in Type 1 wastes.)

S.W. Type 2 - Household/Commercial Refuse; includes trash, rubbish, garbage and decomposable organic refuse from commercial and household operations picked up by regular route collection.

S.W. Type 3 - Solid Fill; includes bulky non-water soluable, non-decomposable inert solids from municipal and industrial operations, demolition, etc. Examples are earth, rock, gravel, concrete, asphalt paving fragments, clay, glass, and rubber products.

Industrial wastes are distributed among the above three categories depending upon the characteristics of the particular waste.

SOURCE TYPES (AIR POLLUTION)

Point Source - A stationary source of pollution which has the potential of emitting a substantial amount of pollutant(s) such as a factory or power plant.

Line Source - A moving source of pollutants such as automobiles, buses, trains, and aircraft.

Area Sources - The sum of numerous widespread small stationary pollution sources as the space heaters in buildings.

Indirect or Complex Source - Stationary facilities or developments which indirectly generate substantial pollution by means of activity associated with them (such as vehicle traffic generated by shopping centers, sports complexes, airports, etc.)

STANDARDS OF PERFORMANCE

Direct limitations of pollutant emissions from certain types of high pollution sources (power plants, etc.) set by EPA and/or the states.

STATE EQUALIZED VALUE

State equalization is a process designed to even out differences in assessment practices among political jurisdictions. The state equalization factor applied to each jurisdiction's assessed value may thus be different. The state equalized value for a jurisdiction, reached by applying the factor to local assessed value, is the base on which millage is levied to generate property tax revenues.

STINKELMANN NUMBER

The Stinkelmann Number is a scale (developed in APEX County) for measuring odor emissions, and for specifying maximum allowable odor emissions. Numbers range from 0-5, covering least to worst odor levels, respectively.

TAX RATE

See MILLAGE

TRANSFER STATION

Site at which wastes are transferred from small compacter vehicles to larger long distance transport vehicles.

TRASH

The non-food, non-putrescible fraction of solid waste.

UNIT COSTS

The costs to the Industrialist of operating his plant are calculated, for each production component, except labor, on the basis of the amount and cost of each component required to produce one unit of the product. These unit costs apply to fuel, administrative overhead, inventory, and raw materials.

Fuel Cost applies to the fuel required to produce each Industrialist's product and will be different for each fuel type.

General Administrative Costs include all overhead expenditures, other than salaries, involved in production.

Inventory Carrying Costs must be paid to store product inventory from one cycle to the next. This cost excludes taxes on inventory.

Materials Costs include all raw materials required to produce the product, except fuel.

The unit costs for each of these components which are applicable for a particular Industrialist for the next year are included in that player's output.

UNIT SALES PRICE

This is the price, which an Industrialist sets each cycle, at which he will sell a unit of his product. Each Industrialist except the power plant has complete control over price; although the number of units he actually sells

will be dependent on the relationship of his price to supply-demand conditions in the general market, and to the current average industry-wide price (reported for the last three years in the Industrialist's output).

WATER QUALITY SAMPLES

A water quality sample is a water sample and analysis providing data on seven water pollutant parameters. The water quality manager may order water samples and designate the location from which they are to be taken.

WATER TABLE LEVEL

The distance from the surface of the ground to the underlying ground water level.

ZONING CATEGORY

Zoning categories apply only to vacant land for APEX County. Each of the six zoning categories may be developed into one or more types of land use:

FROM	TO
Zoning Category	Developed Land use Type(s)
(1) R - Single-family residential	(1) R-1 (low density, high cost) (2) R-2 (med. density, med. cost) (3) R-3 (high density, low cost)
(2) M - Multiple-family residential	(4) M-1 (low density, high cost) (5) M-2 (med. density, low cost)
(3) C - Commercial	(6) CL (Commercial-Local) (7) CR (Commercial-Regional)
(4) I - Industrial	(8) IL (Local industry) (9) IX (Exogenous industry)
(5) O - Office	(10) O (Exogenous office)
(6) A - Agricultural	(11) A (Active farming)

CHAPTER 3

Role Description

Chapter 3

AIR POLLUTION CONTROL OFFICER ROLE DESCRIPTION

The Air Pollution Control Officer (APCO) role in APEX is representative of the functions of the County Air Pollution Control Department in the "real world." The APCO is concerned with preventing or reducing harmful effects of air pollution by maintaining or improving air quality through eliminating or reducing emissions of key pollutants into the atmosphere. A major part of his success is based on his ability to develop and pursue his strategies through a judicious balance of relevant information, effective negotiation and persuasion, and carefully-designed and administered regulation. He must be able to persuade other players in APEX County with the soundness of his strategies and proposals. His efforts depend upon the EQA and the County Politicians who make policies which impact on the environment and who must approve his budget and regulation proposals, and the Industrialists, both gamed and simulated, who must act to reduce their contribution to environmental pollution.

Like other players in the game, the APCO receives computer printout at the beginning of each cycle of play. This printout records the decisions made by the APCO in the previous cycle, as well as those made by the County Politicians in approving his budget and regulation proposals. The printout also includes information which may guide the APCO's decisions in the next cycle.

In APEX, the County is responsible for pollution control throughout the Central City, the Suburb, and the two Townships. The Air Pollution Control Office has already been established under State enabling legislation, with specified authority and powers to carry out the air pollution control program. (A typical State law appears in the Legal Reference Manual. This manual should be consulted when questions of a legal nature arise.)

The APCO makes a budget request to the Environmental Quality Agency each cycle, requesting funds which he can spend during the year. He may also initiate a proposal for Federal funds, on a matching basis, which will be considered by the County Politicians, then approved or rejected by the Federal agency.

In addition to his annual budget preparation, the APCO, like all other players, must vote in the Elite Opinion Poll. This includes issues raised in the METRO-APEX NEWS for which a vote is requested as well as requests by the County Politicians for bond issues and/or special millage.

The APCO will be seeking to determine the source, nature and extent of air pollution problems and to build support for compliance with an effective control program. He may discover that effective air pollution control depends as much or more on negotiation and persuasion as on the strict enforcement of regulations. The APCO can improve air quality levels by seeking to get various point sources to reduce their emissions, by assuring that automotive emission control devices are inspected and maintained, and by encouraging the Planners and Politicians to follow land use and transportation policies which reduce environmental pollution. He will find some point sources are represented by gamed Industrialists, with whom he can deal directly, and other industrial sources are represented by the computer. Also simulated are the substantial emissions from motor vehicles and space heating.

The APCO must develop a strategy for achieving the reduction of emissions. He may propose air pollution regulations, which must be approved by the County Politicians. He may make general recommendations on emission standards. He may try to persuade Industrialists to comply with recommendations or regulations, and he can seek to inform and educate the simulated sources and general public through expenditures for public education. He may recommend and solicit public support for the adoption of policies and restrictions on zoning, growth, land use and transportation which impact on pollution of the air.

But complaince with air pollution regulations or recommendations usually involves direct capital and operating costs for the Industrialists who may consider pollution less critical than their firm's profit picture. Politicians may be concerned with levels of industrial employment and tax base, as well as with air pollution. Developers may support pollution regulations when their opportunities for profitable land and development transactions seem to be decreased by pollution, but they will also be concerned with employment and tax base. The public may support pollution control in principle but may object to the increased costs of products and energy and the travel restrictions which could be necessary to accomplish such control.

The APCO may want to attempt to obtain voluntary compliance by negotiating with Industrialists to design a "reasonable" program for pollution reduction. The Industrialist can reduce pollution by changing fuel types, production capacities and rates, process rates, and control systems.

Although the APCO may seek to gain voluntary compliance with air pollution regulations, he may find that conflicts arise when Industrialists refuse to cooperate. In METRO-APEX the resolution of such conflicts is handled through some form of hearing or adjudication in that of a judge or hearing board. Fines assessed as penalties for violation of air pollution regulations may be paid

at any time by the offending Industrialist, but he can only be required to pay fines as a result of some official judgment represented in the above manner.

While the APCO is most concerned with effects of air pollution on people and property, he will generally have relatively little precise information about those effects. He will usually deal more directly with measurements of air quality and compared only to some standard acceptable air quality. Monitoring stations may be purchased by the APCO in any analysis area to get data on levels of concentration of critical pollutants in the air. He can request an inventory of sources of smoke pollution. He can measure actual emissions from specific point sources and will have in his data estimates of the relative contribution of point, line, and area sources to the overall air pollution problem. He can make plant inspections to get data about sources sufficient to estimate their emissions. All of this information will appear in the computer printout in the cycle after the request is made, assuming the APCO budget allocation is sufficient. In METRO-APEX the APCO also gets data on the number of public complaints about smoke and odor from all analysis areas, and the METRO-APEX NEWS includes complaints about specific emission sources and about general air quality. On the basis of all this data, the APCO can determine what air pollution problems exist, where pollution levels are most severe, and what the major sources are.

Since the primary goal in air pollution control is to prevent or reduce the harmful effects of pollutants, the APCO will be concerned with air quality criteria, goals, and standards--information which comes to him from various outside public and private agencies. He may start his activities by dealing directly with complaints about smoke and odor, as clues to the most readily-evident effects. Or he may start by tackling the control of major emissions sources, which his measurements and inspections indicate are the critical polluters. Or he may start with measurements of air quality to determine more clearly the nature and extent of his pollution problems. Generally, the APCO will find that his strategy involves all of these activities in some part, but he will be limited in the amount of funds he has available to carry them out.

The APCO may find the County and City Planners his most effective allies in developing and carrying out his air pollution control program. In METRO-APEX, the Planners will be dealing primarily with public capital improvements and zoning. As a basis for their recommendations on these matters, they will be concerned with the relative locations of industrial, commercial and residential areas. They will be seeking to assist the County and City political and business leaders in improving the prosperity and quality of life for residents and the business climate for firms in their jurisdictions. They will be dealing with the interrelated problems of solid, liquid, and gaseous waste disposal. They will also deal with the problems of

major transportation routes and traffic densities, which affect motor vehicle air pollution emissions.. They will deal with commercial areas and housing densities, which affect space heating emissions. Planners and APCO may choose to combine forces in making recommendations on zoning, traffic and transportation, and other matters which clearly influence air pollution emissions and pollution concentrations. The Planners may request the APCO to file a report on the environmental impact of the Planner's recommendations. The APCO may find it advantageous to make recommendations on the location of new industries (Exofirms) coming into the City and County, especially those which will add critical pollution loads.

In summary, the APCO has several major methods available for achieving air quality goals. His time and budget may be used to:

1. Propose regulations limiting the emissions of pollutants.
2. Measure air quality by establishing and operating monitoring stations.
3. Carry out plant inspections.
4. Measure the specific emissions of specific sources.
5. Negotiate with Industrialists to gain their voluntary compliance with reasonable emission standards.
6. Work with the Planners and Politicians on land use, community growth and development, and transportation reforms which will impact air quality.
7. Carry out public education, administration, and enforcement programs to influence those emission sources that are simulated as well as those that are gamed.
8. Help develop environmental policies which consider the interrelationships between air, water, solid waste and other forms of pollution.

CHAPTER 4

Annotated Worksheet

Chapter 4

ANNOTATED AIR POLLUTION CONTROL OFFICER WORKSHEET

The APCO worksheet has five parts: (1) the Elite Opinion Poll, (2) the Budget Request, (3) Federal Grant Application, (4) Air Pollution Legislation, and (5) a News Release. This worksheet will serve as the official record of your agency. Space has been provided for you to record decisions over several years. At the end of each cycle, these decisions will be transferred to the computer.

I. ELITE OPINION POLL

Each year certain issues will appear in the METRO-APEX NEWS which require decisions from all role players, acting as the "elite" or power structure of the community. In some cases the decision of the elite is binding on the Politicians and the poll can be considered the same as submitting a referendum to the voters. Here the newspaper will read "DECIDED BY OPINION POLL MAJORITY." In other cases, the decision of the elite is merely advisory, and the Politicians can decide whether or not to heed their mandate. Here, the newspaper will read "POLITICIAN'S ULTIMATE DECISION BUT ELITE OPINION SOLICITED." (See the sample newspaper in Chapter 8 of this manual.)

The outcome of the vote will be recapitulated in the next cycle's newspaper. For each issue outcome, the newspaper will also print the reactions of five pressure groups--Civil Rights Groups, Effective Government Groups, Business Community, Labor Vote, Right-Wing Conservatives.

Players should vote on all issues in the Elite Opinion Poll, including those on the Business Page. Each role will have one vote. In the cases where there is more than one person in a role, an agr ement must be reached.

The Elite Opinion Poll is especially important to the Politicians because their actions relative to the poll may affect their chances for re-election.

Instructions: Indicate your role and the cycle number at the top of the page. Then put the issue number in the left hand column (this should not be confused with a project number), and the number of the alternative chosen in the adjacent column.

Example:

Issue No.	Alternative
42	2
1	3

Note: See the sample newspaper in Chapter 8.

II. BUDGET REQUEST

A. Public Information and Education

Public Education is an integral part of any air pollution control program. Public education typically covers cost associated with reports, technical meetings, news releases, conferences, and meetings with interested citizens groups. The Air Pollution Control Office can develop public awareness through a good public education program, and the amount of resources expended will affect this awareness.

Instructions: Indicate the type of program in the left hand space and the requested funds in the right hand space. Then total the expenditures.

