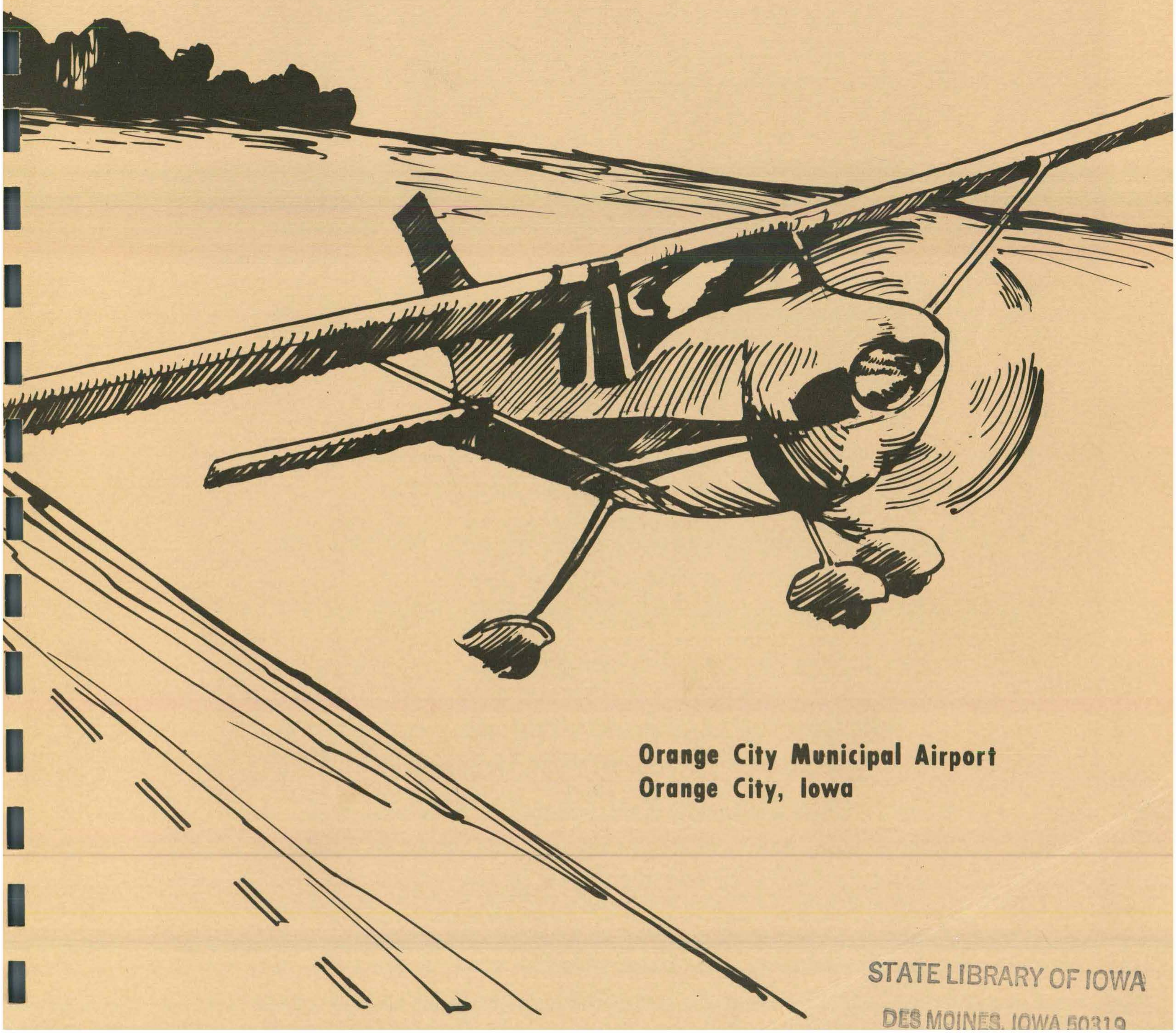
AIRPORT DEVELOPMENT PLAN



Orange City Municipal Airport
Orange City, Iowa

AIRPORT DEVELOPMENT PLAN

For

ORANGE CITY MUNICIPAL AIRPORT

Prepared For

City of Orange City, Iowa

By

PLANNING DIVISION
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SECTION ONE

COMMUNITY & AIRPORT BACKGROUND

A. INTRODUCTION

In 1978, the firm of Otto & Culver, P. C. was retained by the City of Orange City, Iowa to assess present and future needs at the Orange City Municipal Airport. This assessment was accomplished under the Airport Development Planning Program sponsored by the Iowa Department of Transportation. Specific objectives of the study were as follows:

- To provide an effective graphic presentation of the ultimate development of the airport over a 20-year planning period, 1977 to 1997.
- To establish a schedule of priorities and phasing for the various improvements proposed in the plan.
- To provide a plan that is consistent with other community goals and objectives of Orange City and Sioux County as well as the State of Iowa, D.O.T., and the Federal Aviation Administration.
- To provide a tool for decision making at the local level.
- To provide an ultimate development plan which is feasible, acceptable and can be implemented within existing and future financial constraints of the community.

To achieve the above objectives, the planning process as outlined in Figure One was developed and followed. Alternative airport sites were not considered. As such, an emphasis was placed upon identifying the development alternative that was most effective at the existing site.

The Airport Development Planning process is a continual effort. The City of Orange City should involve the Airport within the infrastructure of the community so to ensure a continued high degree of compatibility.

Section One summarizes relevant background information used in the preparation of latter study elements.

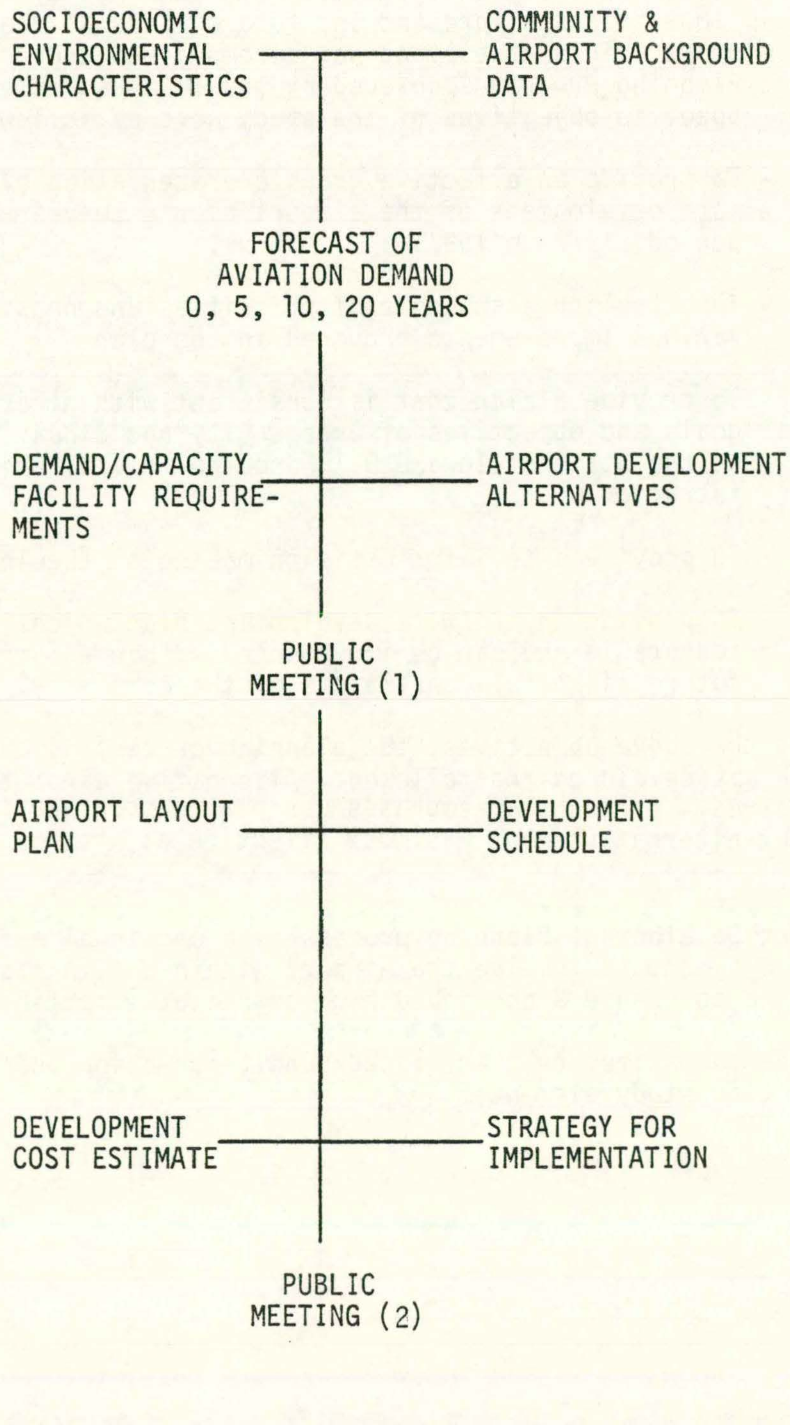


FIGURE ONE: Airport Development Plan Planning Process

The Orange City Municipal Airport is located to the south and west of the corporate limits of the City. Reference may be made to Figure Two.

The facility consists of a single runway, Runway 16/34. The runway is 2,900 feet in length and 60 feet in width. Planned construction of an additional 600 feet of runway on Runway End 34 will provide RW 16/34 with a total length of 3,500 feet. An 80 foot by 80 foot turnaround on Runway End 34 will also be constructed. This project, to include medium intensity runway lighting, wind cone, and SAVASI is to be completed in 1978-1979.

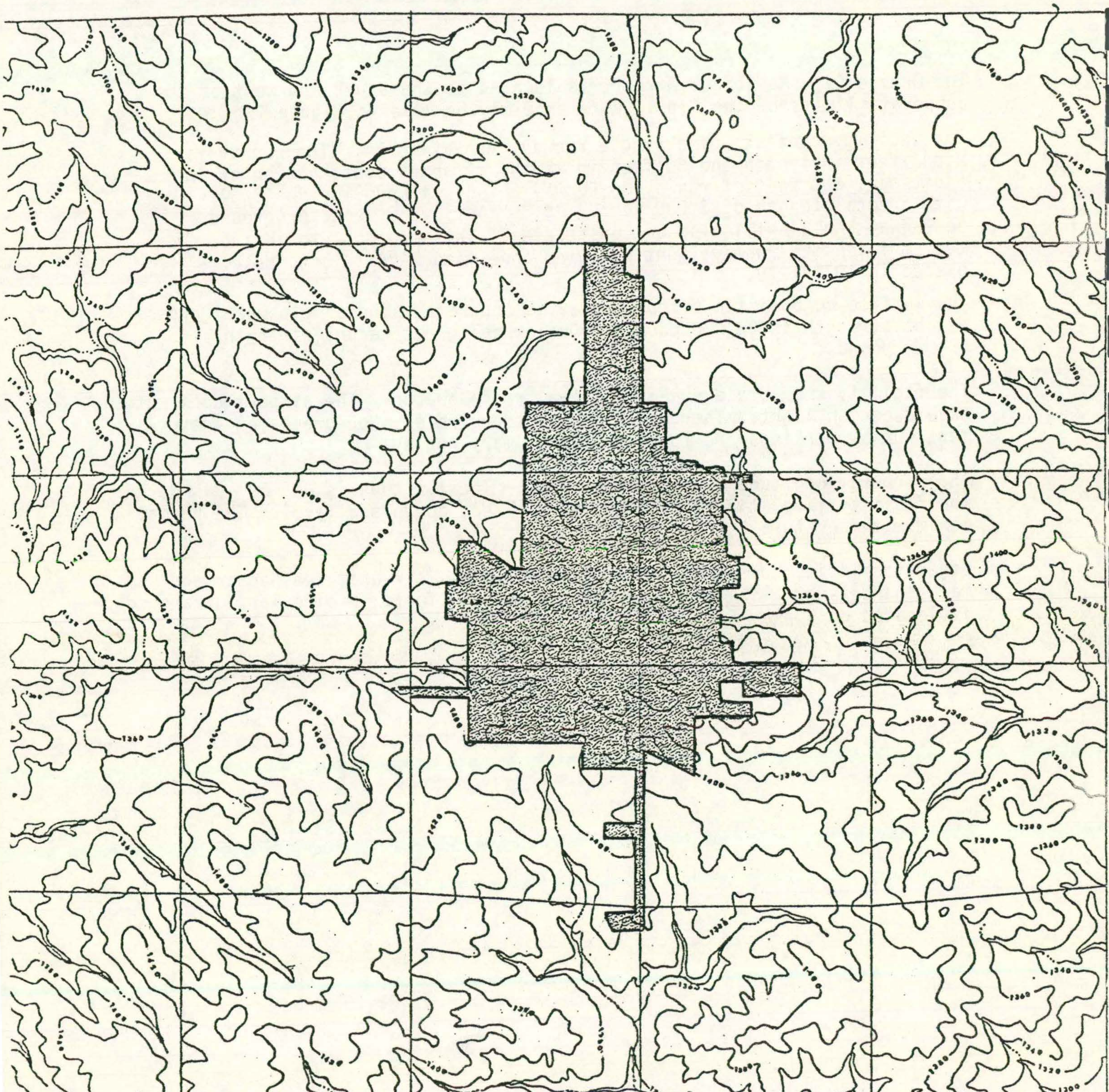
The surface composition of the runway is concrete. The single wheel gross weight strength is 28,000 pounds. Dual wheel gross weight strength is 48,000 pounds.

The facility supports a non-directional radio beacon. The airport does not have a beacon light. There is no segmented circle. Non-precision instrument runway markings are found on the primary runway.

The airport longitude is 96° 04' 2" West. The latitude is 42° 59' 24" North. The facility lies at an elevation of 1,414 feet above sea level. The normal maximum temperature is 86°F.

Other facilities consist of a terminal building, six-unit tee hangar and maintenance shop. The apron is 100 feet by 200 feet. A circular turnaround is located on Runway End 16.

ORANGE CITY TOPOGRAPHIC MAP



VICINITY MAP

FIGURE TWO

N

LEGEND

CORPORATE LIMITS

CONTOUR LINES

DRAINAGE CREEKS

B. COMMUNITY INFRASTRUCTURE

FIRE PROTECTION

Smaller general aviation airports generally rely upon a fire district or associated community facilities for crash rescue and fire protection. The Orange City Municipal Airport is served by the Orange City Fire Department. The Volunteer Fire Department is located on Albany Avenue and Second Street, Southeast. The following personnel and equipment are available:

Equipment	Personnel
1964 Chev. Luvern Pumper	Volunteer - 29
1956 Dodge Brookings Pumper	
1964 Chev. Rescue Truck	
1968 Chev. Tanker	
1972 Ford Pumper	
1952 GMC Army Tanker	

LAW ENFORCEMENT

Security at the airport facility is provided by the City. The Department consists of three full-time persons and three "relief" police.