Example:

A. Public Information and Education

Programs	Costs
television production	$5,000
reports	$ 900
public schools program	$ 700

Total Public Information and Education $ 6,600

B. Administration and Enforcement

Administrative activities include many of the daily operating functions of an agency. For example, they would include functions associated with the preparation of the budget, personnel matters, planning, records storage and retrieval, etc. The costs under this section of the budget include a large portion of the APCO's salary, as well as the general cost of doing business, i.e., secretaries, supplies, office machines, services, accounting, etc.

Enforcement activities, on the other hand, are those associated with drafting legislation, bringing violators to trial, operation of a complaint file, building a court case, etc.

As mentioned above, this section of the budget includes a large portion of the APCO's sal... It also includes portions of the salaries of the rest of ... staff. To help you in determining the staff requirements for your agency, a chart may be useful. Refer to Manpower and Training Needs for Air Pollution Control, Report of the Secretary of Health, Education and Welfare, August 7, 1970, U.S. Government Printing Office, Washington, D.C.

Instructions: In the left hand column, list the various administrative and enforcement programs of your agency. In the right hand column, list the costs associated with these programs. Then total these costs.

Example:

B. Administration and Enforcement

Administration

Programs	I	Costs
policy	I	$2,000
intergov't. relations	I	$1,500
salaries	I	$40,000
Total Administration		$43,500

Enforcement

Programs	I	Costs
preparation of cases	I	$2,000
	I	
Total Enforcement		$2,000

Total Administration and Enforcement $45,500

C. 1. Plant Inspections

Plant inspections are the scheduled inspections made by the agency which provide information developed from a walk-through inspection. For instance, an inspector can determine 1) industry number, 2) analysis area (A.A.) location of plant, 3) process names, 4) process or fuel rate, 5) fuel type, 6) control systems, 7) smoke emission readings, and 8) odor readings. Up to 15 industries can be inspected during the year.

The cost of each plant inspection is $1,500. The $1,500 covers the cost of equipment, office space, training, secretarial cost, and miscellaneous expenses amortized over a 10 year period of time. It also includes portions of the salaries of the inspectors and engineers who carry out the inspections.

Plant inspection requests should be placed in descending order of preference, i.e., the most important plant inspection first followed by the next most important. If there are not enough funds in this budget category, plant inspections will be dropped from the list starting with those of lowest priority.

Instructions: Enter the numbers of the plants to be inspected this cycle in order of priority. The total should be multiplied by $1,500.

Example:

C.1. Plant Inspections

Industries in Priority of Inspection												No. of Insp.	Cost/ Insp.	Total Cost This Cycle
1/	2/	3/	4/	5/	6/	7/	8/	9/	10/	11/	12			
28/	12/	/	/	/	/	/	/	/	/	/		2	$1500	$3,000

For typical information received from a plant inspection see Chapter 8, Annotated Printout.

C. 2. Smoke Inventory

Also under plant inspections the APCO can request a smoke inventory of each jurisdiction. This inventory would include a listing of industries in that jurisdiction and the smoke emission readings for each industry. The cost of this survey covers travel expenses, training for smoke inspectors, and processing of reports.

Instructions: Check the jurisdiction(s) in which the smoke inventory is requested. Add appropriate costs to plant inspection totals.

Example:

C. 2. Smoke Inventory

(1)	Central City (AA's 1-13)	$ 6,000	___
(2)	Suburb (AA's 17-19)	$ 2,000	___ (Check
(3)	Township 1 (AA's 23-28)	$ 1,000	___ Selec-
(4)	Township 2 (AA's 14-16,20-22,24)	$ 1,500	x tion(s)
(5)	County (AA's 1-29)	$10,000	___
	Smoke Inventory Costs This Cycle	$ 1,500	

Plant Inspections(C-1) +
Smoke Inventory(C-2) = Total $ 4,500

Typical Information Received From A Smoke Inventory:

SMOKE INVENTORY TOWNSHIP TWO $1,500

INDUSTRY NUMBER	AA	INDUSTRY NAME	SMOKE IN R
9	15	Humpty Dump	3
35	15	Saint Andre Asphalt	5
36	20	Oriental Concrete Batching	0

D. Emission Measurements

Emissions measurements involve source testing and they require a sophisticated team of engineers and chemists. They also require more extensive equipment and laboratory services and involve a longer sampling time than that needed for plant inspections. For this reason, the cost of an emission measurement is twice that of a plant inspection.

The $3,000 cost for each emission measurement is based on an amortized cost for a beginning agency over a ten year period.

As with a plant inspection, the sum indicated here includes salaries of engineers, chemists, etc., who are involved in taking emission measurements.

An emission measurement provides the same preliminary information as the plant inspection, so it is unnecessary to order a plant inspection when ordering an emission measurement.

Emission measurements will provide all of the information listed for plant inspections, plus 1) emission rates in pounds per hour for Particulates, SO2, CO, NOx and HC and 2) any violations of the State or County regulations, including the estimated number of days in violation.

Information obtained through a plant inspection or an emission measurement may be used as evidence in court.

As with plant inspections, emission measurements should be listed in order of priority. If funds are not sufficient to cover all the measurements requested, the ones of lowest priority will be dropped from the list first. There is a maximum of fifteen emission measurements that can be ordered each cycle.

Instructions: Enter the numbers of the plants to receive emission measurements in order of priority. Multiply the number of measurements requested by $3000 to get the total cost.

Example:

D. Emission Measurements

Industries in Priority of Emission Measure. 1/ 2/ 3/ 4/ 5/ 6/ 7/ 8/ 9/10/11/12/13/14/15	No. of E.M.	Cost/ E.M.	Total Cost This Cycle
6/ / / / / / / / / / / / / / /	1	$3000	$3000

For typical information received from emission measurements see Chapter 8, Annotated Printout.

E. Air Quality Monitoring Stations--Purchase, Relocation and Operation

Air quality monitoring stations provide information on the general air quality of an area. There are 29 possible sampling points within the County, one in each analysis area (AA). The cost of each monitoring station is $8,000. These stations provide protection for the equipment, ready accessibility, a supply of electricity, and are located so as to be clear of obstructions. Once a monitoring station is established, it cannot be moved. However, the monitoring equipment in the station may be moved to another monitoring station, realizing that there is a cost associated with this relocation (to cover the costs of manpower, recalibration, hookup, etc.). For this reason, care should be taken in the selection of monitoring station locations. Factors that should be considered include meteorology, topography, growth potential, and the types of contaminants to be measured.

After a monitoring station is established, 5 different types of air quality monitoring equipment may be installed. The APCO can purchase any individual or combination of the 5 different types of air quality monitoring equipment. Also once a station (building and utilities) is established, the

APCO can purchase any additional pieces of equipment. If the APCO has purchased equipment and wishes to obtain air quality data, he must allocate enough funds for the operation of the equipment. He can move the air quality monitoring equipment to another analysis area, providing there is a station there. The cost of moving his air quality monitoring equipment represents the labor costs involved in dismantling, transporting, reconnecting, and recalibration of this delicate equipment in another area.

The following table should be used in determining the original purchase price, operating costs, and relocation costs. Before any of the air quality monitoring equipment can be purchased, the APCO will need a station to house it. Cost of this station is $8,000 for each analysis area and is a one time cost only.

Costs Associated With A.Q. Monitoring Equipment

Type	Pollutants Monitored	Equipment Purchase Price	Operating Costs	Relocation Cost
1	Particulates	$2500	$1500	$1000
2	Sulfur Dioxide	$4000	$1800	$1600
3	Carbon Monoxide	$5000	$2000	$2000
4	Oxides of Nitrogen	$7000	$2400	$2800
5	Hydrocarbons	$4000	$1800	$1600

When a monitoring station is installed and operating in an analysis area, the following information will appear on the computer printout for the APCO role:

1) either a mean value or 8 hour maximum value in micrograms/cubic meter (CO in milligrams/cu. meter).
2) either a maximum value for a day, 1 hour time period or a 3 hour time period in micrograms/cu. meter (CO is in milligrams/cu. meter).
3) the number of days over a certain reporting level. At the outset these levels are in agreement with the standards set by the Federal Environmental Protection Agency under the 1970 Clean Air Amendments.

In summary, there are three types of decisions involving monitoring stations. The first is the choice of the analysis area in which to locate the station. The second involves the type of equipment to be purchased and operated at that station. And third is the selection of a reporting level for each pollutant to be measured.

Instructions: To move existing air quality monitoring equipment enter in the worksheet the old analysis area (where the equipment is currently located) and the number of the new analysis area (where the equipment is to be relocated); and by using the "Costs Associated with A.Q. Monitoring Equipment" chart, check the appropriate type of equipment to be moved and indicate appropriate moving and operating costs. If there is no existing monitoring station in the new analysis area, one will have to be purchased.

Example:

1. Relocation Costs (existing equipment)

Old AA	New AA	Type of Equipment To Be Moved 1	2	3	4	5	Reloc. Costs	Oper. Costs	Is Station Existing? Yes	No @ $8000/no
5	7		x				$1600	$1800	x	
5	8	x					$1000	$1500		x $8000

(a) Total Relocation Costs $2600

(b) Total Operating Costs $3300

(c) Purchase of New Monitoring Stations 1 @ $8000 = $8,000

(Note: Example only - these totals are not included in following budget and annotated printout, Chapter 8.)

Instructions: For the purchase of new equipment or the operation of equipment that is not being moved, enter the analysis area where the equipment will be operating. Then assign a priority to each station. (This will determine which ones are to be operated in case of insufficient funds. By using the "Costs Associated with A.Q. Monitoring Equipment" chart, check the appropriate type of equipment, purchase and operating costs. If there is no existing monitoring station in the analysis area, one will have to be purchased. Finally, under part 3 come up with the appropriate totals for the worksheet.

Example:

2. Monitoring Stations and New Equipment Purchase & Operations

AA	Priority	Types of Equipment 1/	2/	3/	4/	5	Equip. Purch. Costs	Oper. Costs	Is Station Existing? Yes	No @ $8000/no
1	1	x/	x/	x/	x/		$18500	$7700		x $8000
17	2	x/	/	/	/		$ 2500	$1500		x $8000

(d) Total Equip. Purch. Cost. $21000

(e) Total Operating Costs $9200

(f) Purchase of New Monitoring Stations 2 @ $8000 = $16,000

(g) Total Cost of New Stations (c + f) $16,000

3. Totals

Total Equip. Purchase Costs (d)		$21,000
Total Costs of New Stations (g)	+	$16,000

(h) Total Station & Equipment Purchases $37,000

Total Relocation Costs (a)		$ 0
Total Operating Costs (b)	+	$ 0
Total Operating Costs (e)	+	$ 9,200

(i) Total A.Q. Operating & Relocation Costs (a+b+e) $ 9,200

4. Monitoring Station Reporting Levels

Instructions: To change monitoring station reporting levels indicate the new values under the appropriate pollutants. The initial values are the 1970 Clean Air Amendments Air Quality Standards.

Example:

4. Monitoring Station Reporting Levels

Particulates	SO2	CO	NOx	HC
260.	365.	40.	100.	160.

III. BUDGET SUMMARY AND BUDGET ESTIMATES

1. Budget Summary

Each year (cycle) a budget request for the cycle, a projected budget for the next cycle, and a budget estimated for the following (3rd) cycle is prepared by the APCO and submitted to the head of the Environmental Quality Agency. The EQA then submits a total budget for all offices under his jurisdiction to the County Board of Supervisors. The Board then has three

options: 1) to adopt a one, two, or three cycle budget without modification; 2) to revise the budget(s) before adoption; or 3) to reject entirely. If the budget proposal is modified, the functional budget must be rearranged to reflect the change. It is important to remember that programs will be cut to match funds allotted in the functional budget according to the priorities you have set within each functional category, i.e., plant inspection, emission measurements, and air quality monitoring stations operations.

Each year a budget proposal must also be submitted to the Federal government, if their assistance is requested. Federal funds are usually available on a a matching basis. Matching is based upon the totals and does not apply to the distribution among functional categories. Ordinarily, Federal grants are for a three year period. However, these grants simply involve the total maximum Federal funding available, and specific functional allocation must be approved each year.

Instructions: Take the totals from each of the functional categories and place them under the corresponding headings of the Budget Summary. Then allocate the appropriate portions of the total to the County and Federal governments. Finally, submit the completed budget to the EQA officer who will then submit the budget to the authorizing County official for his signature. All budgets must be approved by the County Politicians at a public hearing.

Example:

1. Budget Summary (Cycle N)

	County	Federal	Total
A. Public Info. & Educ.	$ 2,000	$ 4,600	$ 6,600
B. Admin. & Enforce.	$14,200	$31,300	$ 45,500
C. Plant Inspection	$ 3,000	$ 1,500	$ 4,500
D. Emission Measurements	$ 1,000	$ 2,000	$ 3,000
E. Sta. & Equip.Pur.(E3h)	$ 4,500	$32,500	$ 37,000
F. Sta. Oper.Reloc. (E3i)	$ 4,000	$ 5,200	$ 9,200
Total Budget Summary	$28,700	$77,100	$105,800

Signature of County Representative _____

Signature of Federal Representative _____

2. Budget Estimates

For long-range planning purposes, an estimated budget for the second and third cycle (year) may be proposed. This portion of the budget may be used for APCO planning purposes or the EQA may get County and Federal approval for a three

year period. If these budgets are filled out, they will appear in the cycle printout. If one or both are not filled out, they will not appear in the printout.

Instructions: See Budget Summary, Section III-1.

Example: See Budget Summary, Section III-1.

3. Federal Grant Application

Federal funds are available to help local and state agencies in establishing and maintaining effective programs. In order to receive funds, formal presentation must be made to the Federal government representative in the game. (The Game Overall Director will see that you have access to this representative.) Funds are granted just prior to the cycle in which funds are to be used; however, you should lay the ground work several cycles before the need arises. If additional funds are needed during the usual three year grant period, supplementary funds may be received by making a request to the Federal representative. Details on air pollution grants may be obtained by consulting the Game Overall Director.

Instructions: Enter the funds authorized by the Federal representative in the spaces under each cycle in which the funds are to be granted, for either regular or supplementary grants. Finally, secure the signature of the authorized Federal representative.

Example:

3. Federal Grant Application

	Cycle 1(N)	Cycle (N+1)	Cycle (N+2)
Original Funds Granted for Cycle	$77,100		
Additional Funds Granted for Cycle	-	-	-
Total Funds	$77,100		

Signature of Federal Representative _____

If Federal funds had been requested and granted for cycle 2 or 3 the printout would indicate the amounts by cycle.

Example:

FEDERAL FUNDS AVAILABLE (ON A 3-FOR-1 BASIS)
FOR NEXT TWO CYCLES = CYCLE 2 $ 0.
CYCLE 3 $ 0.
TOTAL FOR TWO YEARS $ 0.

IV. AIR POLLUTION LEGISLATION

The APCO may be involved in developing legislation on two levels. First, proposals may be sent to the State Legislature for new State regulations concerning air pollution. The State will take into consideration any proposals coming from APEX County, but it should be recognized that APEX is only one of many counties in the State. Any change in State Legislation will be reported on the APCO computer printout, and through the News Media. (The Legal Reference Manual should be consulted for information concerning legislation at the start of the game).

The APCO may also work on the local level and concentrate on having legislation approved by the County Board of Supervisors. It is important to remember that all local regulations can be approved only after a public hearing is held on the proposed regulation. (see Enabling Legislation in the Legal Reference Manual). The County Board must formally adopt a regulation before it becomes a law.

This section of the worksheet gives you the opportunity to recommend regulations covering Particulates, SO2, CO, NOx, and HC in either pounds of pollutant per hour of operation, or in pounds of pollutant per 1000 pounds of production (or if a fuel process, per 1000 pounds fuel used). The worksheet also has space to recommend regulations covering smoke emissions in Ringelmann numbers and odor emissions in Stinkelmann numbers (see Glossary for definition). A recommendation on the maximum daily fine level for violation of these regulations may also be made.

If the categories for legislation on the worksheet do not meet your needs, it is not necessary to use them. You may develop any type of ordinance structure that best enables you to carry out your control strategy. However, the computer printout will reduce the work required to check for possible air pollution control regulation violators if the ordinance is expressed in terms of maximum permissible emissions in pounds of pollutants per hour or in pounds of emissions per 1000 pounds of finished materials (or in the case of fuel, pounds per 1000 pounds of fuel used).

Instructions: In section A fill in the appropriate categories for proposed County Regulations. Then obtain the signature of the authorized County Board Official if the regulations are approved after a public hearing.

Use section B to make any recommendations to the State for air pollution legislation.

Example:

A. County Regulations

Initial of Co. Board	Max. Fine Level	Lbs/Hr. Part	SO2	CO	NOx	HC	Lbs/1000 Lbs Prod. Part	SO2	CO	NOx	HC	Smoke	Odor
	$500	40	200	10	140	10	3					2	

B. Recommendations to State on Regulations

		40	200	10	140	10	3					2	2

V. NEW RELEASE

Each cycle you should report your activities to the community. This is partially accomplished by making a news release to the News Media.

Instructions: Develop and write a news release or publication. Present the news release to the representative at the News Media.

Example:

APCO News Release

This year the Air Pollution Control District succeeded in prosecuting three firms for violation of the air pollution control ordinance. The reduction in pollution was ....

CHAPTER 5

Worksheet

ELITE OPINION POLL

Role________________ Cycle Number________

Issue No.	Alternative

Air Pollution Control Officer Cycle ____

II. BUDGET REQUEST

A. Public Information and Education

Programs	I	Costs
	I	
	I	
	I	
	I	
	I	

Total Public Information and Education $____

B. Administration and Enforcement

Administration

Programs	I	Costs
	I	
	I	
	I	
	I	
	I	

Total Administration $____

Enforcement

Programs	I	Costs
	I	
	I	
	I	
	I	
	I	

Total Enforcement $____

Total Administration and Enforcement $____

C. 1. Plant Inspections

Industries in Priority on Inspection* 1/ 2/ 3/ 4/ 5/ 6/ 7/ 8/ 9/10/11/12	I	No. of Insp.	I	Cost/ Insp.	I	Total Cost This Cycle
/ / / / / / / / / / / /	I		I	$1500	I	

Air Pollution Control Officer

C. 2. Smoke Inventory

(1)	Central City (AA's 1-13)*	$ 6,000	___ (Check
(2)	Suburb (AA's 17-19)*	$ 2,000	___ Selec-
(3)	Township 1 (AA's 23-28)*	$ 1,500	___ tion(s)
(4)	Township 2 (AA's 14-16,20-22,24)*	$ 1,500	___
(5)	County (AA's 1-29)*	$10,000	___

Smoke Inventory Costs This Cycle $_____

Plant Inspections(C-1) +
Smoke Inventory(C-2) = Total $_____

D. Emission Measurements

Industries in Priority of Emission Measure.* 1/ 2/ 3/ 4/ 5/ 6/ 7/ 8/ 9/10/11/12/13/14/15	No. of E.M.	Cost/ E.M.	Total Cost This Cycle
/ / / / / / / / / / / / / / /		$3000	

E. Air Quality Monitoring Stations--Purchase, Relocation, and Operation

Costs Associated With A.Q. Monitoring Equipment

Type	Pollutants Monitored	Equipment Purchase Price	Operating Costs	Relocation Costs
1	Particulates	$2500	$1500	$1000
2	Sulfur Dioxide	$4000	$1800	$1600
3	Carbon Monoxide	$5000	$2000	$2000
4	Oxides of Nitrogen	$7000	$2400	$2800
5	Hydrocarbons	$4000	$1800	$1600

1. Relocation Costs (existing equipment)

Old* AA.	New* AA	Type of Equipment* To Be Moved 1 2 3 4 5	Reloc. Costs	Oper. Costs	Is Station Existing? Yes	No	$8000/No

(a) Total Relocation Costs $_____

(b) Total Operating Costs $_____

(c) Purchase of New Monitoring Stations ___ @ $8000 = $_____

Air Pollution Control Officer

2. Monitoring Stations and New Equipment Purchases & Operations

AA*	Priority*	Types of Equipment* 1/2/3/4/5	Equip. Purch. Costs	Oper. Costs	Is Station Existing? Yes	No @ $8000

(d) Total Equip. Purch. Cost $_____

(e) Total Operating Costs $_____

(f) Purchase of New Monitoring Stations__ @ $8000 = $_____

(g) Total Cost of New Stations (c + f) $_____

3. Totals

Total Equip. Purchase Costs (d) $_____
Total Costs of New Stations (g) + $_____

(h) Total Station & Equipment Purchases $_____
(Enter on III,1,E)

Total Relocation Costs (a) $_____
Total Operating Costs (b) + $_____
Total Operating Costs (e) + $_____

(i) Total A.Q. Operating & Relocation Costs (a+b+e) $_____
(Enter on III,1,F)

4. Monitoring Station Reporting Levels

Particulates*	SO2*	CO*	NOx*	HC*

Air Pollution Control Officer

III. BUDGET SUMMARY AND BUDGET ESTIMATES

1. Budget Summary (Cycle N)

	County*	Federal*	Total
A. Public Info. & Educ.			
B. Admin. & Enforce.			
C. Plant Inspection			
D. Emission Measurements			
E. Sta. & Equip.Pur.(E3h)			
F. Sta. Oper.Reloc. (E3i)			
Total Budget Summary	$	$	$

Signature of County Representative _____

Signature of Federal Representative _____

2. Budget Estimates for Cycle (N+1)

	County*	Federal*	Total
A. Public Info. & Educ.			
B. Admin. & Enforce.			
C. Plant Inspection			
D. Emission Measurements			
E. Sta. & Equip.Pur.(E3h)			
F. Sta. Oper.Reloc. (E3i)			
Total Cycle (N+1) Est.	$	$	$

Budget Estimates for Cycle (N+2)

	County*	Federal*	Total
A. Public Info. & Educ.			
B. Admin. & Enforce.			
C. Plant Inspection			
D. Emission Measurements			
E. Sta. & Equip.Pur.(E3h)			
F. Sta. Oper.Reloc. (E3i)			
Total Cycle (N+2) Est.	$	$	$

Air Pollution Control Officer

3. Federal Grant Application

	Cycle__(N)	Cycle__(N+1)	Cycle__(N+2)
Original Funds Granted for Cycle			
Additional Funds Granted for Cycle*			
Total Funds			

Signature of Federal Representative_____

IV. AIR POLLUTION LEGISLATION

A. County Regulations

Initial of Co. Board	Max. Fine Level*	Lbs/Hr.* Part	SO2	CO	NOx	HC	Lbs/1000 Lbs Prod.* Part	SO2	CO	NOx	HC	Smoke*	Odor*

B. Recommendations to State for Regulations*

THIS SPACE FOR ROLE ADVISOR USE ONLY

Cycle No. _____ _____
(Name of the submitting role)

NEWS RELEASE

The following is submitted to the
News Media for possible publication.

Editors Recommendation: PRINT _____ TELEVISE _____

INVESTIGATE FURTHER OR REWRITE _____

.....

Cycle No. _____ _____
(Name of the submitting role)

NEWS RELEASE

The following is submitted to the
News Media for possible publication.

Editors Recommendation: PRINT _____ TELEVISE _____

INVESTIGATE FURTHER OR REWRITE _____

CHAPTER 6

Background Information

Chapter 6

BACKGROUND INFORMATION FOR APCO ROLE

1. Climatological Summary

The climatology of this region is characterized by an average annual temperature of 54.3° F and an average annual precipitation of 41.23 inches. There is a prevailing westerly wind with a mean hourly speed of 9.6 miles per hour. In Figure 1 there are wind roses which represent 10 years of weather observations taken from the airport in analysis area 29. Each line in the wind rose is a vector which represents the percent of time or the speed in miles per hour that the wind travels in a particular direction. (The direction of the vector is toward the center of the wind rose.) Inversion frequency is also presented in Figure 1.

Figure 2 contains information on degree days in APEX County. A degree day is defined as the difference between the average temperature for the day and the base temperature in degrees Fahrenheit. In APEX County, the base temperature has been set at 65° F. As an example, if the average temperature on January 31 is 32° F, then the degree day would be 65° F minus 32° F, or 33° F. The concept of degree day was developed to aid in calculating the space heating requirements under different weather conditions.

2. Topography

The topography of APEX County is typical of the areas of the North Central United States. The area is characterized as flat with no sharp breaks in topography. The most prominent topographical feature is the Red Oak River which joins the Great River in the heart of town, and continues to flow toward the west. As a result of glacial deposits several unusual soils are found in this area which are ideally suited for vegetable crops such as lettuce, tomatoes, beans, and alfalfa.

3. List of Major Industries

The Chamber of Commerce has published lists containing information about the major industries in APEX County. These lists are included as Figures 3, 4 and 5 and they record the location, the name, the number, and the initial production capacity of 40 major industries.

4. Emission Factors--Point Sources

Emission factors are used to make very rough estimates of the pollution emitted from uncontrolled air pollution sources. The emission factors recorded in Figures 6 and 7 have been specifically adapted for use in the METRO-APEX game and should not be used elsewhere.

To calculate the emissions from a combustion process, Figure 6 should be consulted. The appropriate emission factor should be multiplied by the fuel use rate for that industry. For example, if the Pulp Plant uses high grade oil, the appropriate emission factor for particulates is in the range of .24 to .40 pounds of particulates per barrel of oil. A figure in this range is multiplied by the fuel rate which is obtained when a plant inspection or emission measurement is ordered. The particulate emissions are then calculated as follows:

$$\frac{.32 \text{ lbs. Part.}}{\text{bbl. oil}} \times \frac{48 \text{ bbl. oil}}{\text{hour}} = 7.2 \text{ lbs/hr. Particulates for the combustion process}$$

If the fuel rate is not known, it can be estimated by consulting Figure 8, the properties of fuels used in APEX County.

To calculate emissions from a production process, Figure 7 should be used. In this case the emission factor for the appropriate type of industry is multiplied by the process rate. For example, to calculate particulate emissions from the Pulp Plant, an emission factor in the range of $\frac{14 \text{ to } 16 \text{ lbs/hr}}{\text{tons/day}}$ is used. This is multiplied by a process rate of 300 tons/day for the recovery process. The emissions are then as follows:

$$\frac{15 \text{ lbs/hr Part.}}{\text{tons/day}} \times 300 \text{ tons/day} = 4500 \text{ lbs/hr Particulates for the recovery process}$$

5. Properties of Fuels Used in APEX County

Figure 8 contains data on fuels presently used in APEX County. This data can be important in determining emissions from the combustion process of an industry. It can also be used to estimate the effects of a fuel change. For example, if a combustion process used 40 bbl/hr of "lo-grade" oil with a heating value of 4.2×10^6 BTU/bbl, a total of 168×10^6 BTU/hr are being generated. A simple equation for fuel change would be present fuel use rate (fuel units/unit of time) x heating value of present fuel (BTU/fuel unit) = unknown fuel use rate (fuel units/unit time) x heating value of proposed fuel (BTU/fuel unit). It should be noted that the heat generated by a combustion process can be used for many purposes, irrespective of the fuel used by the process.