UTILITIES

The airport itself uses little of the water and sewage capacity of the community. Water supply and sewage treatment is provided by the City.

Water:	
Supply:	7 Wells
Elevated Storage:	560,000 Gallons
Water Plant Capacity:	1,728,000 Gallons/Day
Sewerage Treatment:	
Average Load:	270,000 Gallons/Day
Peak Load:	320,000 Gallons/Day
Design Capacity:	230,000 Gallons/Day

Natural gas is supplied by the Iowa Public Service Company. The Orange City Municipal Light Plant distributes electrical power. Telephone service is provided by the Central Telephone Company.

LAND USE

A Comprehensive Community Plan was prepared by Northwest Iowa Regional Council of Governments in 1976, under Section 701 of the Housing Act of 1954 as amended. Land use is a salient concern on and near all airport facilities. As evident from a visual inspection of the airport, there is considerable potential for compromise of Federal Aviation Regulation, Part 77.

Of concern herein are present land uses, growth directions and the future land use patterns. An objective of this assessment is to ensure that future land uses are compatible with the operation of the airport. Where as, noise is generally not a problem at general aviation airports, there is some potential for problems should residential and public facilities be constructed under or near the approach surfaces to the airport. Second, the height of structures near the airport will compromise the imaginary surfaces of the facility. Should these problem areas become reality or larger in scope, it may be necessary to consider relocation of the airport. Because of the level of public investment in the airport, this latter situation is not in the best interest of the community. Thus, it is important for the City to regulate the use of land and height of structures on and near the airport.

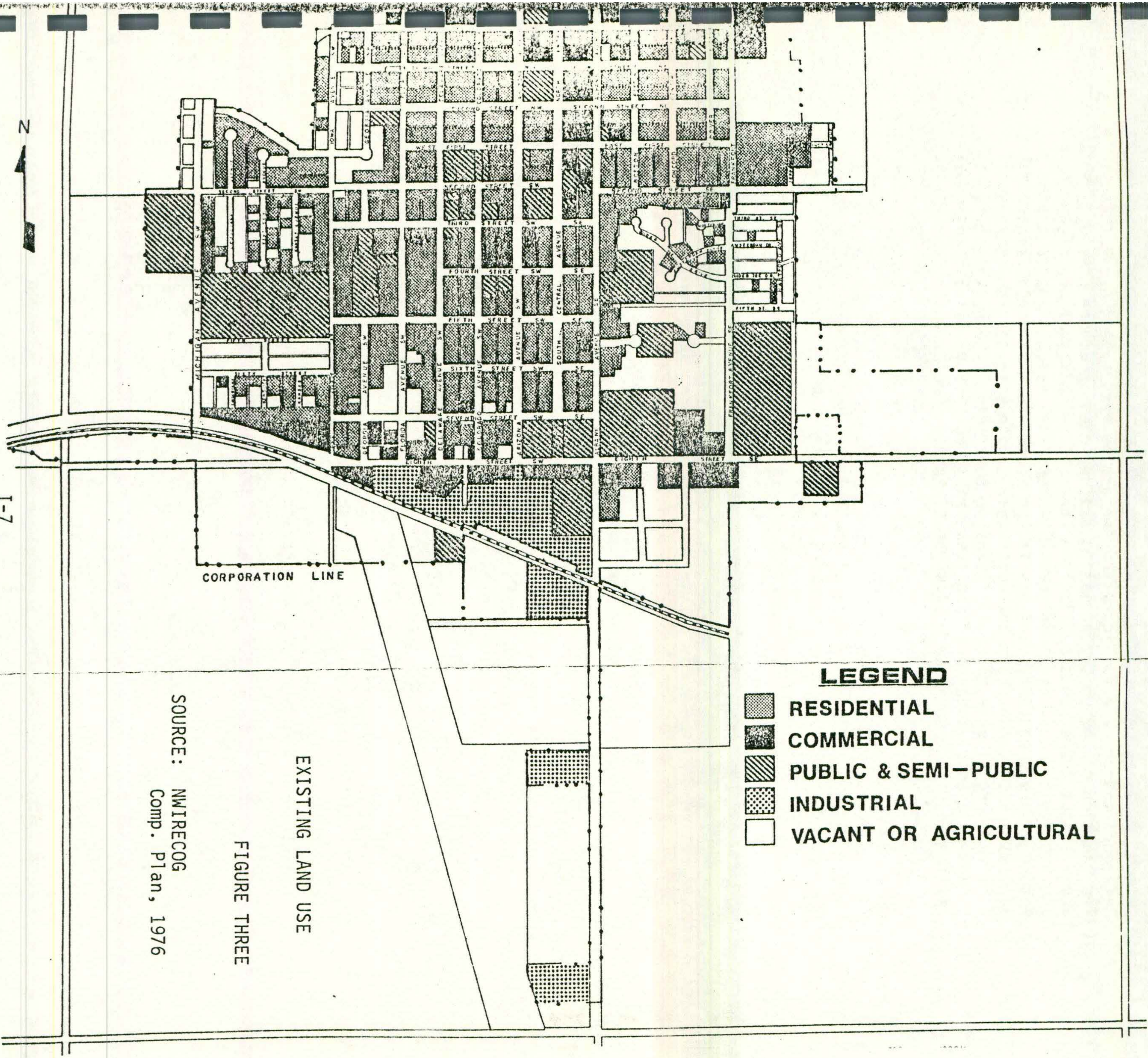
Land uses to the south and west of the airport are currently under intensive cultivation. Land uses to the north and east are primarily commercial and industrial. Reference may be made to Figure Three, concerning existing land use patterns in the vicinity of the airport.

Future land use needs in the community were examined in the Comprehensive Plan and are summarized as follows:

Recommendations[1]

1. Residential development for 1980 should be restricted lots within the corporate limits.
2. Residential development for the period between 1980 and be funneled in an easterly direction.
3. A new location for the existing sewerage treatment should be sought preferably in Section Three with possible coordination with the City of Alton.
4. Commercial development should be restricted to Eighth Street, Albany Avenue, and the Central Business District. Between 1980 and 1990, expansion of the CMD around the existing CBD should be commercial development's main concentration.
5. Industrial development should be restricted to the Industrial Park and areas along the railroad tracks.
6. Public uses shall be coordinated with future development. Possibly centralizing all public services and existing waterplant.
7. Possible deannexation of the area 160 feet north of the North Addition. This area includes the Dutch Colony Addition.

[1] (Source: NWIRECOG: Comp. Plan. 1976) Page 100.

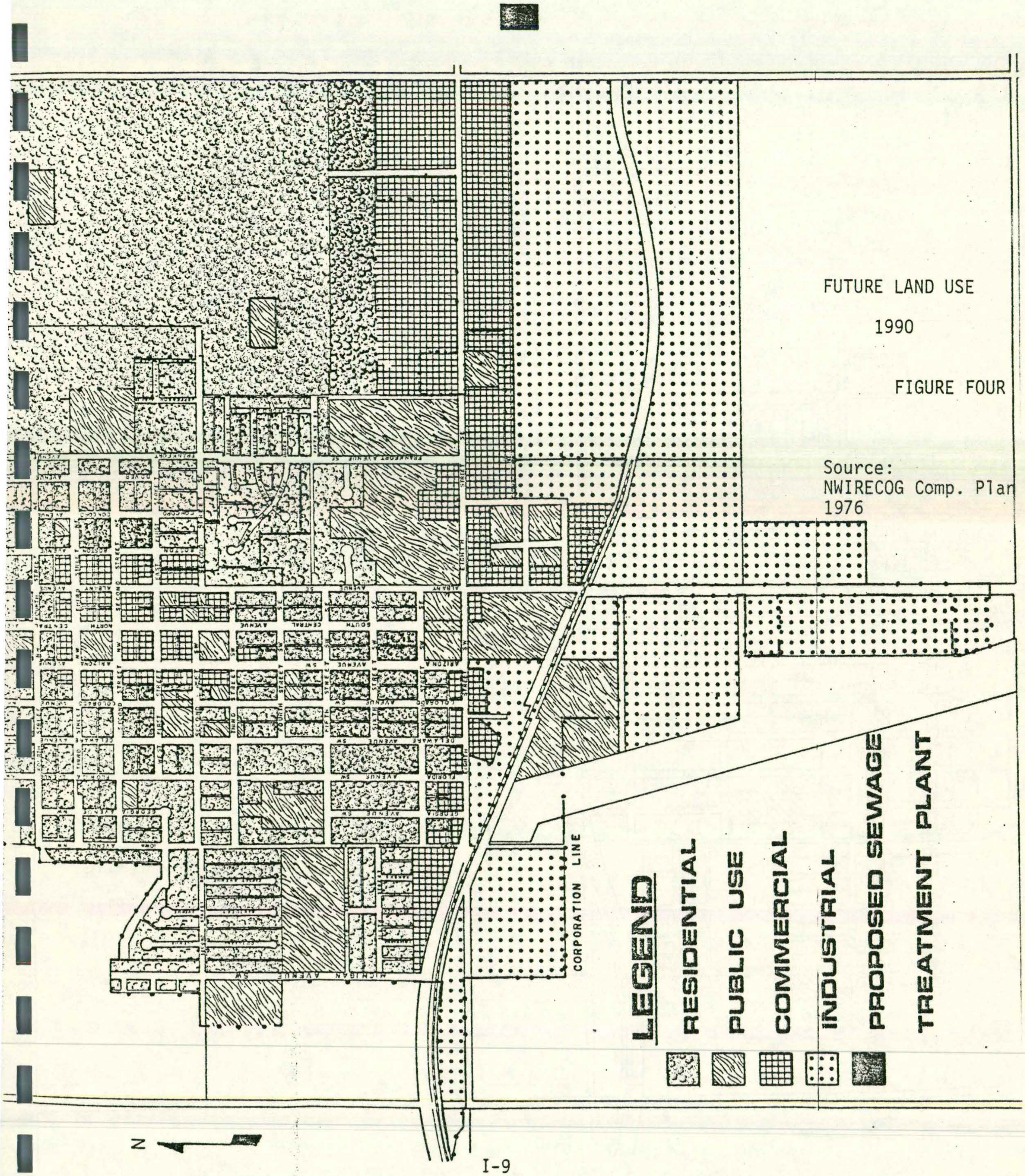


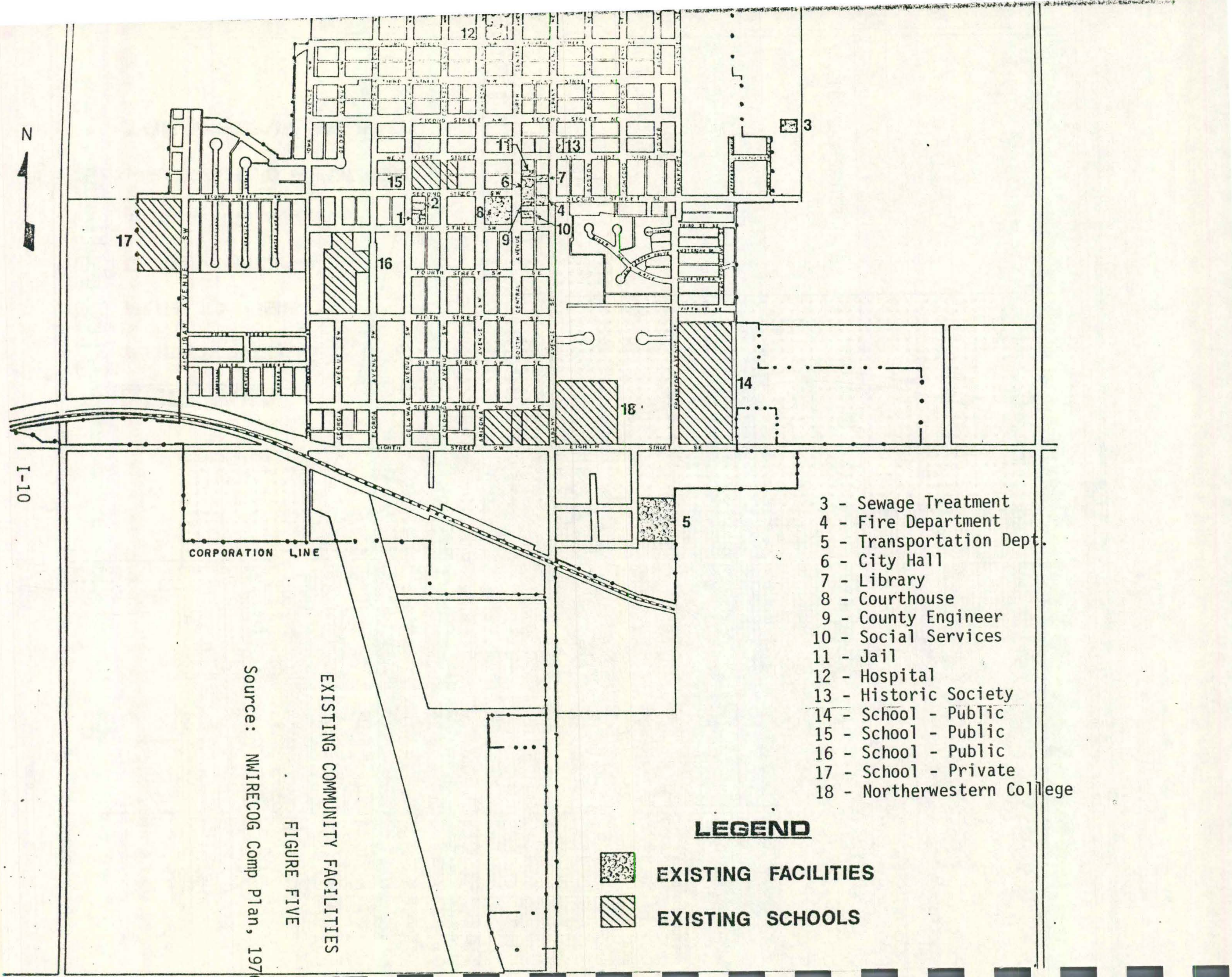
EXISTING LAND USE

FIGURE THREE

SOURCE: NWIRECOG Comp. Plan, 1976

Reference may be made fo Figure Four regarding future land use patterns. The location of community facilities are depicted in Figure Five. It appears that there would be little or no land use conflict provided land use patterns as depicted in Figure Five were followed. As noted on the future land use exhibit, land use to the south and west would remain agricultural. Land use to the east would continue to develop as industrial. There appears to be little or no conflict to the northwest, although some complaints regarding noise may occur. Fortunately, residential development is directed away from the airport.


FUTURE LAND USE
1990
FIGURE FOUR
Source:
NWIRECOG Comp. Plan
1976
LEGEND
RESIDENTIAL
PUBLIC USE
COMMERCIAL
INDUSTRIAL
PROPOSED SEWAGE
TREATMENT PLANT
CORPORATION LINE
MICHIGAN AVENUE SW
FRANKFORT AVENUE SE
N



EXISTING COMMUNITY FACILITIES

FIGURE FIVE

Source: NWIRECOG Comp Plan, 197(

OTHER MODES OF TRANSPORTATION

The City is served by the Chicago and Northwestern Transportation Company. The Company provides rail switching service on a one week interval. Three motor freight carriers provide service to the community.

State Highway 10 provides access to U.S. Highway 75 some six miles to the west and State Highway 60, three miles to the east. The community is approximately 45 miles north of Sioux City, Iowa, via. U.S. Highway 75.

Commercial Air Carrier service is provided at Sioux City by North Central and Ozark Airlines. Barge Transportation is also available at Sioux City, along with piggyback rail service.

C. SOCIOECONOMIC BACKGROUND

Socioeconomic characteristics of the community and its hinterland have a direct relationship to aviation demand at the airport. The socioeconomic background information and data summarized herein was obtained from the Orange City Comprehensive Plan, 1976.

POPULATION

The City of Orange City has experienced, historically, a continual increase in population. Historic and projected population is shown in the table below.

Table 1: Population, Orange City, 1940 - 1990

YEAR	POPULATION	PERCENT INCREASE	SIOUX COUNTY POPULATION	PERCENT OF SIOUX COUNTY
1940	1,920	--	27,205	7.1
1950	2,166	12.8	26,381	8.2
1960	2,707	24.9	26,375	10.3
1970	3,572	31.9	27,996	12.8
1975	4,016	12.4	28,724	14.0
1980	4,419	10.0	29,458	15.0
1985	4,764	7.9	30,153	15.8
1990	5,035	5.6	30,752	16.4

Source: NWIRCOG Orange City Comprehensive Plan, 1976, Page 10

Population growth can be attributed to increased births over deaths or increased in-migration. The latter factor is presently most salient in the case of Orange City. Migration (in or out) is dependent on the attractiveness of the region and job opportunities. Expanded job opportunities is thus a key element in Orange City achieving its projected population growth.

The "Interim Regional Land Use Plan" summarized projected population for Sioux County communities. The population estimates summarized in the report were prepared by the Iowa Department of Environmental Quality. Reference may be made to the following table.

Table 2: Population Projections for Sioux County Communities

COMMUNITY	1970[a]	1975[b]	1980[b]	1990[b]	2000[b]
Alton	1,018	1,005	988	983	993
Boyden	670	728	744	856	898
Chatsworth	90	95	95	99	102
Granville	383	384	383	388	394
Hawarden	2,789	2,912	3,001	3,189	3,282
Hospers	646	669	685	718	739
Hull	1,523	1,647	1,747	1,922	2,013
Ireton	582	619	648	701	729
Matlock	89	83	78	73	72
Maurice	266	281	292	313	325
Orange City	3,572	4,067	4,501	5,247	5,609
Rock Valley	2,205	2,495	4,895	6,138	6,735
Unincorporated	10,996	10,031	9,455	8,877	8,788

a. U.S. Census; b. Iowa Department of Natural Resources
Source: NWIRCOG Interim Land Use Plan, 1977, Page X-3

Age distribution of population is concentrated in the 15 - 19, 20 - 24 and 75+ age groups. The former can be attributed to Northwestern College while the latter concentration indicates the desireability of retirement to the community.

ECONOMIC BASE

The propensity to use air as a mode of transportation is dependent upon a number of factors. In addition to socioeconomic factors such as income, occupation, family size, the following are also factors:

- Travel Distance
- Accessibility
- Time
- Cost Per Unit of Travel
- Reason for Making the Trip
- Number of Persons
- Type and Value of Cargo
- Availability of Aircraft
- Regulations
- Aviation Interest
- Availability of Other Transportation Modes

Occupation or employment by industry provides some insight into travel tendencies. The ENO Foundation catagorized industry by travel tendency as follows:

High Travel:
Mining, Manufacturing, Government Business Service

Medium Travel:
Construction; Wholesale and Retail Trade; Professional Services; Finance, Insurance and Real Estate

Low Travel:
Agriculture, Forestry, Transportation, Communication, Utilities, Repair Service, Recreation, Amusement, Printing

Orange City employment by industry is summarized in the following table.

Table 3: Employment by Industry, 1960 - 1970

EMPLOYMENT CATEGORY	1960	1970	% Change
Construction	94	72	-23.4
Manufacturing	166	282	+69.9
Transportation, Communication, Utilities	47	41	-12.8
Wholesale & Retail Trade	160	338	+111.2
Finance, Insurance, Business & Repair Services	69	100	+44.9
Professional & Related Services	318	548	+72.3
Public Administration	41	71	+73.1
Other	103	137	+33.0
TOTAL	998	1589	+59.2

Source: NWIRCOG Comprehensive Plan, 1976, Page 24

As noted, those industries with high and medium travel tendencies have experienced an increase in employment.

LOCAL MANUFACTURING CHARACTERISTICS

Number of Manufacturing Plants in Community: 5
Number of Manufacturing Plants with Unions: 0
Number of Manufacturing Employees in Community: 409
Number of Work Stoppages in the Last 5 Years: 0

MAJOR MANUFACTURERS OR OTHER LARGE EMPLOYERS IN COMMUNITY:

Name of firm: K-Products, Inc.
Employment: Male 20; Female 255; Total 272
Union Affiliation: None
Product(s) manufactured: Mens Caps, Rain Guages, Emblems

LOCAL MANUFACTURING CHARACTERISTICS (Cont.)

Name of Firm: Vogel Paint & Wax Mfg. Co.
Employment: Male 74; Female 7; Total 81
Union Affiliation: None
Product(s) Manufactured: Paint and Paint Thinners

Name of Firm: S & W Ammunition Company
Employment: Male 23; Female 1; Total 23
Union Affiliation: None
Product(s) Manufactured: Bullets for Reloaders, Arrowheads

Name of Firm: Tolman Welding & Mfg.
Employment: Male 15; Female 1; Total 16
Union Affiliation: None
Product(s) Manufactured: Augers, Hoppers, Feed Equipment, Fertilizer Equipment

Source: Iowa Development Commission, 1976

D. AREA AIRPORTS

Sioux County is fortunate in having three public airport facilities in the County. These three airports are Sioux Center, Hawarden, and Orange City. The Airport at Rock Valley was listed in the 1976 SASP as a private facility open to the public. Public airports located in the counties immediately adjacent to Orange City include those at LeMars, Paullina and Cherokee. All these airports are included in the 1978 State Airport Systems Plan (SASP) except Hawarden & Paullina. The latter two are "system candidate airports".

To determine if the airport should be included in the Iowa State System of Airports, the IDOT devised an index system for rating each airport. To be included, the airport must have 300 points. The selected criteria used in computing the index was as follows:

D = Distance to nearest alternative airport
C_p = One point if county population growth trend is positive (1950-1970)
C_e = One point if county employment growth trend is positive (1950-1970)
P = One point for each of the planning periods (i = 1977, 1982, 1987, 1997) in which the airport community projected population is more than 3000.
I = Five points if the community has applied for assistance in Airport Master Planning or Airport Development Planning.
R = Five points if the airport's primary runway is hard surfaced.
A = One point for every 10 based aircraft projected for each of the planning periods (i = 1977, 1982, 1987, 1997)
O = One point for every 10,000 annual operations projected at the airport for each of the planning periods (i = 1977, 1982, 1987, 1997)

Airport System Index = $D[1+C_p+C_e+\sum P_i+1+R+\sum A_i+\sum O_i]$

AIRPORT	INDEX POINTS
Orange City	390
Sioux Center	345
Hawarden	132
LeMars	640
Paullina	140
Cherokee	925

Area airports, after being included, were assigned a role within the system.

Basic Utility:

Sioux Center Orange City Cherokee	(A basic utility airport is one that accommodates 95% of the propeller aircraft under 12,500 pounds.)

General Utility:

LeMars	(A general utility airport is one that accommodates all propeller aircraft of less than 12,500 pounds)

Reference may be made to Figure Six concerning the geographical location of area airports.

AIRPORT	ORIENTATION	RUNWAYS	SURFACE
LeMars	18/36	75' x 3000'	Paved
Sioux Center	18/36	50' x 3000'	Paved
Paullina	17/35	30' x 2800'	Paved
Hawarden	12/30	50' x 2000'	Paved
Cherokee	18/36	50' x 3000'	Paved
Orange City	16/34	60' x 2900'	Paved *

* 850 foot extension operational 1979
60' x 3750'

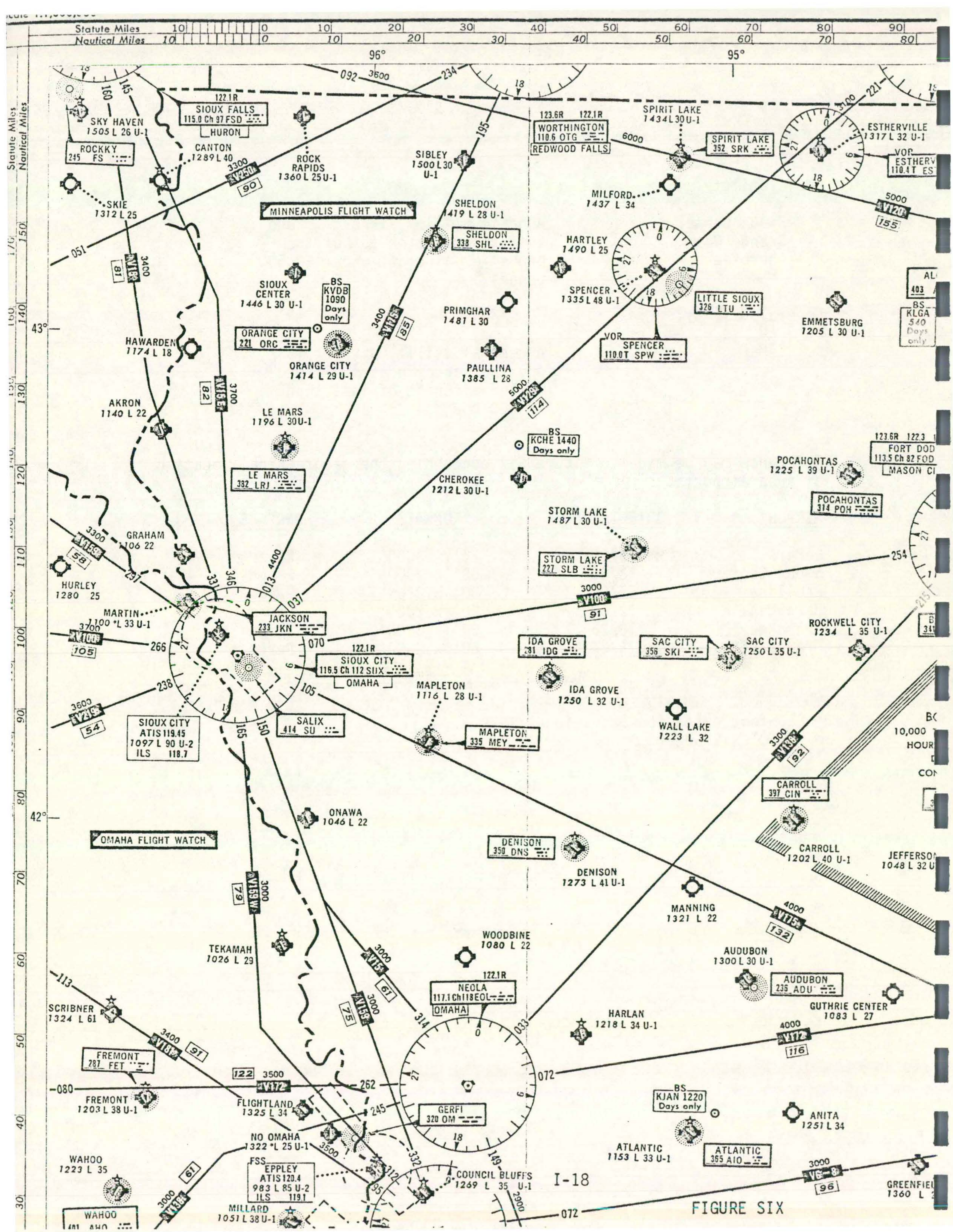

Statute Miles
Nautical Miles
96°
95°
43°
42°
SIOUX FALLS
115.0 Ch 97 FSD
HURON
122.1R
SKY HAVEN
1505 L 26 U-1
ROCKKY
245 FS
CANTON
1289 L 40
SKIE
1312 L 25
ROCK RAPIDS
1360 L 25 U-1
WORTHINGTON
110.6 OTG
REDWOOD FALLS
123.6R 122.1R
SPIRIT LAKE
1434 L 30 U-1
SPIRIT LAKE
352 SRK
ESTHERVILLE
1317 L 32 U-1
VOR
ESTHERV
110.4 T EST
SIBLEY
1500 L 30 U-1
MINNEAPOLIS FLIGHT WATCH
MILFORD
1437 L 34
SHELDON
1419 L 28 U-1
SHELDON
338 SHL
HARTLEY
1490 L 25
SIOUX CENTER
1446 L 30 U-1
BS
KVDB
1090
Days only
SPENCER
1335 L 48 U-1
LITTLE SIOUX
326 LTU
EMMETSBURG
1205 L 30 U-1
BS
KLGA
540
Days only
PRIMGHAR
1481 L 30
ORANGE CITY
221 ORC
ORANGE CITY
1414 L 29 U-1
VOR
SPENCER
110.0 T SPW
HAWARDEN
1174 L 18
PAULLINA
1385 L 28
AKRON
1140 L 22
LE MARS
1196 L 30 U-1
BS
KCHE 1440
Days only
LE MARS
382 LRJ
CHEROKEE
1212 L 30 U-1
FORT DOD
113.5 Ch 82 FOD
MASON CI
123.6R 122.3
POCAHONTAS
1225 L 39 U-1
POCAHONTAS
314 POH
STORM LAKE
1487 L 30 U-1
STORM LAKE
227 SLB
GRAHAM
1106 22
HURLEY
1280 25
MARTIN
1100 *L 33 U-1
JACKSON
233 JKN
V100
91
ROCKWELL CITY
1234 L 35 U-1
IDA GROVE
281 IDG
SAC CITY
356 SKI
SAC CITY
1250 L 35 U-1
SIOUX CITY
116.5 Ch 112 SUX
OMAHA
122.1R
IDA GROVE
1250 L 32 U-1
MAPLETON
1116 L 28 U-1
SIOUX CITY
ATIS 119.45
1097 L 90 U-2
ILS 118.7
SALIX
414 SU
MAPLETON
335 MEY
WALL LAKE
1223 L 32
CARROLL
397 CIN
ONAWA
1046 L 22
OMAHA FLIGHT WATCH
DENISON
350 DNS
DENISON
1273 L 41 U-1
CARROLL
1202 L 40 U-1
JEFFERSON
1048 L 32 U
MANNING
1321 L 22
WOODBINE
1080 L 22
TEKAMAH
1026 L 29
AUDUBON
1300 L 30 U-1
AUDUBON
236 ADU
NEOLA
117.1 Ch 118 EOL
OMAHA
122.1R
GUTHRIE CENTER
1083 L 27
SCRIBNER
1324 L 61
HARLAN
1218 L 34 U-1
FREMONT
287 FET
FREMONT
1203 L 38 U-1
FLIGHTLAND
1325 L 34
GERFI
320 OM
BS
KJAN 1220
Days only
ANITA
1251 L 34
NO OMAHA
1322 *L 25 U-1
ATLANTIC
1153 L 33 U-1
ATLANTIC
365 AIO
WAHOO
1223 L 35
FSS
EPPLEY
ATIS 120.4
983 L 85 U-2
ILS 119.1
COUNCIL BLUFFS
1269 L 35 U-1
GREENFIEL
1360 L
MILLARD
1051 L 38 U-1
WAHOO
401 AHO