6. Line Sources

Automobile traffic is considered a line source. There are approximately 2.1 people per registered automobile in APEX County in Cycle 1. Gasoline sales for Cycle 1 indicate 1.9 gallons of gasoline are used per auto per day. Figure 11 which is taken from EPA Publication AP-42, presents emission factors for gasoline and diesel engines.

7. Control Equipment

Each industry can install air pollution control equipment. Figure 10 represents general information on control systems including the estimated initial cost and the expected annual operating costs. However, the exact equipment size, efficiency, and cost of a control device for a particular industry can only be obtained when that industry orders a consultant survey.

8. Area Sources

Space heating is a major source of pollution from area sources. Each of the five household types is considered to use a characteristic fuel, i.e., the low income group uses the lowest quality and the higher income uses natural gas heating. For calculation methods you should consult Guntis Ozolins and Raymond Smith, A Rapid Survey Technique for Estimating Community Air Pollution Emissions, Public Health Service (No. 999-AP-29).

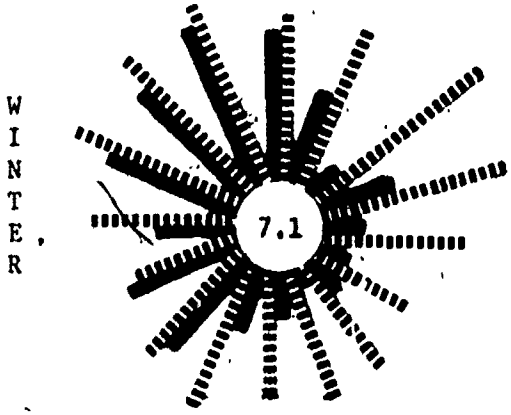
9. Indirect or Complex Sources

These sources are stationary facilities which indirectly generate pollution by means of the mobile source (automotive) activity associated with them; also the increased pollution arising from growth of new commercial, industrial and residential development including the resultant increased electrical demand, heating, motor vehicle traffic and solid waste production. Examples of this type of source are major highways, airports, amusement parks, shopping centers, sport complexes and other large developments.

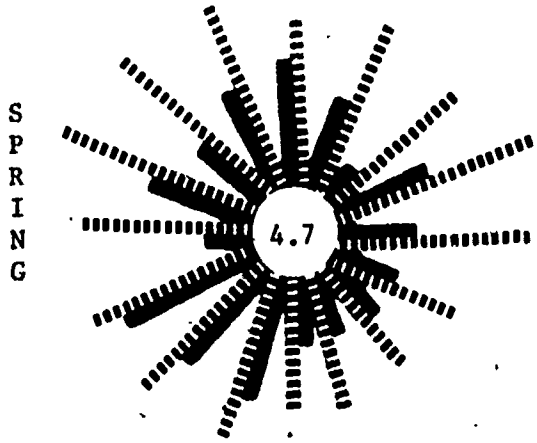
The potential pollution from such proposed large developments is difficult to predict; however, the APCO should work closely with the Planners to anticipate the environmental impact of such growth. References: (1) Federal Register, Vol. 38, No. 74, April 18, 1973 and Vol. 38, No. 116, June 18, 1974; (2) Report on Guidelines for Relating Air Pollution Control to Land Use and Transportation Planning in the State of California, Livingston and Blayney, City and Regional Planners, San Francisco, California, July 1973 (prepared for the California Air Resources Board).

Figure 1. WIND ROSES BY SEASONS

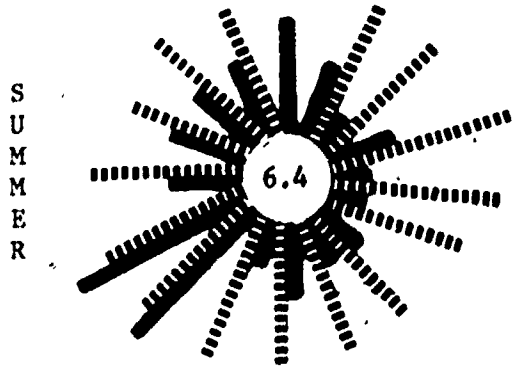
Inversion Frequency 44%.



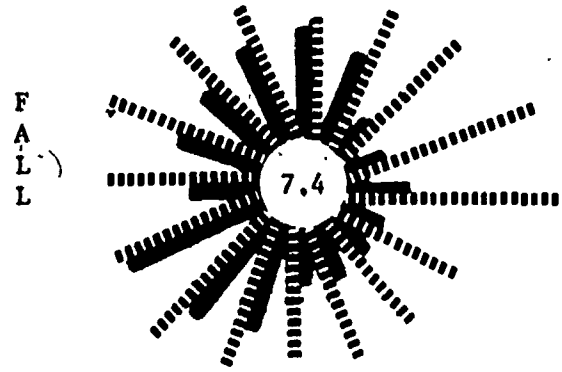
Inversion Frequency 42%



Inversion Frequency 47.4



Inversion Frequency 55.6



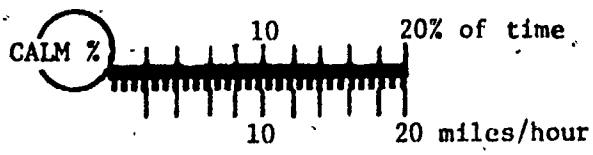


Figure 2. DEGREE DAYS FOR APEX COUNTY BY MONTH*

J	F	M	A	M	J	JL	A	S	O	N	D	ANNUAL
986	907	704	402	104	0	0	0	47	269	573	902	4,866

*a degree day is defined as the difference between the average temperature for the day and a base temperature (65° for APEX).

Figure 3

CHAMBER OF COMMERCE
LIST OF MAJOR INDUSTRIES BY INDUSTRY NUMBER

INDUSTRY NUMBER	INDUSTRY NAME	PRODUCTION CAPACITY	LOCATION (A.A.)
1	Shear Power Company	500 Megawatts	8
2	People's Pulp Plant	300 Tons/Day	2
3	Rusty's Iron Foundry	50 Tons/Day	5
4	Gestalt Malt Brewery	8740 Bbls/Day	27
5	Caesar's Rendering Plant	23 Tons/Day	12
6	Dusty Rhodes Cement Company	12500 Bbls/Day	23
7	Shick Cannery	9560 Cases/Day	3
8	Municipal Incinerator	200 Tons/Day	10
9	Humpty Dump	250 Tons/Day	15
10	Flies Dump	250 Tons/Day	26
11	Auto Assembly Able	500 Cars/Day	4
12	Auto Assembly Baker	200 Cars/Day	4
13	Auto Assembly Charlie	100 Cars/Day	6
14	Wolverine Forging Plant	200 Tons/Day	7
15	Finch's Forging Plant	200 Tons/Day	6
16	Smithy's Forging Plant	200 Tons/Day	2
17	Ahead Forging Plant	200 Tons/Day	6
18	Wordy Printing Company	18000 Feet/Hr	6
19	Bogus Printing Company	18000 Feet/Hr	6
20	Boylan's Fertilizer	180 Tons/Day	2
21	Peter's Water Heaters	700 Shells/Day	7
22	Tar Heel Asphalt Paving	1600 Tons/Day	8
23	Concrete Batching	1600 Tons/Day	12
24	Spartan Galvanizing Company	24 Tons/Day	8
25	Monkey Brass Melting Company	14 Tons/Day	5
26	Trojan Varnish Manufacturing	660 Gal/Day	10
27	Hannah Feed and Grain	360 Tons/Day	1
28	La Rue Soap and Detergent	480 Tons/Day	1
29	Acme Dry Cleaning	800 Lbs/Day	4
30	Trojan Dry Cleaning	800 Lbs/Day	7
31	Losten Foundry - Iron	50 Tons/Day	5
32	Dusty's Cement Products	12500 Bbls/Day	3
33	Rembrandt's Rendering Facility	23 Tons/Day	27
34	Wiffenpoof Fertilizer	180 Tons/Day	1
35	Saint Andre Asphalt Paving	1600 Tons/Day	15
36	Oriental Concrete Batching	1600 Tons/Day	20
37	Daily Journal Printing	18000 Feet/Hr	7
38	Tiger Body Assembly	500 Autos/Day	3
39	Academic Feed and Grain	360 Tons/Day	13
40	Spotless Dry Cleaning	800 Lbs/Day	11

Figure 4

CHAMBER OF COMMERCE
LIST OF MAJOR INDUSTRIES BY ANALYSIS AREA

LOCATION (A.A.)	INDUSTRY NAME	PRODUCTION CAPACITY	INDUSTRY NUMBER
1	Hannah Feed and Grain	360 Tons/Day	27
1	LaRue Soap and Detergent	480 Tons/Day	28
1	Wiffenpoof Fertilizer	180 Tons/Day	34
2	Smithy's Forging Plant	200 Tons/Day	16
2	Boylan's Fertilizer	130 Tons/Day	20
2	People's Pulp Plant	300 Tons/Day	2
3	Shick Cannery	9560 Cases/Day	7
3	Dusty's Cement Products	12500 Bbls/Day	32
3	Tiger Body Assembly	500 Autos/Day	38
4	Auto Assembly Able	500 Cars/Day	11
4	Auto Assembly Baker	200 Cars/Day	12
4	Acme Dry Cleaning	800 Lbs/Day	29
5	Rusty's Iron Foundry	50 Tons/Day	3
5	Monkey Brass Melting Company	14 Tons/Day	25
5	Losten Foundry	50 Tons/Day	31
6	Auto Assembly Charlie	100 Cars/Day	13
6	Finch's Forging Plant	200 Tons/Day	15
6	Ahead Forging Plant	200 Tons/Day	17
6	Wordy Printing Company	18000 Feet/Hr.	18
6	Bogus Printing Company	18000 Feet/Hr.	19
7	Wolverine Forging Plant	200 Tons/Day	14
7	Peters Water Heaters	700 Shells/Day	21
7	Trojan Dry Cleaning	800 Lbs/Day	30
7	Daily Journal Printing	18000 Feet/Hr.	37
8	Shear Power Company	500 Megawatts	1
8	Tar Heel Asphalt Paving	1600 Tons/Day	22
8	Spartan Galvanizing Company	24 Tons/Day	24
10	Trojan Varnish Manufacturing	660 Gal/Day	26
10	Municipal Incinerator	200 Tons/Day	8
11	Spotless Dry Cleaning	800 Lbs/Day	40
12	Caesar's Rendering Plant	23 Tons/Day	5
12	Concrete Batching	1600 Tons/Day	23
13	Academic Feed and Grain	360 Tons/Day	39
15	Humpty Dump	250 Tons/Day	9
15	Saint Andre Asphalt Paving	1600 Tons/Day	35
20	Oriental Concrete Batching	1600 Tons/Day	36
23	Dusty Rhodes Cement Company	12500 Bbls/Day	6
26	Flies Dump	250 Tons/Day	10
27	Rembrandts Rendering Facility	23 Tons/Day	33
27	Gestalt Malt Brewery	8740 Bbls/Day	4

Figure 5

CHAMBER OF COMMERCE
LIST OF MAJOR INDUSTRIES BY TYPE

INDUSTRY NUMBER	INDUSTRY NAME	PRODUCTION CAPACITY	LOCATION (A.A.)
	FOOD AND AGRICULTURAL		
27	Hannah Feed and Grain	360 Tons/Day	1
39	Academic Feed and Grain	360 Tons/Day	13
5	Caesar's Rendering Plant	23 Tons/Day	12
33	Rembrandt's Rendering Facility	23 Tons/Day	27
4	Gestalt Malt Brewery	8740 Bbls/Day	27
7	Shick Cannery	9560 Cases/Day	3
	PRINTING AND PUBLISHING		
18	Wordy Printing Company	18000 Feet/Hr	6
19	Bogus Printing Company	18000 Feet/Hr	6
37	Daily Journal Printing	18000 Feet/Hr	7
	CHEMICAL PROCESS INDUSTRY		
26	Trojan Varnish Manufacturing	660 Gal/Day	10
20	Boylan's Fertilizer	180 Tons/Day	2
34	Wiffenpoof Fertilizer	180 Tons/Day	1
28	LaRue Soap and Detergent	480 Tons/Day	1
	MINERAL PRODUCTS INDUSTRY		
22	Tar Heel Asphalt Paving	1600 Tons/Day	8
35	Saint Andre Asphalt Paving	1600 Tons/Day	15
6	Dusty Rhodes Cement Company	12500 Bbls/Day	23
32	Dusty's Cement Products	12500 Bbls/Day	3
23	Concrete Batching	1600 Tons/Day	12
36	Oriental Concrete Batching	1600 Tons/Day	20
	METALLURGICAL INDUSTRY PRIMARY METALS INDUSTRY SECONDARY METALS INDUSTRY		
3	Rusty's Iron Foundry	50 Tons/Day	5
31	Losten Foundry	50 Tons/Day	5
25	Monkey Brass Melting Company	14 Tons/Day	5
24	Spartan Galvanizing Company	24 Tons/Day	8
17	Ahead Forging Plant	200 Tons/Day	6
15	Finch's Forging Plant	200 Tons/Day	6
16	Smithy's Forging Plant	200 Tons/Day	2
14	Wolverine Forging Plant	200 Tons/Day	7

(CONTINUED ON NEXT PAGE)

Figure 5 (cont.)

INDUSTRY NUMBER	INDUSTRY NAME	PRODUCTION CAPACITY	LOCATION (A.A.)
	FABRICATION OF METAL PRODUCTS		
11	Auto Assembly Able	500 Cars/Day	4
12	Auto Assembly Baker	200 Cars/Day	4
13	Auto Assembly Charlie	100 Cars/Day	6
38	Tiger Body Assembly	500 Autos/Day	3
21	Peters Water Heaters	700 Shells/Day	7
	PULP AND PAPER INDUSTRY		
2	Peoples Pulp Plant	300 Tons/Day	2
	SOLVENT EVAPORATION AND GASOLINE MARKETING		
29	Acme Dry Cleaning	800 Lbs/Day	4
40	Spotless Dry Cleaning	800 Lbs/Day	11
30	Trojan Dry Cleaning	800 Lbs/Day	7
	POWER PRODUCTION		
1	Shear Power Company	500 Megawatts	8
	REFUSE DISPOSAL		
9	Humpty Dump	250 Tons/Day	15
10	Flies Dump	250 Tons/Day	26
8	Municipal Incinerator	200 Tons/Day	10

Figure 6

EMISSION FACTORS FOR INDUSTRIES IN APEX

Combustion Process
(Uncontrolled)

FUEL TYPE	PARTICULATES	SO2	CO	NOx	HC	SMOKE
1. Low Grade Coal	200-220 lbs ton coal	180-200 lbs ton coal	1.5-2.5 lbs	30-40 lbs	.3-.9 lbs ton coal	.12R-.023R ton coal
2. High Grade Coal	80-100 lbs ton coal	40-50 lbs ton coal	1-2 lbs ton coal	20-30 lbs ton coal	.09-.11 lbs ton coal	.010R-.015R ton coal
3. Low Grade Oil	.56-.70 lbs bbl oil	9-12 lbs bbl oil	Small	2.8-4.8 lbs bbl oil	.10-.15 lbs bbl oil	.010R-.015R bbl oil
4. High Grade Oil	.24-.40 lbs bbl oil	1.9-2.9 lbs bbl oil	Small	2.0-3.0 lbs bbl oil	.10-.15 lbs bbl oil	.002R-.994R bbl oil
5. Natural Gas	.014-.020 lbs MCF Gas*	Small	Small	.2-.6 lbs MCF* Gas	.02-.06 lbs MCF* Gas	

*MCF = Thousands of Cubic Feet

Figure 7

EMISSION FACTORS FOR INDUSTRIES IN APEA
Production Process (uncontrolled)

INDUSTRY TYPE	PARTICULATES	SO_2	CO	NO_x	HC	SMOKE	ODOR
Pulp	14-16 lbs/hr tons/day	.40-.60 lbs/hr tons/day	———	.12-.20 lbs/hr tons/day	———	[illegible]-.0084 tons/day	.012-.0125 tons/day
Foundry	7-10 lbs/hr tons/day	.12-.15 lbs/hr tons/day	30-35 lbs/hr tons/day	———	———	.02-.048 tons/day	.02-.045 tons/day
Cement	.7-.4 lbs/hr bbl/day	———	———	———	———	———	———
Brewery	.002-.005 lbs/hr bbl/day	———	———	———	———	———	.001-.0025 bbl/day
Canning	.001-.002 lbs/hr case/day	———	———	———	———	———	.0001-.00025 case/day
Rendering	———	———	———	———	———	[illegible]-.094 tons/day	.16-.185 tons/day
Incinerator	.7-1.0 lbs/hr tons/day	.06-.09 lbs/hr tons/day	———	.07-.09 lbs/hr tons/day	.10-.12 lbs/hr tons/day	.004-.006R tons/day	.005-.0105 tons/day
Dump	2.0-2.2 lbs/hr tons/day	.06-.08 lbs/hr tons/day	———	———	12-14 lbs/hr tons/day	.012-.01eR tons/day	.016-.0205 tons/day
Auto Assembly	———	———	———	.02-.03 lbs/hr cars/day	1-1.5 lbs/hr cars/day	———	———
Forging Plant	———	———	———	.003-.006 lbs/hr tons/day	———	———	———
Printing	———	———	———	.0006-.0007 lbs/hr 1000 ft/day	.2-.4 lbs/hr 1000 ft/day	———	———

Figure 7

EMISSION FACTORS FOR INDUSTRIES IN APEX
Production Process (Uncontrolled)

INDUSTRY TYPE	PARTICULATES	SO_2	CO	NO_x	HC	SMOKE	ODOR
Fertilizer	1.6-1.8 lbs/hr tons/day	—	—	.001-.002 lbs/hr ton/day	—	.02-.03R ton/day	.01-.025 ton/day
Water Heaters	—	—	—	.001-.003 lbs/hr shells/day	.01-.02 lbs/hr shells/day	—	—
Asphalt Paving	1.0-1.5 lbs/hr tons/day	—	—	.0010-.0075 lbs/hr tons/day	—	.0038-.0038R tons/day	.001-.0035 tons/day
Concrete Batching	.003-.004 lbs/hr tons/day	—	—	—	—	—	—
Galvanizing	.04-.05 lbs/hr tons/day	—	—	.04-.05 lbs/hr tons/day	—	.18-.22R tons/day	—
Brass Melting	1-3 lbs/hr tons/day	—	—	.005-.008 lbs/hr tons/day	—	.2-.3R tons/day	.3-.4R tons day
Varnish	.0005-.001 lbs/hr gallons/day	—	—	.001-.002 lbs/hr gallons/day	.007-.015 lbs/hr gallons/day	.004-.008R gallons/day	.005-.008S gallons/day
Feed & Grain	1-3 lbs/hr tons/day	—	—	—	—	—	—
Dry Cleaning	—	—	—	—	.008-.01 lbs/hr lbs/day	—	.010-.0045 lbs/day
Soap & Detergent	.55-.65 lbs/hr tons/day	—	—	.005-.007 lbs/hr tons/day	—	.008-.009R tons/day	.004-.005S tons day

Figure 8

PROPERTIES OF FUELS USED IN APEX COUNTY

NAME OF FUEL	FUEL NO.	% SULFUR	% ASH	HEATING VALUE	UNIT	COST IN $/UNIT
Lo Coal (Low Grade)	1	4.4	10.	18×10^6	Tons	$7.00
Hi Coal (High Grade)	2	1.2	5.5	20×10^6	Tons	$9.00
Lo Oil (Low Grade)	3	1.6	1.0	4.2×10^6	BBL	$1.50
Hi Oil (High Grade)	4	0.4	0.5	4.5×10^6	BBL	$2.30
Natural Gas	5	0	0	0.6×10^6	MCF (1000 cu.ft)	$0.50

Figure 9

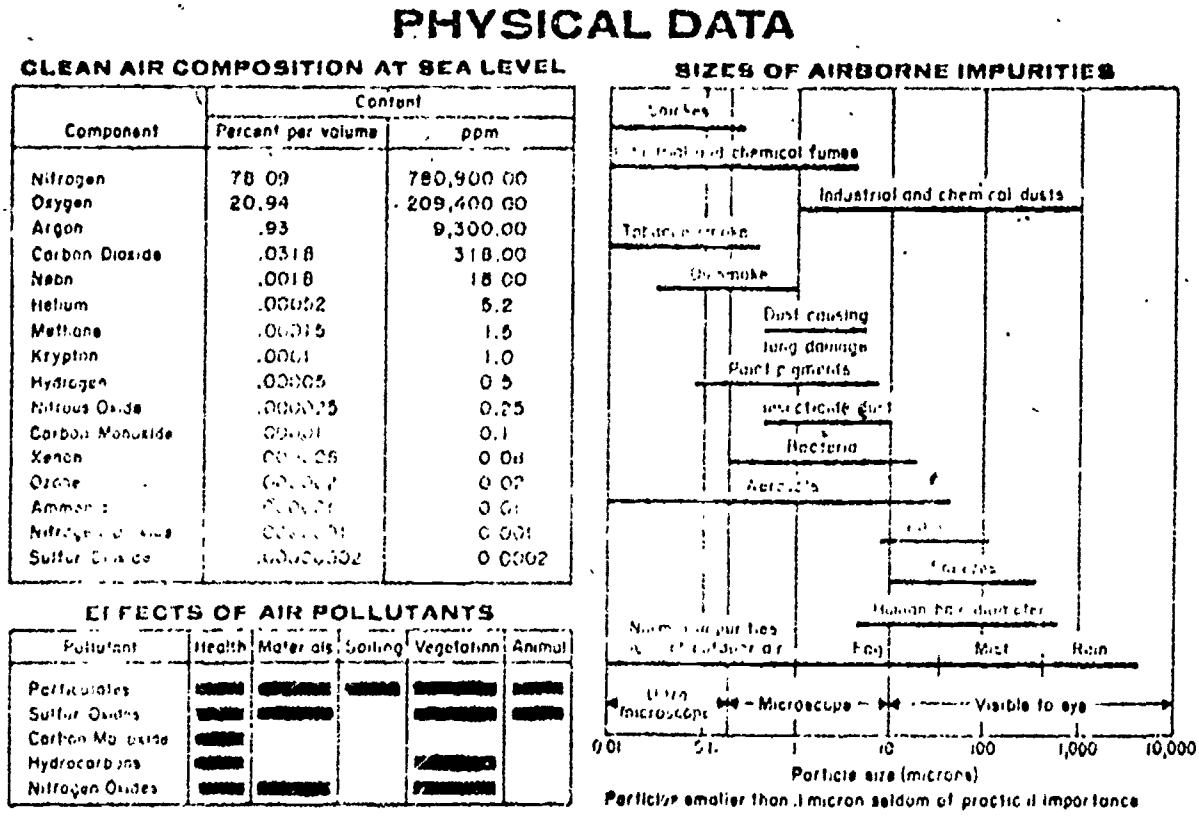


Figure 10

GENERAL CONTROL SYSTEMS INFORMATION FOR APEX ESTIMATES FOR TYPICAL SYSTEMS

SOURCE TYPE	TYPE OF CONTROL SYSTEM	INITIAL INVESTMENT COST	CONTROL EFFICIENCY FACTORS
PARTICULATES			
Power	Scrubber+Lime Inj.	$10,000,000-20,500,000	87 - 92%
Pulp	Scrubber	10,000- 500,000	90 - 99.9%
Foundry	Scrubber	10,000- 20,000	80 - 86%
Cement	Baghouses	50,000- 1,000,000	95 - 99.9%
Foundry	Precipitator	60,000- 85,000	95 - 98%
Brewery	Baghouse	15,000- 25,000	94 - 98%
Cannery	Cyclone	20,000- 30,000	75 - 99%
Incinerator	SprayChamber+Cyclone	200,000- 700,000	75 - 99%
SO2			
Power	Scrubber+Lime Inj.	10,000,000-20,500,000	70 - 80%
Power	Oxidation(Monsanto)	9,000,000-12,000,000	87 - 92%
Pulp	Scrubber	35,000- 60,000	85 - 92%
CO			
Foundry	Afterburners	5,000- 30,000	95 - 98%
NOx			
Power	Injector	850,000- 2,600,000	18 - 23%
SMOKE			
Foundry	Afterburner	1,500- 3,000	90 - 95%
Rendering	Afterburner	2,500- 5,000	96 - 99.9%
ODOR			
Pulp	Oxidation	50,000- 75,000	86 - 92%
Pulp	Vapor Sphere & Vent	35,000- 60,000	97 - 99.9%
Foundry	Afterburner	2,500- 5,000	90 - 95%
Rendering	Afterburner	2,000- 30,000	97 - 99.9%
Brewery	Afterburner + Dryer	100,000- 180,000	90 - 98.4%

Figure 11

AVERAGE EMISSION FACTORS FOR HIGHWAY VEHICLES
BASED ON NATIONWIDE STATISTICS*

Year	CO	HC		NOx	Particulates		SO2
		Exhaust	Evap.		Exhaust	Tires	
	g/mi	g/mi	g/mi	g/mi	g/mi	g/mi	g/mi
1965	89	9.2	5.8	4.8	0.38	0.20	0.20
1970	78	7.8	3.9	5.3	0.38	0.20	0.20
1971	74	7.2	3.5	5.4	0.38	0.20	0.20
1972	68	6.6	2.9	5.4	0.38	0.20	0.20
1973	62	6.1	2.4	5.4	0.38	0.20	0.20
1974	56	5.5	2.0	5.2	0.38	0.20	0.20
1975	50	5.0	1.5	5.0	0.38	0.20	0.20
1976	44	4.3	1.3	4.8	0.38	0.20	0.20
1977	37	3.7	1.0	4.3	0.38	0.20	0.20
1978	31	3.2	0.83	3.8	0.38	0.20	0.20
1979	27	2.7	0.67	3.4	0.38	0.20	0.20
1980	23	2.4	0.53	3.1	0.38	0.20	0.20
1990	12	1.3	0.38	1.8	0.38	0.20	0.20

Figure 12

EMISSION FACTORS FOR LIGHT DUTY VEHICLES (1973)*
Grams/Mile

Pollutant	Gasoline Engines	Diesel Engines
Particulates:		
Exhaust	0.34	0.73
Tires	0.20	0.20
SO2	0.13	0.63
CO	19.00	1.70
NOx	2.30	1.60
HC	2.70	0.45

*Reference: Compilation of Air Pollutant Emission Factors. Environmental Protection Agency, Office of Air Programs Publication No. AP-42, 971. Including Supplements 1 and 2 September 1972 and July 1973.