FIGURE SIX

SECTION TWO

FORECAST OF AVIATION DEMAND

A. INTRODUCTION

The forecast of aviation demand levels at the Orange City Municipal Airport provides only what may be termed a trend line of future numbers of based aircraft, local and itinerant aircraft operations, numbers of airmen and numbers of passengers and air cargo. Along a given trend line, actual occurrences will be above and below as demonstrated from a review of historical data. Such annual variations are caused, not only by long term trends, but socioeconomic events and political decisions at the local level.

The forecast presented herein is based upon regional historical data supplemented by projections developed by the Iowa Department of Transportation. Because of the data base and the small numbers dealt with, a decision made locally could drastically alter any estimates made herein. The validity of the estimate comes from the long term trend within the region. As historical data would indicate, decisions are made to relocate aircraft from one airport to another for reasons ranging from personal to cost and services. Such events, while affecting a specific airport, do not influence overall regional trends. Thus, a "step down" procedure was used to estimate probable levels of aviation activity.

To facilitate understanding of the estimate for a specific airport location, reference was made to the 1978 State Airport Systems Plan:

> "The choice of a site for basing an aircraft is not always directly related to the residence of the owner. The choice may be affected by such factors as hangar rental and maintenance fee structures, availability of terminal services, availability of navigational aids, runway length and condition, etc."
>
> (Source: 1978 SASP, P. 38)

The above explains some of the annual variations of general aviation aircraft registered or based at one airport or another. Those airports which now enjoy numbers of based aircraft owned by persons from outside the community or airport service area, may in the future lose their historical dominance.

> "Ideally, as airport development improves the quality of airports throughout the state, the attractiveness of the airports will become more similar causing the number of aircraft based in a county to more nearly equal the number of registered in the county."
>
> (Source: 1978 SASP, P. 39)

B. BASED AIRCRAFT

NATIONAL & STATE TRENDS

The number of registered aircraft in the U.S. and Iowa nearly doubled from 1960 to 1970. This historic rate of increase is expected to continue through 1997. The IDOT summarized future estimated number of registered aircraft as follows:

Table 4: Registered Aircraft, 1960 - 1997

	U.S. Aircraft	Iowa Aircraft	Iowa % of U.S. Total
1960	70,627	1,654	2.34
1965	94,442	1,980	2.07
1970	131,743	2,565	1.95
1971	131,148	2,619	2.00
1972	145,010	2,609	1.80
1973	153,540	2,652	1.73
1974	161,500	2,708	1.68
1975	167,000	2,789	1.67
1976	172,000 (a)	2,984	1.73
1977	178,000 (a)	2,907	1.63
1982	210,878 (b)	3,378 (b)	1.60
1987	243,718 (b)	3,767 (b)	1.55
1997	309,398 (b)	4,544 (b)	1.47

(a) FAA
(b) DOT Projection
Source: 1978 SASP, P. 38

As noted in the above table, the number of registered aircraft in Iowa is projected to reach 4,544 by 1997. This represents an increase of 56 percent from the 1977 registration count. The next logical step in estimating future numbers of aircraft based at Orange City was to examine the number of registered aircraft at the regional level. Regional trends are based upon a 16 county area to include the following counties: Buena Vista, Cherokee, Calhoun, Clay, Dickinson, Emmet, Ida, Lyon, O'Brien, Osceola, Palo Alto, Plymouth, Sac, Sioux, Woodbury and Pocahontas.

REGIONAL TRENDS

Registered historical numbers of general aviation aircraft within the 16 county region are presented in Table Five. General aviation experienced rather substantial growth from 1965 to 1975 -- increasing from 226 aircraft in 1965 to 424 aircraft in 1975. This represents a growth of 198 aircraft or 87.6 percent. The growth was constant from 1965 to 1971, reaching a high of 406 aircraft in 1972. Beginning in 1973 with 374 registered aircraft, the trend has continued upward.

Woodbury County dominated the regional setting and contributed to the overall stability with a continual upward rate of growth. The remaining 15 counties experienced annual variations in the number of registered aircraft. Sioux County displayed relative stability. The significance of the regional trend is summarized as follows:

- It displays an upward trend historically
- With the exception of 1972, the trend is relatively constant in numerical terms.
- There is considerable annual variation by county.
- That such variation, when observed alone for a specific site, would suggest extreme increase or decrease.
- That while important to the airport, such annual variations are not significant over a long period of time.

Figure Seven depicts historical growth and a historical trend line fitted by a non-linear equation, $yc = a + bx + cx^2$. As noted, the actual occurance by year varies above and below the calculated trend line. With the exception of 1972 and 1973, the variation was within ten aircraft of the trend line value. The annual variation is summarized in Table Six.

Table 5: REGISTERED NUMBER OF GENERAL AVIATION AIRCRAFT, 1965-1975, 16 COUNTY REGION

YEAR	BUENA VISTA	CHEROKEE	CALHOUN	CLAY	DICKINSON	EMMET	IDA	LYON	O'BRIEN	OSCEOLA
1977										
1976										
1975	25	34	18	34	19	17	11	20	27	10
1974	23	32	14	20	21	13	12	21	25	10
1973	21	32	13	29	22	14	9	22	30	10
1972	20	28	16	45	26	11	14	24	30	11
1971	24	27	11	25	25	12	8	23	31	11
1970	25	33	15	24	24	12	13	18	25	12
1969	18	20	20	30	20	11	6	13	19	8
1968	14	15	22	25	22	10	9	11	23	8
1967	9	15	20	27	17	14	6	16	19	8
1966	13	17	14	22	10	12	7	10	22	7
1965	21	10	8	22	6	13	6	9	13	6

YEAR	PALO ALTO	PLYMOUTH	POCAHONTAS	SAC	SIOUX	WOODBURY	TOTAL
1977							
1976							
1975	13	23	18	21	24	110	424
1974	12	23	17	15	28	99	395
1973	10	23	18	12	15	94	374
1972	10	24	21	13	11	92	406
1971	11	21	25	11	5	80	350
1970	7	23	26	14	3	57	329
1969	7	20	20	12	6	79	309
1968	10	22	16	8	9	73	297
1967	8	21	15	10	6	73	284
1966	8	14	12	12	7	79	266
1965	8	10	9	11	3	71	266

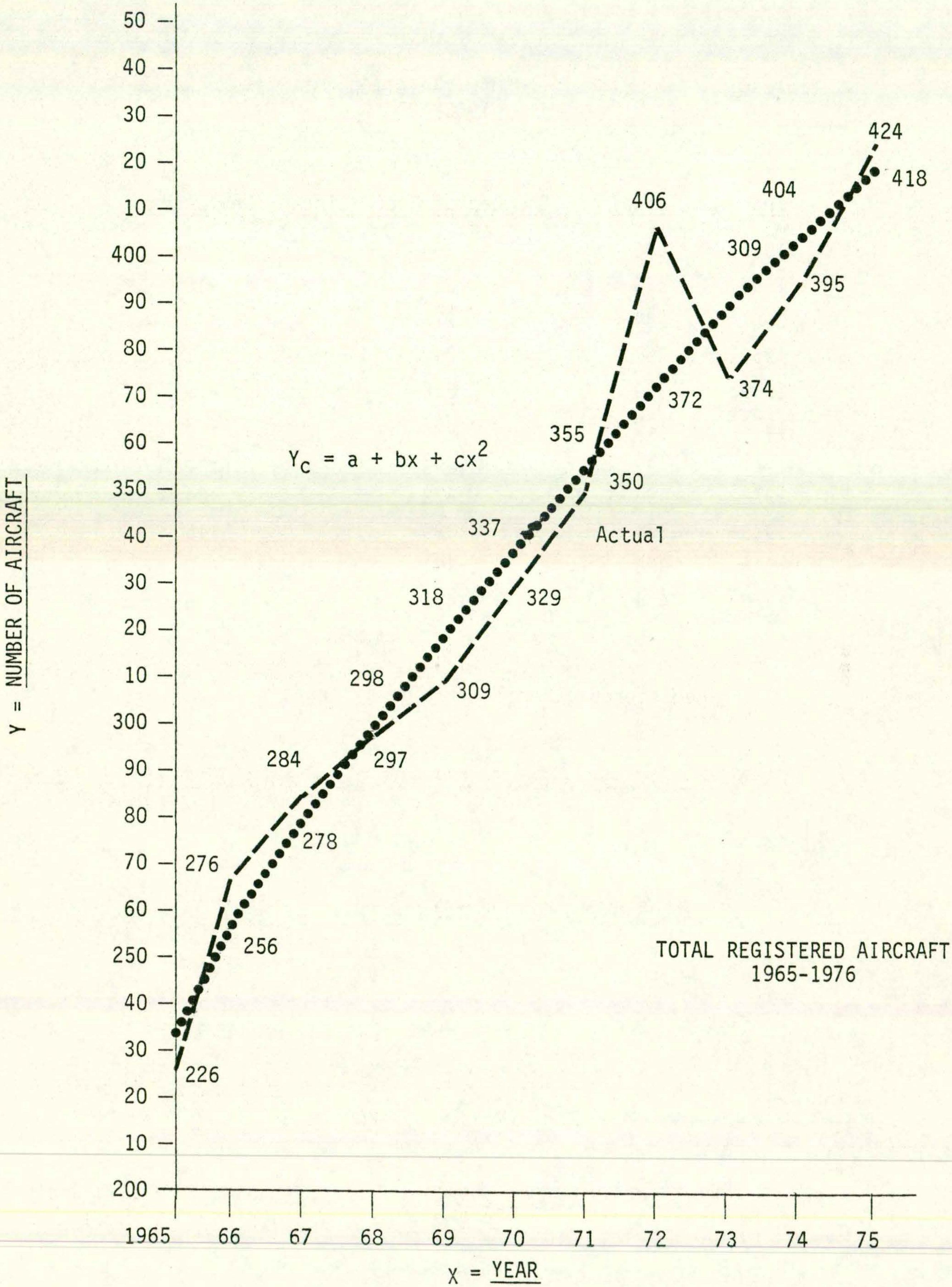

Y = NUMBER OF AIRCRAFT
50
40
30
20
10
400
90
80
70
60
350
40
30
20
10
300
90
80
70
60
250
40
30
20
10
200
1965
66
67
68
69
70
71
72
73
74
75
X = YEAR
$Y_C = a + bx + cx^2$
Actual
226
276
256
284
278
298
297
318
309
337
329
355
350
406
372
309
374
404
395
424
418
TOTAL REGISTERED AIRCRAFT
1965-1976

Table 6: ANNUAL VARIATION 1965-1975

Year	Actual *	2nd Degree Trend Line	Deviation
1965	226	234	- 8
1966	266	256	+10
1967	284	278	+ 6
1968	297	298	- 1
1969	309	318	- 9
1970	329	337	- 8
1971	350	355	- 5
1972	496	372	+34
1973	374	389	+15
1974	395	404	- 9
1975	424	418	+ 6

* Registered general aviation aircraft

The calculated trend line, based upon the above, would appear valid if extended into the future. Beyond 10 years, most estimates are questionable and should be reviewed. Thus, the trend line would appear to give a realistic estimate through 1982 and up to 1987. Beyond 1987 and through 1997, the estimate would be questionable. Orange City is encourage to review the long term estimate in 1982 so as to account for unforeseen events that may take place within the next five years.

Regional estimates of future numbers of registered aircraft were calculated based upon the following methodology: (yc = Year Calculated)

Non-Linear Trend Line --------------- $yc = a + bx + cx^2$

Year	x	x^2	x^4	y	xy	x^2y
1975	+ 5	25	625	424	+2,120	10,600
1974	+ 4	16	256	395	+1,580	6,320
1973	+ 3	9	81	374	+1,122	3,366
1972	+ 2	4	16	406	+ 812	1,624
1971	+ 1	1	1	350	+ 350	350
1970	0	0	0	329	0	0
1969	- 1	1	1	309	- 309	309
1968	- 2	4	16	297	- 597	1,188
1967	- 3	9	81	284	- 852	2,556
1966	- 4	16	256	266	-1,064	4,256
1965	- 5	25	625	226	-1,130	5,650
	0	110	1,158	3,660	2,032	36,219

y = Number of registered aircraft , x = Year (assigned value)

Equations	Constants
(I) $\Sigma y - Na + c\Sigma x^2$	c = -0.444
(II) $\Sigma xy = b\Sigma x^2$	b = 18.473
(III) $\Sigma x^2y = a\Sigma x^2 + c\Sigma x^4$	a = 337.1678

Future estimates can be calculated by using the second degree equation,

$$yc = a + bx + cx^2$$

The constants a, b, and c were obtained by solving the preceeding equations.

y = Number of registered aircraft in 16 counties
x = Assigned value
x^2, x^4, xy and x^2y = calculated values
yc = year calculated
n = number

Table 7: REGIONAL ESTIMATES OF AIRCRAFT

1976-1997

Non-Linear Trend

	Year Calculated		a	+	bx	+	c x^2		No. of Aircraft
1976 :	yc	=	337.2	+	18.5 (6)	+	(-.44)(36)	→	432
1977 :	yc	=	337.2	+	18.5 (7)	+	(-.44)(49)	→	445
1978 :	yc	=	337.2	+	18.5 (8)	+	(-.44)(64)	→	457
1979 :	yc	=	337.2	+	18.5 (9)	+	(-.44)(81)	→	468
1980 :	yc	=	337.2	+	18.5 (10)	+	(-.44)(100)	→	478
1981 :	yc	=	337.2	+	18.5 (11)	+	(-.44)(121)	→	488
1982 :	yc	=	337.2	+	18.5 (12)	+	(-.44)(144)	→	496
1987 :	yc	=	337.2	+	18.5 (17)	+	(-.44)(289)	→	525
1992 :	yc	=	337.2	+	18.5 (22)	+	(-.44)(484)	→	531
1997 :	yc	=	337.2	+	18.5 (27)	+	(-.44)(729)	→	516

(Source: Otto & Culver, P.C.)

A straight line estimate, based upon the equation, yc = a + bx, produces an estimate that appears realistic from 1976 to 1982 but far too high for the remaining 15 year period.

1976 = 448	1980 = 522
1977 = 467	1981 = 541
1978 = 485	1982 = 559
1979 = 504	

Such an estimate appears too high and is thus of little value over a period of time.

Figure Eight summarizes graphically the foregoing discussion. After 1982, a high, low and middle trend line was established. The middle trend line is expected to prevail with actual numbers of registered aircraft centered above and below this line. In summary, regional registered aircraft are expected to be as follows:

1976 = 443	1981 = 488
1977 = 445	1982 = 496
1978 = 457	1987 = 535
1979 = 468	1997 = 581
1980 = 478	

SIOUX COUNTY TRENDS

Using a step down procedure, it is assumed that Sioux County's share of the regional total will remain somewhat constant. The majority of the county's aircraft are based at Orange City and Sioux Center.

It should be noted that becuase of the close proximity of the two facilities, the one offering the better services, facilities and management will likely capture a larger share of the county's total number of registered aircraft. Table Eight shows Sioux County's historical share of the region's aircraft from 1965 to 1975. Also shown is the future numbers of aircraft based upon the county's average share from 1971 - 1975 (low) and 1974 - 1975 (high). A middle line was established from the difference between the low and high. The actual trend is expected to fall nearer the high forecast than the middle line. As noted with historical data, there is expected to be considerable variation from year to year in terms of registered aircraft.

Reference to Table Nine provides an insight into the geographical distribution of aircraft ownership and registration in Sioux County as of December 7, 1977. Orange City dominates the county with approximately 49 percent of all owners listing an Orange City address. Sioux Center follows with approximately 18 percent. Granville and Hawarden capture approximately 10 and 8 percent respectively. The remaining 15 percent of aircraft owners list Maurice, Hull, Ireton, Hospers or Rock Valley as their mailing address.

An inventory of aircraft in August of 1978 revealed a significant change in aircraft ownership within Orange City. The City from December, 1977 to August, 1978 lost 7 aircraft.

It should be pointed out that registration by address is not the sole determinant where the aircraft is based. For example, the single Hull registrant bases his aircraft at Sioux Center. A number of persons, such as the aircraft registrant in Maurice, do not base their aircraft at a specific airport site. Consideration must also be given to business aircraft, where in the case of K-Products in Orange City, a decision to dispose of their four aircraft would alter the percent figures considerably. With the small base upon which the estimates are made, any minor change of one or two aircraft will be a factor.

FIGURE 8

REGIONAL REGISTERED AIRCRAFT TRENDS

1976-1997

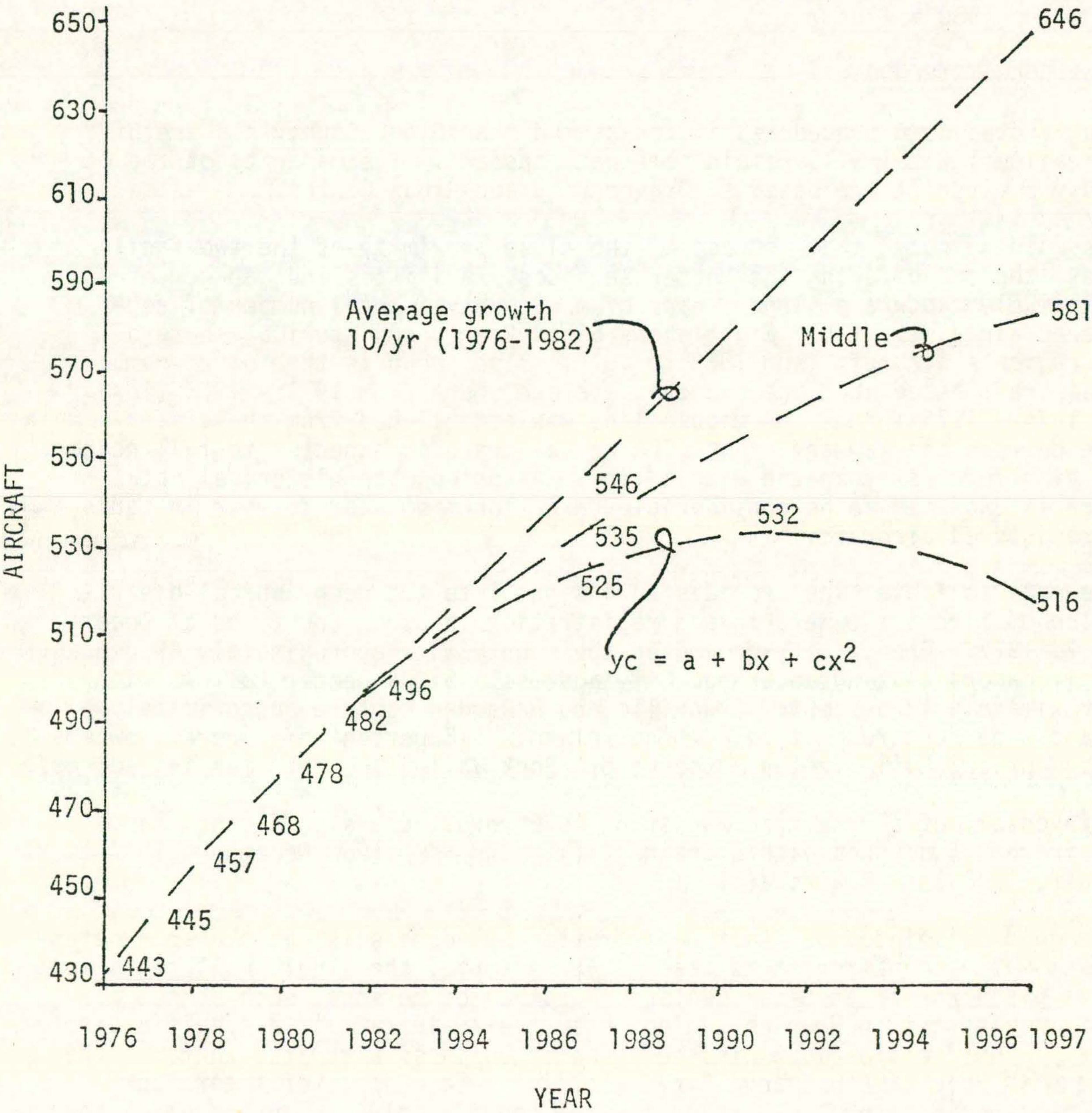


Table 8:

SIOUX COUNTY'S HISTORIC & FUTURE SHARE OF THE
REGION'S REGISTERED AIRCRAFT

Year	Region	Sioux County Numerical		Sioux County Percent
1965	226	3		1.33
1966	266	7		2.63
1967	284	6		2.11
1968	297	9		3.03
1969	309	6		1.94
1970	329	3		0.91
1971	350	5		1.43
1972	406	11		2.71
1973	374	15		4.01
1974	395	28		7.09
1975	424	24		5.66
1976	443	N/A		----
1977	445	39		8.76
		Low[1]	Medium[2]	High[3]
1978	457	23	31	40
1979	468	23	32	41
1980	478	24	33	42
1981	488	24	34	43
1982	496	25	34	43
1987	535	26	37	47
1997	581	29	40	51

1. Low: 4.94% (August 1971-1977)
2. Medium: Middle Point of High and Low Estimate
3. High 8.76% (1977 Estimate)

Table 9:

AIRCRAFT INVENTORY, SIOUX COUNTY, BY ADDRESS OF REGISTRANT
December 7, 1977

	Registrant's Address	Aircraft Name & Model	Serial Number	Registrant's Name
1.	Orange City	MU2K	3135A	K-Products
2.	Orange City	PA32-260	32-7300027	Dirks, J.
3.	Orange City	Cessna 242	17255118	DeJong, R.
4.	Orange City	Mooney M20J	24-0354	K-Products
5.	Orange City	Mooney	24-0049	Degroot
6.	Orange City	Cessna T210	21061041	K-Products
7.	Orange City	Beech	TC-1978	Vogel Paint & Wax
8.	Orange City	Beech B55	TC-1702	Vogel Paint & Wax
9.	Orange City	Cessna 172	17261670	Tupil City of Flyers Club
10.	Orange City	Mooney	680156	DeJong, R.
11.	Orange City	Beech	D-1566	Van Hofwegen, C.
12.	Orange City	Cessna 172	17293746	Wichers, R.
13.	Orange City	PA 31-350	31-7405189	K-Products
14.	Orange City	Cessna 172	17248416	Middendrop, J.
15.	Orange City	PA 22-160	22-6105	Denger Aircraft
16.	Orange City	PA 28-180	28-3682	Denger Aircraft
17.	Orange City	Cessna 120	13275	Schapp, E.
18.	Orange City	PA 28-140	28-21941	DAMAR Impl.
19.	Orange City	Cessna 140	9824	Ford, D.
1.	Sioux Center	PA 28-08	287505052	Brower, R.
2.	Sioux Center	PA 28R	28R-733505291	Brower, R.
3.	Sioux Center	PA 36-260	36-766065	Brower, R.
4.	Sioux Center	PA25	25-521	Sioux Imprv.
5.	Sioux Center	PA 23-250	27-3925	Brower, R.
6.	Sioux Center	Cessna 175	56376	Dibbet, H.
7.	Sioux Center	Beech V35	D-8019	Hagen
1.	Maurice	Cessna 170	26325	Wichers, A.
1.	Hull	PA 28-180	28-1910	DeKoster, L.
1.	Ireton	Cessna P260C	22-6105	Groom, R.
1.	Hospers	Stinson 108	108-4688	Porter, G.
2.	Hospers	Cessna 172	17254876	Ossterhuis, U.
1.	Rock Valley	Cessna 120	12110	Santema, R.
1.	Granville	JAL3	Home built	List, J.
2.	Granville	PA22	22-2855	List, J.
3.	Granville	Taylorcraft	F-102	List, J.
4.	Granville	JAC4	---	List, J.
1.	Hawarden	PA22	22-856	Hawarden Flying Club
2.	Hawarden	Cessna	28099	Heldt, G.
3.	Hawarden	B23	M-1145	Osterkamp, E.

Source: IDOT.
12/07/77

(An actual count on September 6, 1978 revealed that 10 of the 19 aircraft with an Orange City registration had been sold or relocated to other airport facilities. In the same period, 3 aircraft were added: Callair Sprayer, Mooney M20 and Piper PA-28-180.)

At present there are four airport sites in Sioux County: Sioux Center, Orange City, Hawarden, and Rock Valley. Sheldon's close proximity must also be considered. From a geographical distribution, airport areas of influence for the three major airports are depicted in the figure below.

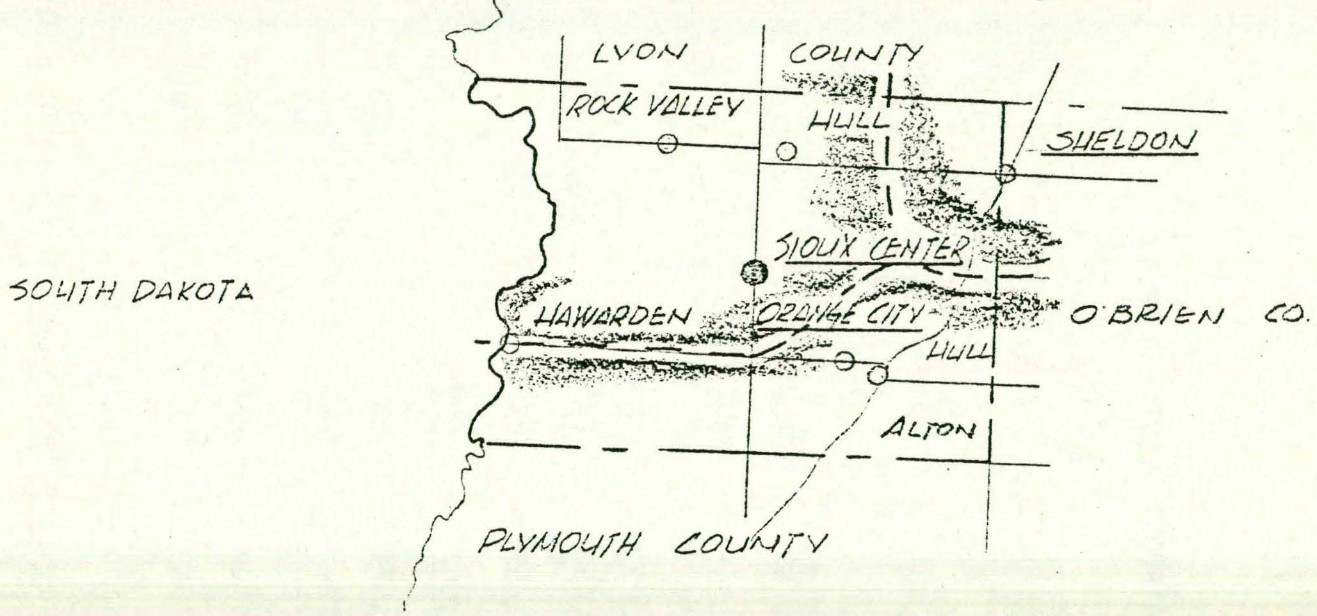


Figure 9: Airport Areas of Influence

The airport areas of influence are based upon the assumption that all factors are equal: good management and services, comparable hangar facilities and rates, similar level of airport development, etc. Rock Valley and Hawarden will also capture a share of the registered aircraft. For purposes here, the assumption is made that aircraft registrants and based aircraft will approximate the population within the airports area of influence. Reference may be made to Table Ten concerning county population distribution.