Figure 13

NATIONWIDE EMISSIONS FOR 1971*

Pollutant	Stationary Combustion ton/yr	Solid Waste Disposal ton/yr	Mobile Combustion ton/yr	Industrial Processes ton/yr	Miscellaneous ton/yr	Total ton/yr
Particulates	6,500,000	700,000	1,000,000	13,500,000	5,200,000	26,900,000
Sulfur Oxides	26,300,000	100,000	1,000,000	5,100,000	100,000	32,600,000
Carb. Monoxide	1,000,000	3,800,000	77,500,000	11,400,000	6,500,000	100,200,000
Nitro. Oxides	10,200,000	200,000	11,200,000	200,000	200,000	22,000,000
Hydrocarbons	300,000	1,000,000	14,700,000	5,600,000	5,000,000	26,000,000

*Reference: Compilation of Air Pollutant Emission Factors. Environmental Protection Agency, Office of Air Programs Publication No. AP-42, 1971. Including Supplements 1 and 2 September 1972 and July 1973.

CHAPTER 7

References

Chapter 7

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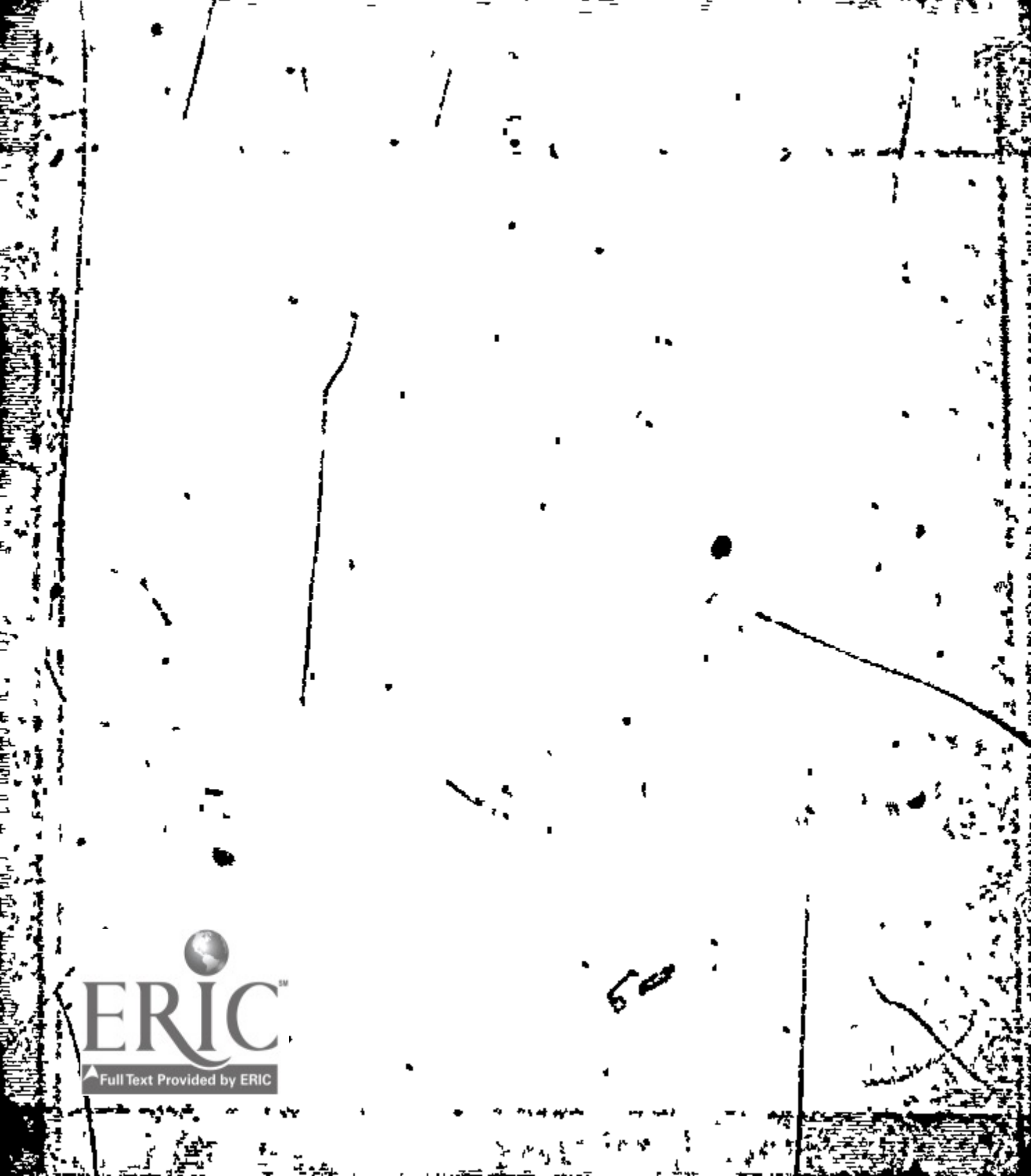
CHAPTER 8

Annotated Printout



The following pages represent the annotated printout for the Air Pollution Control Officer. The decisions are representative of the types of decisions that the Air Pollution Control Officer could make. Some of the rationale for making these decisions are explained in Chapter 4 of this manual.

a

FUNDS SPENT IN CYCLE 1

	COUNTY	FEDERAL	TOTAL
A. PUBLIC INFORMATION & EDUCATION	2000.	4600.	6600.
B. ADMINISTRATION & ENFORCEMENT	14200.	31300.	45500.
C. PLANT INSPECTIONS	3000.	1500.	4500.
D. EMISSION MEASUREMENTS	1000.	2000.	3000.
E. A.Q. MONITORING STATION PURCHASES	4500.	32500.	37000.
F. MON. STATION OPER. & RELOCATION	4000.	5200.	9200.
** TOTAL	28700.	77100.	105800.

b

FEDERAL FUNDS AVAILABLE (ON A 3.0 FOR 1.0 BASIS) FOR NEXT TWO CYCLES

c

CYCLE 2 $ 0.
CYCLE 3 $ 0.
TOTAL FOR TWO YEARS $ 0.

MONITORING STATION STATUS DURING CYCLE 1

d

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
AA BUILDINGS IN EXISTENCE	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
MONITORING EQUIPMENT FOR -																													
1. PARTICULATES	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
2. SULFUR DIOXIDE	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3. CARBON MONOXIDE	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4. OXIDES OF NITROGEN	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5. HYDROCARBONS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

e

KEY= 0 NONE IN EXISTENCE
1 IN EXISTENCE
-1 IN EXISTENCE BUT NOT OPERATED

PLANT INSPECTIONS ORDERED ON FOLLOWING INDUSTRIES --
12 28 0 0 0 0 0 0 0 0 0 0 0 0 0 0

EMISSION MEASUREMENTS ORDERED ON FOLLOWING INDUSTRIES --
6 0 0 0 0 0 0 0 0 0 0 0 0 0 0

f

a FEDERAL FUNDS ARE AVAILABLE ONLY IF GRANT IS APPROVED FOR CURRENT CYCLE. TOTAL FEDERAL FUNDS NORMALLY MAY NOT EXCEED THREE TIMES THE COUNTY APPROPRIATION.

b TOTAL FUNDS ALLOCATED TO EACH CATEGORY MUST BE SUFFICIENT TO COVER THE APCO REQUEST FOR INFORMATION OR LOWER PRIORITY ITEMS WILL BE ELIMINATED.

c FIGURES WILL APPEAR HERE IF FEDERAL FUNDS HAVE BEEN GRANTED FOR FUTURE CYCLES.

d ONLY ONE MONITORING STATION MAY BE LOCATED IN EACH ANALYSIS AREA. A MONITORING STATION BUILDING EXISTS IN AA 1 AND AA 17.

e THE MONITORING STATION IN AA 1 HAS EQUIPMENT TO MEASURE PARTICULATES, SO_2, CO AND NO_x AND THE EQUIPMENT WAS OPERATED LAST CYCLE. THE MONITORING STATION IN AA 17 HAS EQUIPMENT TO MEASURE PARTICULATE AND WAS OPERATED LAST CYCLE.

f THIS IS A LISTING OF THE INDUSTRY NUMBERS ON WHICH PLANT INSPECTIONS AND EMISSION MEASUREMENTS WERE ORDERED. THE RESULTS OF THESE MEASUREMENTS APPEAR LATER IN THIS PRINTOUT.

g

SMOKE INVENTORY TOWNSHIP TWO s 1500.

INDUSTRY NUMBER	AA	h	INDUSTRY NAME	SMOKE IN R	i
9	15		HUMPTY DUMP	3	
35	15		SAINT ANDRE ASPHALT PAVING	5	
36	20		ORIENTAL CONCRETE BATCHING	0	

g THIS IS THE RESULTS OF THE SMOKE INVENTORY FOR TOWNSHIP TWO.

h INDICATED HERE IS THE INDUSTRY NUMBER, ANALYSIS AREA, LOCATION AND NAME.

i THIS IS THE READING OF THE INDUSTRY'S STACK EMISSIONS IN RINGELMANN UNITS. (SEE GLOSSARY). THE INDUSTRIALIST MAY BE IN VIOLATION OF A COUNTY OR STATE REGULATION.

PLANT INSPECTION AND EMISSION MEASUREMENT RESULTS

IND NO.	AA	PROCESS NAME	PROCESS OR FUEL RATE		FUEL TYPE	MAX. PRODUCTION CAPACITY		CONTROL SYSTEM			UDOR	EMISSION RATES (LBS/HR) SMOKE PARTS		SO2		CO		NOX		HC	
6	23	COMBUSTION	9	TONS/HOUR	LO COAL	12237	BBLS/DAY	0	0	0	0	R-5	1897	1716		18		316		5	
6	23	BALL MILLS	33	TONS/HOUR		12237	BBLS/DAY	0	0	0	0	R-0	6000	0		0		0		0	
6	23	KILNS	33	TONS/HOUR		12237	BBLS/DAY	0	0	0	0	R-0	2000	0		0		0		0	
6	23	CAR LOADING	33	TONS/HOUR		12237	BBLS/DAY	23	0	0	0	R-0	1	0		0		0		0	
12	4	BAKING COATINGS	175	TONS/DAY		200	CARS/DAY	29	0	0	0	R-0									
28	1	SPRAY DRYING	480	TONS/DAY		480	TONS/DAY	39	0	0	SU2	R-4									

CONTROL SYSTEMS IN OPERATION

23	BAGHOUSES (CARLOADING)	0	1	1.0	0.0	0.0	0.0	0.0
39	VENTURI SCRUBBER	0	0	0.9	0.0	0.0	0.0	0.0

CONTROL SYSTEMS NOT IN OPERATION

29 DIRECT FLAME AFTERBURNER

j GAMED INDUSTRIES MAY HAVE MORE THAN ONE PRODUCTION PROCESS. SIMULATED INDUSTRIES ARE ASSUMED TO HAVE ONLY ONE PRODUCTION PROCESS.

k,l,m,n INFORMATION GAINED FROM A "PLANT INSPECTION".

o AN "EMISSION MEASUREMENT" PROVIDES ALL OF THE DATA OF A "PLANT INSPECTION" PLUS DETAILED EMISSION DATA.

p AN INDUSTRY MAY HAVE A CONTROL SYSTEM INSTALLED BUT NOT OPERATING. REPEATED PLANT INSPECTIONS OR EMISSION MEASURFMENTS MAY CAUSE SIMULATED INDUSTRIES TO INSTALL CONTROLS AND OPERATE THEM.

q ODOR IS MEASURED IN STINKELMAN UNITS RANGING FROM 0 TO 5 WITH 5 REPRESENTING THE WORST ODOR AND 0 REPRESENTING NO ODOR. THE LETTERS INDICATE THE TYPE OF SMELL: PD=PUTRID, PT=PUNGENT, AC=ACRID, SU=SULFUROUS.

r SMOKE OPACITY IS MEASURED IN A RANGE OF RINGELMANN UNITS FROM 0 TO 5 BEING THE GREATEST OPACITY AND 0 INDICATING NONE.

s INDUSTRY CHANGES IN PRODUCTION RATE AND FUEL TYPE FROM CYCLE TO CYCLE MAY CHANGE ODOR, SMOKE AND EMISSION RATES.

t CONTROL SYSTEM EFFICIENCIES SPECIFY REDUCTION IN ODOR, SMOKE, PARTICULATE, SO_2, CO, NO_x, AND HC. THE 1.0 INDICATES 100% REDUCTION IN PARTICULATE EMISSION FROM PROCESS 4 CAR LOADING, OF INDUSTRY 6 BY THE OPERATION OF CONTROL SYSTEM 23.

AIR POLLUTION STATE REGULATIONS
AND INDUSTRIES FOUND TO BE IN VIOLATION

MAXIMUM DAILY FINE $ 500.

IND NO	PROC. NO.	ESTS. DAYS IN VIOL	GROSS EMISSION REGULATIONS POUNDS/HR PART.	SO2	CO	NOX	HC	PROCESS RATE REGULATIONS POUNDS/1000 LBS PART.	SO2	CO	NOX	HC	SMOKE AND ODOR
		STD.	********	********	********	********	********	********	********	********	********	********	R-2 S-*
6	1	184	********	********	********	********	********	********	********	********	********	********	R-5 S-*
28	1	184	********	********	********	********	********	********	********	********	********	********	R-4 S-*

AIR POLLUTION APEX COUNTY REGULATIONS
AND INDUSTRIES FOUND TO BE IN VIOLATION

MAXIMUM DAILY FINE $ 500.