Table 10: POPULATION DISTRIBUTION WITHIN AIRPORT SERVICE AREA

SIOUX CENTER	1975	2000	ORANGE CITY	1975	2000	SHELDON	1975	2000
Rock Valley	2,495	3,393	Granville	384	394	Boyden	728	898
Hull	1,647	2,013	Alton	1,005	993	Matlock	83	72
Perkins	---	---	Chatsworth	93	102			
Carmet	---	---	Maurice	281	325			
Hawarden*	1,456	1,641	Ireton	619	729			
Sioux Center	4,192	6,735	Hawarden*	1,456	1,641			
			Hospers	669	739			
			Orange City	4,067	5,609			
Community Pop.	9,790	13,782		8,574	10,532		811	970
Unicorporated Population	4,012	3,515		4,012	3,515		2,007	1,758
Total Pop.**	13,802	17,297		12,586	14,047		2,818	2,728
Percent of Total	47%	51%		43%	41%		10%	8%

* 1/2 of 1976 population estimate (2,912); 2000 population estimate (3,282)
** Total County population: 1975, 29,206; 2000, 34,075
*** Population data was obtained from the NWIRCOG report, Interim Regional Land Use Plan, 1977, p. X-3

ORANGE CITY MUNICIPAL AIRPORT TRENDS

Reference to Table Eleven provides a future estimate of the numbers general aviation aircraft that may be based at the Sioux Center Municipal Airport. The future estimate is based upon the assumption that:

- Sioux Center, Orange City and Sheldon will capture nearly all aircraft registered in the county.
- Future distribution will approximate population assuming the three airports are comparable.
- A small number of aircraft will continue to be based at the Hawarden and Rock Valley as well as on private strips in unincorporated areas of the county.
- Allocation:
  Orange City, Sioux Center, Sheldon
  1978 - 80% of County's aircraft based at Orange City, Sioux Center and Sheldon
  1982 - 85% of County's aircraft based at Orange City, Sioux Center and Sheldon
  1987 - 90% of County's aircraft based at Orange City, Sioux Center and Sheldon

  (Hawarden, Rock Valley, Private Strips are expected to capture only 10% of the registered aircraft by 1987)

  Orange City
  1978 - 43% of 80%
  1982 - 42% of 85%
  1987 - 41% of 90%
  (Allocation based upon population distribution)

Based upon the above methodology, future based aircraft estimates were made. Reference may be made to the following table.

Table 11: Based General Aviation Aircraft, Orange City, 1978 - 1997

	LOW		MIDDLE		HIGH	
YEAR	COUNTY	ORANGE CITY	COUNTY	ORANGE CITY	COUNTY	ORANGE CITY
1978	23	8	31	11	40	14
1979	23	8	32	11	41	14
1980	24	8	33	11	42	14
1981	24	8	34	12	43	15
1982	25	9	34	12	43	15
1987	26	9	37	13	47	17
1997	29	11	40	15	51	19

The number of based aircraft is expected to follow the middle to high trend line. At the present time, the actual number of aircraft based at the facility is 12. The 1978 SASP projected the following numbers of aircraft:

YEAR	IDOT	O&C
1978	12	11-14
1982	14	12-15
1987	16	13-17
1997	19	15-19

BASED AIRCRAFT MIX

The largest aircraft based at the facility is an MU-2K. The aircraft has a maximum take-off weight of 10,800 pounds and a maximum landing weight of 10,260 pounds. The remaining based aircraft all have a gross weight under 6,000 pounds.

Table 12: Based Aircraft, Orange City, 1978

GROSS WEIGHT OF AIRCRAFT	MAXIMUM GROSS WEIGHT	NO. OF ENGINE
MU-2K	10,800 Lbs.	2
Mooney M204	2,525 Lbs.	1
Beech B55	5,100 Lbs.	2
Piper Lance	--	1
Cessna 172	2,300 Lbs.	1
PA-28-140	2,400 Lbs.	1
Cessna 120	1,450 Lbs.	1
PA-28-140	2,400 Lbs.	1
Mooney M20	2,525 Lbs.	1
PA-28-140	2,400 Lbs.	1
Callair	--	1

The Airport Manager estimated that there was between 150 and 200 annual operations by the MU-2. In addition, there are a number of itinerant operations by aircraft with a gross weight in excess of 6,000 pounds. Operations by such aircraft were estimated at between 100 and 150.

Reference may be made to the following table regarding represented aircraft with a gross weight in excess of 6,000 pounds.

Table 13: Representative Aircraft, Gross Weight (6,000 to 12,500 Lbs.)

AIRCRAFT NAME	GROSS WEIGHT
Piper Navajo,	6,200 Lbs.
Aero Commander	6,500 Lbs.
Cessna 402	6,300 Lbs.
Beech Duke	6,775 Lbs.
Beech King Air A-90	9,650 Lbs.
MU-2L	11,625 Lbs.
Cessna Citation	11,500 Lbs.
Queen Air B80	8,800 Lbs.
Commander 685	9,000 Lbs.

C. AVIATION OPERATIONS AND OPERATIONS MIX

ANNUAL ITINERANT AND LOCAL OPERATIONS

An aircraft operation is defined as the airborne movement of aircraft in controlled and non-controlled airport terminal areas and about given en-route fixes or at other points where counts can be made. Each movement counts as one operation. A "touch and go," for example, counts as two operations.

Total annual aircraft operations are further broken down by local and itinerant. A local operation is defined as one by an aircraft that:

1. Operates within the local traffic pattern or within sight of the control tower;
2. is known to be departing for or arriving from local practice areas; or
3. executes simulated instrument approaches of low passes at the airport.

An itinerant aircraft operation is one that operates outside the local traffic pattern. A typical example of an itinerant operation is an air taxi operation. Aviation operations most often are discussed in terms of:

- Total Annual Aircraft Opeartion
  Total Annual Local
  Total Annual Itinerant
- Peak Day and Peak Hour Operations

Aircraft Operations are a function of the following:

- Based Aircraft
- Airmen
- Airport Facilities
- Aircraft Maintenance Services
- Airport Management
- Socioeconomic Characteristics of the Airport Service Area

Without a daily log of operational activity, an estimate of total annual itinerant and local operations is most often derived from local sources or from a random survey. The 1976 SASP found that community population, based aircraft and registered airmen in the county were variables which had a high degree of correlation with operations. The model developed in the 1976 SASP was also used in the 1978 SASP.

Log (Annual Total Operations) = 2.614 + 0.541 Log (Based Aircraft x County Airmen)

The same variables were used to estimate itinerant operations.

Log (Annual Itinerant Operations) = 1.865 + 0.605 Log (Based Aircraft x County Airmen)

Local operations were calculated as the difference between total and itinerant operations. Reference may be made to the table below.

Table 14: 1978 SASP, Aircraft Operations, Orange City

YEAR	TOTAL	ITINERANT	LOCAL
1977	14,300	5,300	9,000
1982	16,700	6,400	10,300
1987	18,500	7,300	11,200
1997	21,500	8,700	12,800

Source: 1978 SASP, P. 4-A 3

Assuming that the ratio of operations to based aircraft remained constant, the following numbers of total annual aircraft operations were developed and summarized in Table Fifteen.

Table 15: Annual Aircraft Operations, 1978 - 1997

YEAR	LOW	MIDDLE	HIGH
1978	(8) 9,536	(11) 13,112	(14) 16,688
1982	(9) 10,737	(12) 14,316	(15) 17,895
1987	(9) 10,404	(13) 15,028	(17) 19,652
1997	(11) 12,447	(15) 16,974	(19) 21,500

The actual number of aircraft operations are expected to fall between the middle and high estimates. The same procedure was used to estimate annual itinerant operations.

Table 16: Annual Itinerant Operations, 1978 - 1997

YEAR	LOW	MIDDLE	HIGH
1978	(8) 3,533	(11) 4,858	(14) 6,183
1982	(9) 4,114	(12) 5,486	(15) 6,857
1987	(9) 4,106	(13) 5,931	(17) 7,784
1997	(11) 5,037	(15) 6,868	(19) 8,700

As with total annual operations, annual itinerant operations are expected to fall between the middle and high estimate. Local operations, presented in the following table, represent the difference between total annual and annual itinerant operations.

Table 17: Annual Local Operations, 1978 - 1997

YEAR	LOW	MIDDLE	HIGH
1978	6,003	8,254	10,505
1982	6,623	8,830	11,038
1987	6,298	9,097	11,868
1997	7,410	10,106	12,800

As noted in table Sixteen and Seventeen, the number of local operations represent a decreasing share of the total annual operations over the twenty year period. Total annual, itinerant and local operations are summarized in Figure Ten.

PEAK HOUR AND PEAK DAY OPERATIONS

Peak day and peak hour estimates for Orange City were obtained from field observations by the Iowa Department of Transportation in 1975. The results of the survey were as follows:

Peak Hour Operations - 28 Peak Hour Annual - .00233
Peak Day Operations -- 60 Peak Day Annual -- .00500
Total Annual Operations - 12,000
Source: 1978 SASP, P. 41

Estimated peak hour and peak day activity for Orange City is summarized in Table Eighteen.

Table 18: Peak Day and Peak Hour Aircraft Operations, 1978 - 1997.

PEAK HOUR

Year	Low	Middle	High
1978	22	31	39
1982	25	33	42
1987	24	35	46
1997	29	40	50

PEAK DAY

Year	Low	Middle	High
1978	47	66	83
1982	54	72	89
1987	52	75	98
1997	62	85	107

D. AIRMEN, AIR PASSENGERS AND AIR FREIGHT

AIRMEN

The number of registered airmen in Sioux County is expected to increase throughout the twenty year planning period. The distribution of these airmen within the county is expected to approximate the distribution of county population. Reference may be made to the table below regarding the 1978 SASP projected number of airmen.

Table 19: Registered Airmen, 1982 - 1997 (By County)

YEAR	SIOUX	PLYMOUTH	LYON	WOODBURY	O'BRIEN
1982	116	74	35	503	100
1987	125	78	37	538	106
1997	142	87	42	608	118

Source: 1978 SASP, P. 37

AIR PASSENGERS

The number of enplaned passengers were estimated at 1.5 times the number of itinerant aircraft operations. The 1.5 multiplier is based upon the 1976 SASP.

Table 20: Air Passengers, 1978 - 1997

YEAR	LOW	MIDDLE	HIGH
1982	6,171	8,229	10,286
1987	6,159	8,897	11,676
1997	7,556	10,302	13,050

AIR FREIGHT

The tonnage of air freight was estimated at eight pounds per enplaned passenger or one ton per 250 enplaned passengers. Thus, in 1997, some 15 to 26 tons of freight could be expected.

AIRCRAFT OPERATIONS MIX

The number of aircraft operations by aircraft class are expected to remain stable over the twenty year planning period. Annual operations by Class C aircraft, heavy twins and small executive jets, are not expected to exceed 500 throughout the twenty year planning period. A majority of aircraft operations will be by single engine and light twin aircraft.

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E. SUMMARY

Based upon the forecast of aviation demand, the Orange City Municipal Airport should be designed around the concept of a Basic Utility, Stage II airport. This type of airport accommodates about 95 percent of propeller aircraft under 12,500 pounds.

To justify the next higher category airport, there should be a minimum of 500 itinerant operations by aircraft having a gross weight of 6,000 pounds or greater.

Airport Type

- Utility Airports
  - Basic Utility - Stage I
  - Basic Utility - Stage II (Orange City)
  - General Utility
- Transport Airports
  - Basic
  - General
- Air Carrier Airports

While the airport has a number of operations by Class C aircraft, it would appear that the Basic Utility, Stage II airport will meet the community's needs over the twenty year planning period. The 1978 SASP also identified the basic utility, stage II airport as satisfying future levels of anticipated aviation demand.

SECTION III

FACILITY REQUIREMENTS

A. INTRODUCTION

The identification of facility requirements is based upon the forecast of aviation activity, existing facilities and design standards. The Iowa Department of Transportation has taken exception to conformance with FAA standards in some cases. The most salient of these, with respect to Orange City is the crosswind runway.

> "FAA standards suggest that crosswind runways at utility airports should be paved whereas the premise here is that these will remain unpaved." (1978 SASP, P. 54)

Such deviation by the IDOT is based upon the assessment of future funding levels for airport improvements in the State of Iowa. Whereas the FAA standards represent the ultimate level of development, the IDOT maintains that any such deviation from FAA standards is an appropriate subject for detailed review within the planning process.

The objective herein is to identify those facility improvements which will enhance the operational capability and safety of the airport at minimal cost.