IND NO	PROC. NO.	ESTS. DAYS IN VIOL	GROSS EMISSION REGULATIONS POUNDS/HR PART.	SO2	CO	NOX	HC	PROCESS RATE REGULATIONS POUNDS/1000 LBS PART.	SO2	CO	NOX	HC	SMOKE AND ODOR
		STD.	40.00	200.00	10.00	140.00	10.00	3.0000	********	********	********	********	R-2 S-*
6	1	363	1896.85	1716.20	18.07	316.14	********	105.0000	********	********	********	********	R-5 S-*
6	2	363	6000.00	********	********	********	********	88.4957	********	********	********	********	R-* S-*
6	3	363	2000.00	********	********	********	********	29.4986	********	********	********	********	R-* S-*
28	1	184	********	********	********	********	********	********	********	********	********	********	R-4 S-*

AIR POLLUTION RECOMMENDATIONS TO STATE
AND INDUSTRIES FOUND TO BE IN VIOLATION

IND NO	PROC. NO.	ESTS. DAYS IN VIOL	GROSS EMISSION REGULATIONS POUNDS/HR PART.	SO2	CO	NOX	HC	PROCESS RATE REGULATIONS POUNDS/1000 LBS PART.	SO2	CO	NOX	HC	SMOKE AND ODOR
		STD.	40.00	200.00	10.00	140.00	10.00	3.0000	********	********	********	********	R-2 S-2
6	1	363	1896.86	1716.20	18.07	316.14	********	105.0000	********	********	********	********	R-5 S-*
6	2	363	6000.00	********	********	********	********	88.4957	********	********	********	********	R-* S-*
6	3	363	2000.00	********	********	********	********	29.4986	********	********	********	********	R-* S-*
28	1	184	********	********	********	********	********	********	********	********	********	********	R-4 S-2

U THE STANDARD IS THE MAXIMUM EMISSION OF A POLLUTANT ALLOWED UNDER THE LAW. THE CURRENT STATE REGULATION IS A MAXIMUM SMOKE OPACITY OF RINGELMANN 2. THE COUNTY HAS REGULATIONS SPECIFYING MAXIMUM EMISSIONS FOR 5 POLLUTANTS AND RINGELMANN 2 FOR SMOKE.

V STARS ON THESE LINES INDICATE NO REGULATIONS IN EXISTANCE OR NO VIOLATION OF A STANDARD WAS DETECTED.

W EMISSION REGULATIONS MAY BE STATED AS POUNDS PER HOUR, POUNDS PER 1000 POUNDS OR BOTH.

X AN EMISSION MEASUREMENT WAS ORDERED ON INDUSTRY NUMBER 6 LAST CYCLE AND THE NUMBERS SHOW MEASURED EMISSION RATES WHICH EXCEEDED THE STANDARDS.

Y THE CURRENT MAXIMUM LEGAL FINE PER DAY FOR EACH VIOLATION IS SHOWN. STATE AND COUNTY BOTH HAVE $500 MAXIMUM FINE LEVEL. (SEE LEGAL REFERENCE MANUAL)

Z RECOMMENDATIONS CAN BE MADE TO THE STATE ASKING THEM TO CHANGE THEIR REGULATIONS AND FINE LEVELS.

COMPLAINTS LOG

(TABULATION OF ALL COMPLAINTS SENT OR ROUTED TO APCO) a

TYPE OF COMPLAINT

	PUTRID ODOR	ACRID ODOR	SULFUROUS ODOR	PUNGENT ODOR	SMOKE	II	TOTAL BY A.A.
A.A. 1	0	0	303	0	264	II	567
A.A. 2	2835	0	370	0	980	II	4185
A.A. 3	412	0	0	0	493	II	905
A.A. 4	0	0	0	1522	0	II	1522
A.A. 5	398	0	1110	0	679	II	2187
A.A. 6	0	0	0	0	0	II	0
A.A. 7	0	0	0	0	0	II	0
A.A. 8	0	0	0	894	2168	II	3062
A.A. 9	0	0	0	0	0	II	0
A.A. 10	0	431	0	2452	628	II	3511
A.A. 11	0	0	0	228	0	II	228
A.A. 12	0	451	0	0	75	II	526
A.A. 13	0	0	0	0	0	II	0
A.A. 14	0	0	0	0	0	II	0
A.A. 15	0	0	75	90	91	II	256
A.A. 16	0	0	0	0	0	II	0
A.A. 17	0	0	0	0	0	II	0
A.A. 18	0	0	0	0	0	II	0
A.A. 19	0	0	0	0	0	II	0
A.A. 20	0	0	0	0	0	II	0
A.A. 21	0	0	0	0	0	II	0
A.A. 22	0	0	0	0	0	II	0
A.A. 23	0	0	0	0	39	II	39
A.A. 24	0	0	0	0	0	II	0
A.A. 25	0	0	0	0	0	II	0
A.A. 26	0	0	9	0	6	II	15
A.A. 27	0	70	0	75	32	II	177
A.A. 28	0	0	0	0	0	II	0
A.A. 29	0	0	0	0	0	II	0
	3645	952	1867	5261	5455		17180 c

b

a A RECORD OF THE TOTAL NUMBER AND TYPE OF CITIZEN COMPLAINTS RECEIVED BY APCO LAST CYCLE.

b THE TYPE OF COMPLAINT AND ANALYSIS AREA MAY INDICATE TYPES OF POLLUTION SOURCES AND APPROXIMATE LOCATION. THIS CAN BE HELPFUL IN DECIDING PRIORITIES FOR INDUSTRY PLANT INSPECTIONS AND EMISSION MEASUREMENTS.

c THE NUMBER OF CITIZEN COMPLAINTS MAY BE USED AS AN INDICATION OF AN EFFECTIVE CONTROL PROGRAM OR MAY BE USED TO JUSTIFY INCREASED BUDGET OR NEW CONTROL REGULATIONS.

AIR QUALITY INFORMATION

WINTER d

		f PARTICULATES MICROGMS/CU. METER			SULFUR DIOXIDE MICROGMS/CU. METER			g CARBON MONOXIDE MILLIGMS/CU. METER			OXIDES OF NITROGEN MICROGMS/CU. METER			HYDROCARBONS MICROGMS/CU. METER		
h	FED.STDS.	MEAN 75.	MAX.DAY 260.	DAYS OVER 260.0 i	MEAN 80.	MAX.DAY 365.	DAYS OVER 365.0	MAX. 8 HOUR 10.	MAX. 3 HOUR 40.	DAYS OVER 40.0	MEAN 100.	MAX.DAY	DAYS OVER 100.0	MEAN	MAX. 3 HOUR 160.	DAYS OVER 160.0
	AA 1	30.1	142.9	0	4.4	21.5	0	5.5	9.5	0	39.9	286.8	.5			
	AA .17	43.8	207.8	0											e	

j k l

d AIR QUALITY MONITORING STATION DATA FOR ANALYSIS AREA 1 AND 17 FOR THE WINTER QUARTER. THESE WERE THE ONLY MONITORING STATIONS OPERATED LAST CYCLE - (SEE ANNOTATED PRINTOUT SHEET AIR QUALITY MONITORING STATION AND EQUIPMENT OPERATED IN CYCLE 1.) SIMILAR DATA WOULD BE GIVEN FOR THE REMAINING THREE SEASONS.

e THE MONITORING STATION IN ANALYSIS AREA 1 HAD PARTICULATES, SO_2, CO AND NO_x MEASURING EQUIPMENT INSTALLED BUT DID NOT HAVE HYDROCARBON MEASURING EQUIPMENT SO NO HYDROCARBON DATA WAS GENERATED.

f MICROGRAMS OF POLLUTANT PER CUBIC METER OF AIR.

g MILLEGRAMS OF POLLUTANT PER CUBIC METER OF AIR (1 MILLIGRAM=1000 MICROGRAMS).

h STANDARDS SHOWN FOR REFERENCE ARE THE FEDERAL PRIMARY OR SECONDARY AI. UALITY STANDARDS.

i THE REPORTING LEVEL VALUE MAY BE CHANGED BY THE APCO.

j THE MEAN VALUE OF CONCENTRATION OF PARTICULATES MEASURED IN AA 1 DURING THE WINTER SEASON.

k THE MAXIMUM SO_2 CONCENTRATION OVER A 24 HOUR PERIOD MEASURED IN AA 1 DURING THE WINTER SEASON.

l THE MAXIMUM CO CONCENTRATION OVER A 3 HOUR PERIOD MEASURED IN AA 1 DURING THE WINTER SEASON.

PERCENTAGE CONTRIBUTION BY AIR POLLUTION SOURCES

POLLUTANT TYPE

	PART.	SO2	CO	NOX	HC
POINT SOURCES	99.6	90.1	13.3	57.3	87.7
LINE SOURCES	0.0	0.0	86.7	25.2	11.6
AREA SOURCES	0.4	9.9	0.0	17.5	0.6

THIS TABLE SUMMARIZED FOR EACH POLLUTANT THE PERCENTAGE CONTRIBUTION BY SOURCE TYPE.

m POINT SOURCES ARE STATIONARY SOURCES OF POLLUTION SUCH AS A FACTORY OR POWER PLANTS.

n LINE SOURCES ARE MOVING SOURCES OF POLLUTION SUCH AS AUTOMOBILES, BUSES, TRAINS AND AIRCRAFT.

O AREA SOURCES ARE THE SUM OF WIDESPREAD SMALL STATIONARY SOURCES SUCH AS THE SPACE HEATERS IN BUILDINGS.

p CURRENTLY POINT SOURCES GENERATE MOST OF THE PARTICULATE AIR POLLUTION IN APEX AND LINE SOURCES GENERATE MOST OF THE CARBON MONOXIDE. THESE PERCENTAGES MAY CHANGE WITH TIME AS SOME SOURCES ARE BROUGHT UNDER CONTROL AND AS POPULATION; INDUSTRIAL GROWTH AND TRANSPORTATION PATTERNS CHANGE.

The following pages include the METRO-APEX NEWS which will give you a basis regarding some of the decisions made for Cycle 1. It will also provide you with a history of some of the problems in APEX County.

a **METRO-APEX NEWS**

TEAM 1. EDITION 1 — SUNDAY, JUNE 30, 1974 — ANNOTATED PRINTOUT FOR CHAPTER 8

N A T I O N A L   N E W S   H E A D L I N E S b

AUTOMOBILE PRODUCTION RECOVERS FROM SLUMP. HIGHEST SALES IN HISTORY PREDICTED.

SINGLE REAL ESTATE DEVELOPER SPEAKS IN FAVOR OF OPEN HOUSING AT CONGRESSIONAL COMMITTEE MEETING--OTHERS NEGATIVE.

U. S. CENSUS BUREAU ISSUES REPORT STATING THAT NET ANNUAL ADDITIONS TO THE HOUSING STOCK HAVE DECLINED TO [illegible],000 UNITS LEAVING A GAP OF [illegible] BETWEEN NEW UNITS ADDED AND NET NEW FAMILY FORMATIONS.CENTRAL CITY HOUSING SITUATION CRITICAL. c

DEFENSE SPENDING IS AGAIN AT AN ALL TIME HIGH-AS CONGRESSIONAL CRITICS WARN OF GUNS VS. BUTTER CONFLICT.

U. S. UNEMPLOYMENT RATE THE PAST YEAR WAS 4.1 PERCENT

S T A T E   N E W S   H E A D L I N E S b

POOR PEOPLE'S MARCH ON THE STATE CAPITOL INFURIATES LAWMAKERS WHO SAY THEY WON'T BOW TO PRESSURE GROUP TACTICS.

STATE [illegible] HEALTH AGENCIES PLANS TO WORK WITH COUNTY HEALTH AGENTS TO CRACK DOWN ON UNSAFE SEPTIC TANKS IN URBAN [illegible] METROPOLITAN AREA IN THE STATE. OLD SEPTIC TANKS AND INADEQUATE SEWER SYSTEMS MAKE SUB-DIVISION DEVELOPMENTS DANGEROUS.

EDUCATORS PRESS STATE FOR GREATER AID TO LOCAL SCHOOL DISTRICTS, ARGUING WE ARE FALLING BEHIND THE NATIONAL LEADERS.

APEX CITED AS ONE OF THE WORST MIDDLE-SIZED CITIES WHO HAVE LET CAPITAL PLANT INVESTMENTS IN THE DOWNTOWN DETERIORATE. c

DEMOCRAT-REPUBLICAN DEADLOCK IN STATE SENATE IS BROKEN AS GOVERNOR INTERVENES TO FORCE AN EDUCATION-WELFARE PACKAGE.

WELFARE MOTHERS IN TEN COUNTIES SIT IN TO PROTEST LOW ALLOCATIONS FROM STATE AND COUNTIES. TAXPAYER ANGER OVER DEMONSTRATIONS IN STATE IS GROWING, MAKING INCREASED STATE WELFARE PAYMENTS UNLIKELY THIS YEAR.