B. RUNWAYS AND TAXIWAYS

RUNWAY ORIENTATION

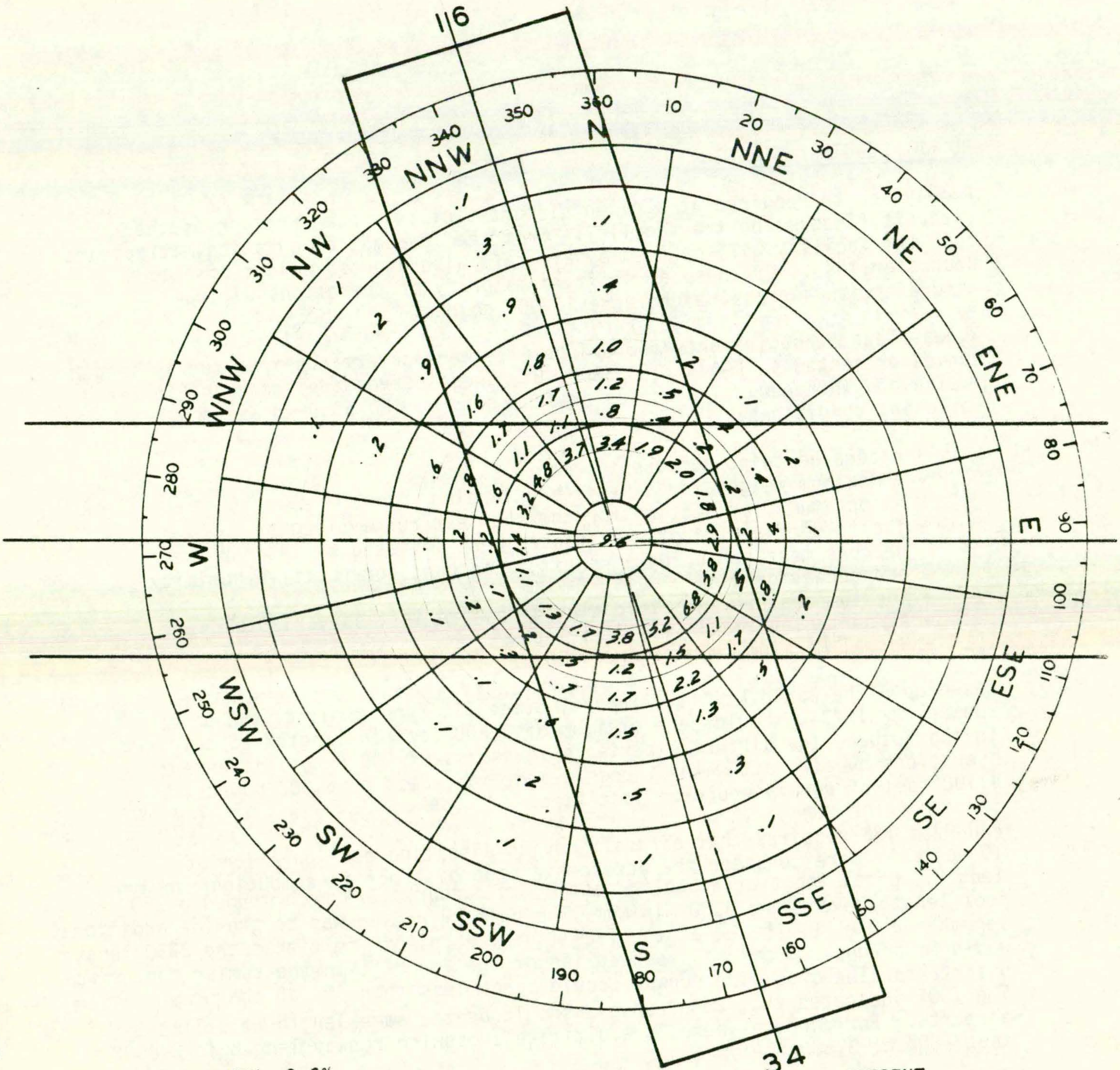
The orientation of Runway 16/34 is fixed at North 15° 23' West (true). The best or ultimate orientation of a runway is one which provides for ultimate wind coverage. The 1978 SASP reports that winds are such in Iowa that no one single runway will provide adequate coverage. The objective is to orient the runway or runways so that 95 percent of the winds are included within a 12 m.p.h. crosswind component value. Since a wind data base is not available at Orange City, wind data from Sioux City was used.

Runway 16/34 provides a 91.4 percent coverage. Reference may be made to Figure Eleven which depicts percent of wind speed by direction, runway orientation, and wind coverage. The crosswind runway should be oriented in a direction which would provide the best supplemental wind coverage.

The orientation of the crosswind runway is influenced by factors other than wind. Some of these factors to be considered are:

1. Maintenance of a 60 degree separation between runway facilities.
2. Obstructions.
3. Topography.
4. Land Use.
5. Other Airport Facilities.

Alternative crosswind runway alternatives are considered in the following Section. The objective here is to identify whether or not a crosswind runway is needed.



Calms 0-4 MPH, 9.6%

PRESENT
WIND ROSE DATA

Wind Coverage (12 MPH)
Primary Runway 18/36 91.4%

SOURCE OF DATA:
Sioux City, Iowa

PERIOD:
1951-1960

FIGURE ELEVEN

RUNWAY LENGTH AND WIDTH

Runway length required at a given airport facility is a function of the aircraft fleet using the facility. From the forecast of aviation, it appears that the facility will be used by aircraft with a gross weight of 12,500 pounds or less. Of these aircraft, a majority of operations will be by aircraft with a gross weight under 6,000 pounds.

Runway length requirements for Orange City were determined from runway length curves presented in FAA AC 150/5300-4B. These curves are shown in Figures Twelve and Thirteen. The curves presented in AC 150/5300-4B assume the following conditions:

- A zero headwind component
- A maximum weight for takeoff and landing
- An optimum flap setting for the shortest runway length
- The takeoff and landing distances were incresed by 10% for the group's most demanding aircraft to account for relative humidity and runway gradient.
- The temperature and field elevation were left as variables
- Airport elevation: 1,414 Ft. ASL
- Normal Maximum temperature = 86° F.

Based upon the Basic Utility Airport, Stage II, type airport, the primary runway, RW 16/34, should be a minimum of 3,500 feet in length. Should, in the future, the airport experience in excess of 500 annual itinerant operations by aircraft with a gross weight in excess of 6,000 pounds, 4,100 feet of runway would be justified.

FAR Part 135 requires that aircraft having a seating configuration of 10 seats or more consider the accelerate stop distance in computing runway length. Local input at a public meeting in January 1979 recommended a 250 foot length beyond the 3500 minimum. The primary reason was to provide additional length for the MU-2 based at the facility. The "pilot" felt that the 3750 length would be adequate provided a scheduling of the aircraft in the summer months was undertaken. The crosswind runway should be no less than 80% of the primary runway lengt The IDOT indicates that both runways should be the same length at utility airports. For purposes here, the ultimate crosswind runway length is 2,800 feet (80% of 3,500 feet).

The primary runway has a single wheel gross weight strength of 28,000 pounds. The crosswind runway, when construction, should also be of P.C.C. construction.

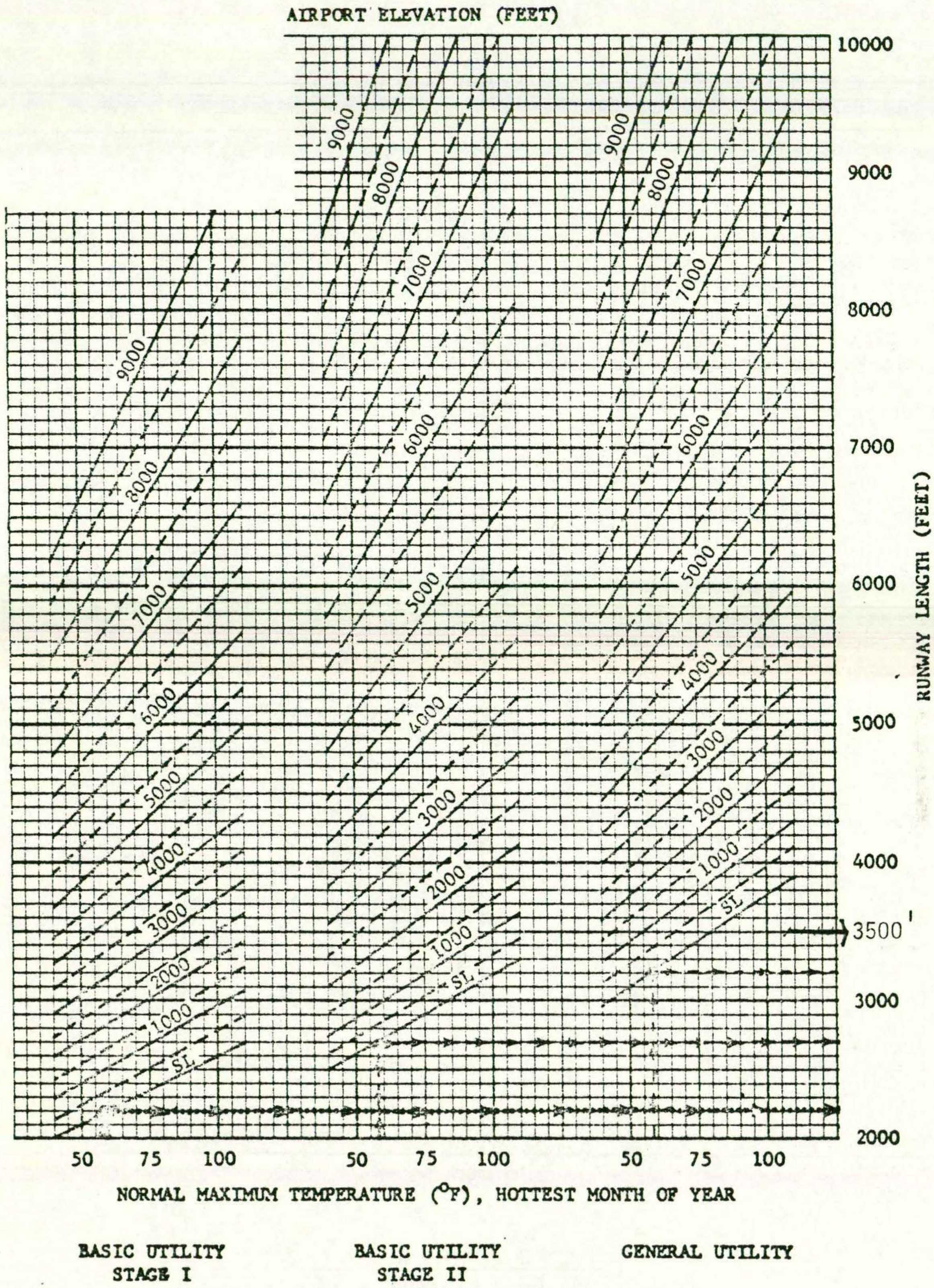
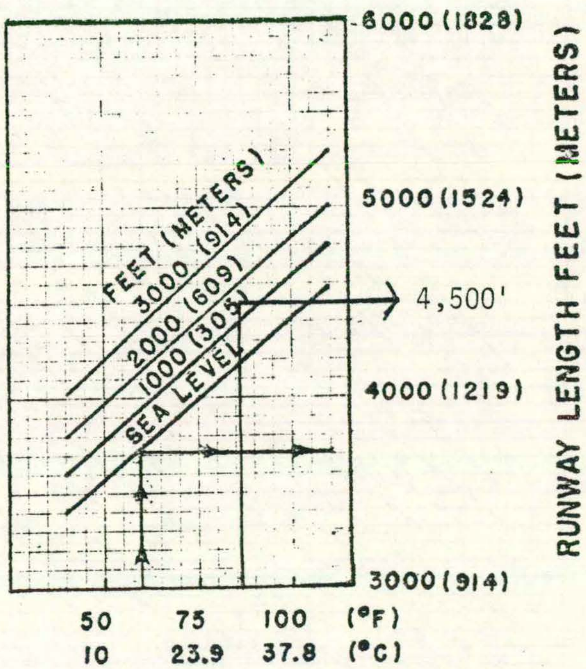


FIGURE TWELVE

RUNWAY LENGTH CURVES

REPRESENTATIVE AIRPLANES	RUNWAY LENGTH CURVES
Beech B80 Queen Air Beech E90 King Air Beech B99 Airliner Beech A100 King Air Britten-Norman Mark III-I Trilander Mitsubishi MU-2L Swearigen Merlin III-A Swearigen Merlin IV-A Swearigen Metro II	EXAMPLE: TEMPERATURE 59°F (15°C) AIRPORT ELEVATION SEA LEVEL GEN. UTILITY 3700' (1 128 m)  MEAN DAILY MAXIMUM TEMPERATURE OF THE HOTTEST MONTH OF THE YEAR.

RUNWAY LENGTH TO ACCOMMODATE AIRPLANES HAVING A SEATING CONFIGURATION OF 10 PASSENGER SEATS OR MORE

FIGURE THIRTEEN

SOURCE;
AC 150/5300-4B

TAXIWAY

The IDOT finds justification for a partial parallel taxiway system when total annual operations are between 30,000 and 50,000. A full parallel system is justified when operations are in excess of 50,000 annually.

Based upon the forecast of aviation demand, a partial or full taxiway system would not be justified. Stub taxiways, at present, connect the runway to the apron and provide access to the hangar facilities. The length of this taxiway is 245 feet. The width is 20 feet. It is recommended that the taxiway width be increased to 30 feet (20' x 245'). A partial parallel taxiway may be used to provide access from the terminal area to the crosswind runway. Existing and future taxiways providing access to hangar facilities neet not be more than 20 feet in with.

HOLDING APRON

Where a partial or full parallel taxiway is not recommended, an aircraft turnaround is recommended for each runway end. A circular turnaround was constructed on Runway End 16.

The 1978 runway extension project provided for an 80 foot by 80 foot rectangular turnaround on Runway End 34.

Construction of Turnarounds on the crosswind runway are considered a low priority item.

Both runways should have a pavement surface width of 60 feet. Because of financial constraints, it is expected that the crosswind runway will initially be turf.