L O C A L   N E W S   I T E M S b

a THE METRO-APEX NEWS IS PUBLISHED EACH CYCLE AND IS A PRIME SOURCE OF INFORMATION ABOUT CURRENT PROBLEMS AND EVENTS AND THEIR IMPACT ON APEX COUNTY.

b THE METRO-APEX NEWS FEATURES NATIONAL NEWS HEADLINES, STATE NEWS HEADLINES AND LOCAL NEWS ITEMS. THE "LOCAL NEWS ITEMS" ARE PRESENTED UNDER SUB-HEADINGS OF METROPOLITAN AND COUNTY, CENTRAL CITY, SUBURB, TOWNSHIP 1, TOWNSHIP 2, AND BUSINESS PAGE.

c NATIONAL AND STATE NEWS REFLECTS THE GENERAL STATE OF THE ECONOMY AND NEW GOVERNMENTAL POLICIES WHICH MAY IMPACT ON VARIOUS SEGMENTS OF THE APEX COMMUNITY.

d EACH YEAR CERTAIN ISSUES WILL APPEAR IN THE METRO-APEX NEWS WHICH REQUIRE DECISIONS FROM ALL ROLE PLAYERS. EACH ISSUE IS IDENTIFIED BY AN ISSUE NUMBER. THE ISSUES CONSIST OF A STATEMENT OF THE ISSUE AND SEVERAL PROPOSED ALTERNATIVE ACTIONS. EACH PLAYER SHOULD CHOOSE THE ALTERNATIVES HE FAVORS AND FILL OUT THE ELITE OPINION POLL OF HIS WORKSHEET.

e SOME ALTERNATIVES PROPOSE THE IMPLEMENTATION OF SPECIFIC PROJECTS. PROJECT NUMBERS SHOULD NOT BE CONFUSED WITH ISSUE NUMBERS.

f LOCAL NEWS ITEMS ARE IDENTIFIED BY THE ANALYSIS AREA IN WHICH THEY ORIGINATED.

g THE BUSINESS PAGE LISTS EXOFIRMS WHICH WOULD LIKE TO LOCATE IN APEX. THE FIRM WILL NORMALLY NOT LOCATE IN APEX UNLESS THE SPECIFIED CONDITIONS ARE MET.

h THE LOCATIONS PREFERED BY THE EXOFIRM ARE LISTED IN ORDER OF PREFERENCE, IE., AA 10 IS THE FIRST PREFERENCE, AA 25, SECOND CHOICE, ETC.

METROPOLITAN AND COUNTY

RUNWAY EXPANSION NEEDED FOR APEX AIRPORT. COST SET AT $350,030. PROJECT NO. 109.

....PRECEDING IS ISSUE A2 POLITICIAN'S ULTIMATE DECISION BUT ELITE OPINION SOLICITED

---- ALTERNATIVE 1 FAVOR RUNWAY PROJECT 109

---- ALTERNATIVE 2 POSTPONE AND RECONSIDER

---- ALTERNATIVE 3 OPPOSE RUNWAY PROJECT 109

COUNTY ROAD COMMISSIONER DECLARES THAT [illegible] STONE ASPHALT COMPANY WILL CAUSE AN INCREASE IN COSTS OF HIGHWAY CONSTRUCTION IN THE AREA. THIS MAY SET A PRECEDENT WHICH COULD ULTIMATELY MEAN HIGHER TAXES STATEWIDE.

STATE INSPECTOR LIKENS DUST PROBLEM FROM DUSTY ROADS-CEMENT PLANT BAG-FILLING OPERATION TO CAUSES OF SILICOSIS IN MINING OPERATIONS.

STATE LEGISLATURE ENACTS BAN ON ALL OPEN BURNING DUMPS. APEX SOLID WASTE MANAGER FACES MOUNTING PROBLEMS -- INADEQUATE INCINERATION, GROWING AMOUNTS OF WASTE, PUBLIC DISTRUST OF LANDFILLS, AND OUTDATED COLLECTION EQUIPMENT. APEX MAY BE BURIED IN ITS OWN TRASH.

AA 3 -
OLD TIME RESIDENT CLAIMS, THIS DRATTED POLLUTION IS GETTING WORSE EVERY YEAR. DONT KNOW HOW LONG I CAN HOLD OUT.

AA 4 -
INDUSTRY GROUP BLAMES HOMEOWNER BACKYARD BURNING AS PRIME CAUSE OF AREA SMOG.

AA 3 -
SMOKE HAZE INCREASES HAZARDS OF AIRCRAFT LANDING, PILOT TELLS AREA KIWANIS.

CENTRAL CITY

PLANS COMPLETED FOR NEW CITY HALL, FUNDING SOUGHT. A $1.2 MILLION BOND ISSUE IS PROPOSED TO FUND A MODERN, EFFICIENT, WELL-DESIGNED CITY HALL TO REPLACE PRESENT 80-YEAR-OLD BUILDING IN AA 6. GENERAL SUPPORT OF COMMUNITY LEADERS IS ASKED FOR THIS LONG-OVERDUE IMPROVEMENT (PROJECT 86).

....PRECEDING IS ISSUE I 1 POLITICIAN'S ULTIMATE DECISION BUT ELITE OPINION SOLICITED

---- ALTERNATIVE 1 FAVOR PROJECT 86

---- ALTERNATIVE 2 POSTPONE AND RECONSIDER

---- ALTERNATIVE 3 OPPOSE PROJECT 86

SUMMER DAY CAMPS PROPOSED FOR DISADVANTAGED YOUTH. STATE FUNDS, WITH CHARITY CONTRIBUTIONS, MAKE $100,000 AVAILABLE, PROVIDED CITY CAN COME UP WITH $120,300. PROGRAM NO. 10.

ANNEXATION OF MAPLE GROVE AREA (AA 12) TO GO TO A VOTE. FAVORED BY CHAMBER OF COMMERCE DUE TO POSSIBLE INDUSTRIAL SITES AT FREEWAY INTERCHANGE. THE ANNEXATION OF THIS AREA IS ALSO OPPOSED BY ANTI-TAX GROUPS BECAUSE OF THE COST OF PUBLIC IMPROVEMENTS REQUIRED. SCHOOL DISTRICT ANNEXATION TIED TO CITY VOTE - BOTH MUST BE APPROVED TOGETHER.

....PRECEDING IS ISSUE SO DECIDED BY OPINION POLL MAJORITY AND REFERENDUM

---- ALTERNATIVE 1 FAVOR ANNEXATION OF AA 12

---- ALTERNATIVE 2 AVOID THE ISSUE

---- ALTERNATIVE 3 OPPOSE THE ANNEXATION

CONSUMERS REPORT IMPAIRMENT OF SENSE OF SMELL AFTER WEEK'S TRAVEL PAST TROJAN VARNISH COMPANY IN ANALYSIS AREA 10. DANNY DINKS, WHO PASSES THE PLANT FOUR TIMES DAILY, COMPLAINS HE CAN'T SMELL HIS GIRL'S PERFUME ANYMORE.

AA 6 -
RESIDENTS PRESS DEMANDS FOR SMALL CITY PARKING LOT AS LOCAL PARKING PROBLEMS MOUNT AND DOUBLE-PARKING CREATES SNARLS.

AA 9 -
HUGE CRACKS IN LOCAL STREETS CAUSE MAJOR ACCIDENT AS DELIVERY TRUCK SPINS OUT OF CONTROL. IMMEDIATE RESURFACING A 'MUST'

AA 3 -
GROWING TRAFFIC LOAD CITED. INSPECTOR MUGGERIDGE SAYS STREET WIDENING MUST BEGIN 'BEFORE IT'S TOO LATE.'

AA 4 -
OVERLOADING OF AGED SEWER LINES BRINGS DEMANDS FOR IMMEDIATE EXPANSION OF SANITARY SEWER CAPACITY.

AA 8 -
STORM CAUSES BASEMENT FLOODING IN SEVERAL-BLOCK AREA AS STORM SEWERS OVERFLOW. ACTION DEMANDED NOW TO EXPAND CAPACITY.

AA 3 -
RECORD OVERALL FLOODS AREA. EXPANSION OF LOCAL STORM SEWER SYSTEM NEEDED.

AA 6 -
WATER PRESSURE DEFLATED BY RAPIDLY-INCREASING USE, MAY HAMPER FIRE-FIGHTING EFFORTS UNLESS WATER MAINS ARE EXPANDED SOON.

AA 3 -
WATER MAIN EXPANSION NECESSARY TO MAINTAIN WATER PRESSURE PRESENTLY LIMITED BY INCREASED USE OF AIR CONDITIONING.

AA 4 -
WATER MAINS BREAK [illegible] TIMES IN TWO MONTHS. RESIDENTS, UNDERSTANDABLY IRRITATED, DEMAND 'LASTING' MAJOR REPAIRS.

AA 4 -
'PARKS ARE NEEDED WHEN PEOPLE ARE--NOISING PEOPLE OUT OF THE CITY ISN'T FEASIBLE,' CLAIMS RESIDENT GROUP IN PETITION.

AA 8 -
SHELTER HOUSE PROPOSED FOR PARK. LOCAL CITIZENS COMPLAIN CONSTANTLY ABOUT POOR PICNIC FACILITIES.

AA 1 -
CITY YOUTH DEMANDS NEW PLAY FIELD EQUIPMENT. OFFICIALS HOWEVER CITE WHOLESALE THIEVERY AND IMPLY YOUTHFUL RACKETEERING.

SUBJECT 4, JURISDICTION 2 b

AA 10 -
HOMEOWNERS ASSOCIATIONS DEMAND CITY TAKE IMMEDIATE ACTION TO RESURFACE WINTER-DAMAGED NEIGHBORHOOD STREETS.

AA 19 -
POORLY-CONSTRUCTED SANITARY SEWER SYSTEM CAUSES UNPLEASANT BLOCKAGES. RESIDENTS ARE CALLING FOR REPLACEMENT.

AA 19 -
TASTE OF WATER IS MAKING AREA RESIDENTS SICK. ONLY PERSON BENEFITING IS THE LOCAL CULLIGAN MAN.

AA 19 -
PARENTS GROUP WANTS LOCAL SWIMMING POOL SO CHILDREN WILL KEEP OFF STREETS ON HOT DAYS.

TOWNSHIP 1 (JUR. 3) b

AA 27 -
SAFETY SIGNAL INSTALLATION NECESSARY TO HALT INCREASING PEDESTRIAN ACCIDENTS AT BUSY SHOPPING CENTER INTERSECTION.

AA 21 -
AUTO INDUSTRY HOLDS KEY TO NATIONS FUTURE SAYS CHAMBER OF COMMERCE. PRESSURES POLITICIANS TO BUILD MORE PRIMARY STREETS.

AA 24 -
STORM SEWER EXPANSION DEMANDED BY IRATE CITIZENS. MILDEST SHOWERS TURN UNIMPROVED LOCAL STREETS INTO SOUPY QUAGMIRES.

AA 24 -
FIVE FEET OF WATER INUNDATE LOCAL STREETS. ONLY LARGE-SCALE STORM SEWER CONSTRUCTION WILL PREVENT FURTHER OCCURRENCES.

AA 28 -
LOCAL CITIZENS HOPEFUL ABOUT GETTING WATER MAIN EXPANSION. PATIENCE WORN BY MANY DELAYS MAKES IT PRIME POLITICAL ISSUE.

AA 24 -
YOUNG ROWDIES INTIMIDATE TODDLERS IN LOCAL PARK. MOTHERS DEMAND CONSTRUCTION OF INDEPENDENT TOT LOTS.

TOWNSHIP 2 (JUR. 4) b

AA 21 -
STEADILY-INCREASING TRAFFIC FLOW ON PRIMARY THOROUGHFARE IN THE AREA UNDERSCORES NEED FOR WIDENING.

AA 19 -
NEW PRIMARY ROAD PUSHED BY RESIDENT GROUP TO AID COMMUTER CONGESTION PROBLEMS.

AA 22 -
DEVELOPERS CALL UPON CITY TO EXTEND LOCAL SANITARY SEWER MAINS TO AREA RIPE FOR DEVELOPMENT. NEW TRUNKLINES NEEDED.

AA 22 -
HOMEOWNERS FLOODED AND SLAB FOUNDATIONS ERODED AS RAINS OVERFLOW STORM SEWERS. INCREASED CAPACITY CONSIDERED MANDATORY.

AA 14 -
WATER FACILITIES FAIL TO PACE URBAN GROWTH AND PRIVATE WELLS ARE NOT RELIABLE. MAJOR WATER MAIN CONSTRUCTION URGENT.

AA 15 -
COST-BENEFIT SHOWS FOLLY OF PUBLIC ICE SKATING RINK BUT COMMUNITY GROUP CONTINUES TO PRESS ITS DEMANDS ON POLITICIANS.

BUSINESS PAGE b

g NEW FIRMS PLANNING TO COME TO A.P.E.X. AREA

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h

SUPER CHICKENS INC (EXOFIRM NO. 4) PREFERS LOCATION IN ANALYSIS AREAS 10 25 17. WILL USE 8.80 ACRES.
WILL HAVE 200 EMPLOYEES AND WILL ADD 572000. DOLLARS TO THE TAX BASE.
POLITICIANS NOTE-- REZONING NEEDED TO V-4 (VACANT INDUSTRIAL).
STREETS COSTING 35000. DOLLARS ARE NEEDED.
REQUIRES INVESTMENT OF AT LEAST $ 200000. BY LOCAL BUSINESSMEN.

ZIPPY FROZEN FOODS INC FREEZER (EXOFIRM NO. 8) PREFERS LOCATION IN ANALYSIS AREAS 5 6 24. WILL USE 3.00 ACRES.
WILL HAVE 90 EMPLOYEES AND WILL ADD 135000. DOLLARS TO THE TAX BASE.
POLITICIANS NOTE-- STREETS COSTING 35000. DOLLARS ARE NEEDED.
REQUIRES INVESTMENT OF AT LEAST $ 25000. BY LOCAL BUSINESSMEN.

MAIL-ADS PRINTERS (EXOFIRM NO. 12) PREFERS LOCATION IN ANALYSIS AREAS 0 0 0. WILL USE 1.50 ACRES.
WILL HAVE 180 EMPLOYEES AND WILL ADD 300000. DOLLARS TO THE TAX BASE.
POLITICIANS NOTE-- REZONING NEEDED TO V-4 (VACANT INDUSTRIAL).
REQUIRES INVESTMENT OF AT LEAST $ 25000. BY LOCAL BUSINESSMEN.