Primary Runway

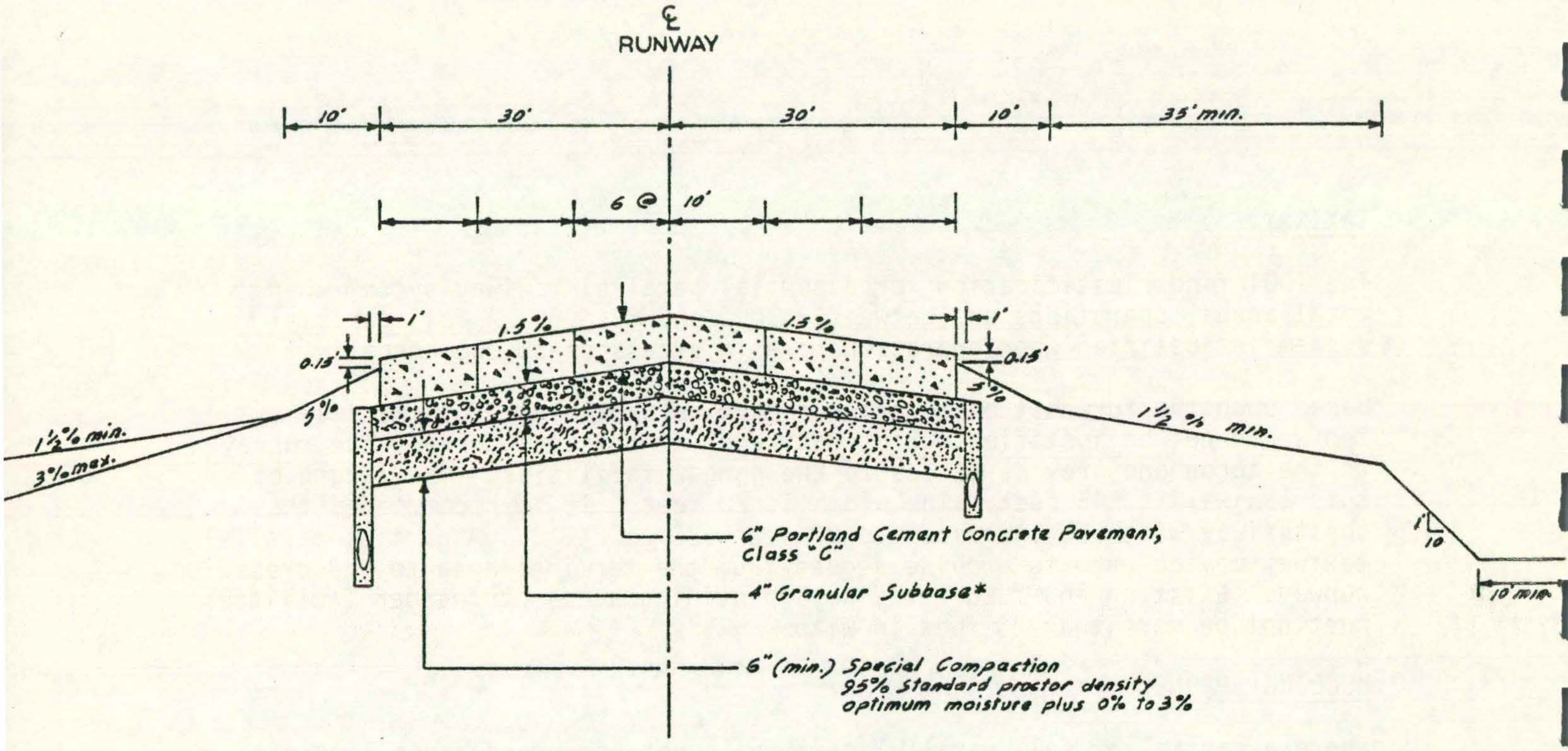
2900' x 60' ------- Existing
850'x 60 ' ------- Extension 1978 - 1979

Crosswind Runway

To be constructed

RUNWAY PAVEMENT

Pavement design on the primary runway existing prior to the 1978 extension project consisted of 6" P.C.C. (P-501) over 6" subbase course (P-154). The extension project consisted of 6" P.C.C. over a 4" granular subbase. the typical pavement cross section for the 1978 extension is shown in Figure Fourteen.



SOURCE:

Otto & Culver, P.C. Construction Drawings

TYPICAL PAVEMENT CROSS SECTION

FIGURE 14

RUNWAY GRADE CHANGE AND VISIBILITY ZONE

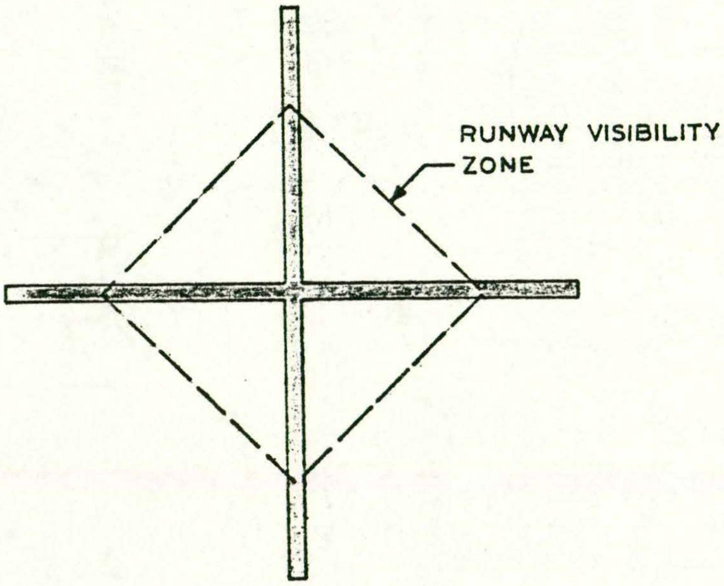
Runway grade changes should be such that there will be an unobstructed line of sight any point five feet above the runway centerline for the entire length of the runway. Maximum grade changes should not exceed two percent where vertical curves are required. The length of the vertical curve should not be less than 300 feet for each percent grade change. No vertical curves are required when the grade change is less than 0.4%.

Traverse grades on the runway itself should be at least one percent and no more than two percent. Within ten feet of the pavement edge, the grade should have a minimum slope of three percent and not to exceed five percent. Reference may be made to Figure Sixteen concerning a typical runway cross section.

The layout of the runways and other airport components must be such that a runway visibility zone can be provided. This zone is an area formed by imaginary lines connecting the visibility point of each runway. This requirement is of importance when assessing alternative runway alignments for the crosswind runway or expansion of the terminal area. The objective is to ensure that the runway grades, terrain, structures and other permanent objects do not obstruct a line-of-sight from any point five feet above one runway centerline to any point five feet above an intersecting runway centerline, both points being within the visibility zone.

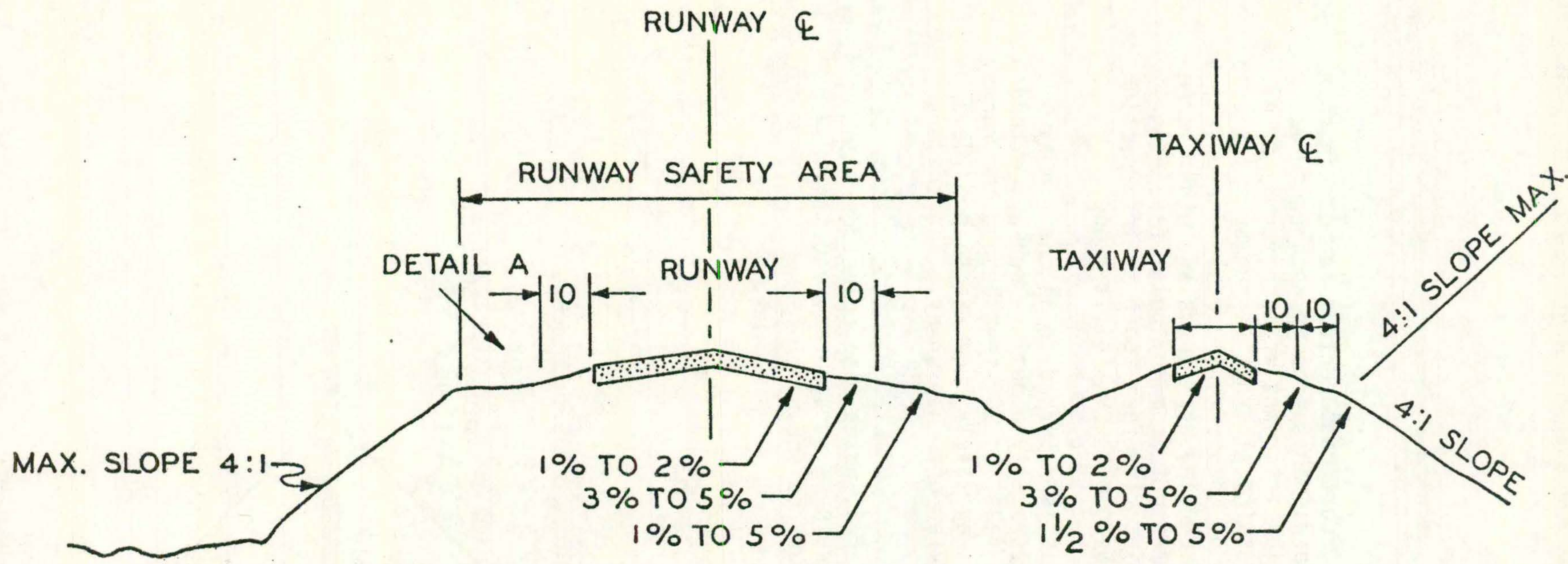
A graded area beyond the runway surface is referred to as the runway safety area. The area, located symmetrically about the runway, extends outward from the runway centerline 75 feet and 200 feet beyond the runway ends. The primary function of the runway safety area is to provide a degree of safety, should an aircraft veer off the runway. The traverse grade should not exceed five percent.

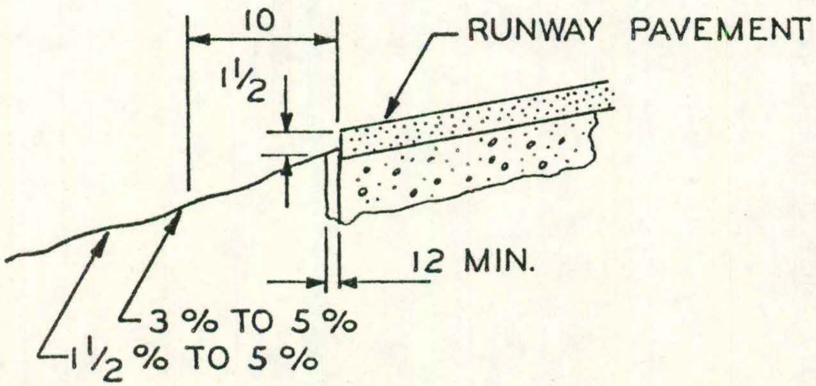
The minimum width of a runway safety area, which also coincides with the landing area, should be void of drainage structures, etc. that could cause damage to aircraft or injury to occupant.



RUNWAY VISIBILITY ZONE

FIGURE FIFTEEN





DETAIL A

TYPICAL CROSS SECTION

FIGURE SIXTEEN

LATERAL WIDTHS AND CLEARANCES

Following is criteria for separation of airport facilities:

	Minimum	Desireable
- Runway to taxiway centerline	200'	200'
- Runway centerline to building restriction line (BRL) and property line (non-taxiway side)	200'	250'
- Runway centerline to building restriction Line (taxiway side)	250'	300'
- Runway centerline to property line (taxiway side)	250'	300'
- Taxiway centerline to airplane tiedown area	75'	Design
- Taxiway centerline to fixed or movable obstacle	50'	Design
- Runway centerline to fixed or movable obstacle	125'	125'
- Runway centerline to tiedown area	225'	275'

Source: FAA AC 510/5300-4B

PAVEMENT MARKINGS

Non-precision instrument (N.P.I.) markings are found on Runway 16/34. A non-precision instrument runway is one to which a straight-in non-precision approach has been approved. N.P.I. markings consist of basic runway markings in addition to threshold markings.

- Centerline Markings

  The centerline markings consist of a broken line having 120 foot dashes and 80 foot blank spaces. The minimum width is one foot

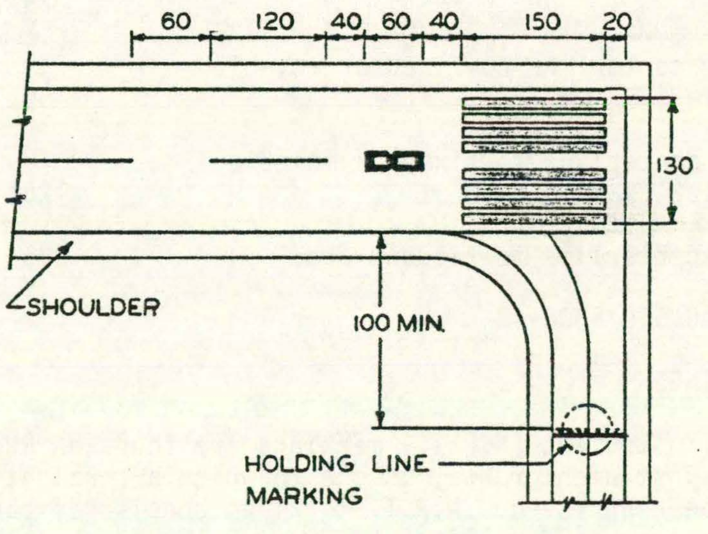
- Designation Markings

  Each runway end is marked with designated numbers representing the magnetic azimuth, measured clockwize from north and the runway centerline from the approach end and recorded to the nearest 10° with the last zero omitted.

- Threshold Markings

  Threshold markings consist of eight 150' x 12' stripes. Each stripe is separated by a minimum of three feet except in the center where the minimum distance is 16 feet.

Reference should be made to FAA AC 150/5340-1D concerning pavement marking requirements and the figure below.



NON PRECISION INSTRUMENT RUNWAY

FIGURE SEVENTEEN

C. LANDING AND NAVIGATIONAL AIDS

RUNWAY AND TAXIWAY LIGHTING

Medium intensity runway lights were installed on Runway 16/34 as part of the 1978 runway extension project. As such, no improvements are anticipated over the twenty year planning period. Taxiway lights were also installed on the circular turnaround and the stub taxiway. The present system is off until activited by radio or photo cell.

Runway lights are used to outline the edges of the runway during periods of darkness or low visibility. Each runway edge light fixture emits an aviation white light defining the lateral limits of the runway. The edge light fixture should be located no more than ten feet from the defined runway edge and spaced 200 feet on center. The runway light stake should be no less than 30 inches high due to snow, snow removal and grass cutting. The lights, located on both sides of the runway, should be directly across from each other and perpendicular to the runway centerline. Special requirements exist at runway intersections. Two groups of threshold lights, the second part of a runway light system are located symmetrically about the runway centerline. The threshold lights emit a 180° aviation red light inward and 180° green light outward. Threshold lights should be located no closer than two feet and no more than ten feet from the runway threshold.

Reference should be made to the as built construction drawings regarding design on Runway 16/34.

VISUAL APPROACH SLOPE INDICATOR (VASI)

The 1978 SASP recommends installation of a VASI-2 at both ends of a runway where annual operations are 10,000 or greater. A VASI-2 is recommended for installation on Runway 16/34. The 1978 runway extension project proposes installation of a single abbreviated VASI (SAVASI) on Runway 16/34. It is recommended that the SAVASI be relocated to the crosswing runway and a VASI-2 installed on the primary when the crosswind runway is hard surfaced.

The system should be located to the left side of the runway approach and 50 feet out from the pavement edge. The downwind bar should, ideally, be located 500 feet± from the threshold. The upwind bar should be located 700 feet± from the downwind bar. The VASI system enables the pilot to determine if his approach is high, on glide slope, or low, from the two color light beam emitted.

Pilots on an "on course" approach will see a red bar over white. On a high approach, both light beams are white, while on a low approach, both beams appear red.

The proposed location of the VASI-2 is shown on the construction drawings for the 1978 runway extension project (reference drawing number 0780011-8).

RUNWAY END IDENTIFIER LIGHTS, (REIL)

The primary function of runway end identifier lights is to assist the pilot with runway identification where the runway is difficult to distinguish because of other light sources. The close proximity of the runway to other light sources would justify installation of a REIL system on both ends of Runway 16/34.

The REIL's should be located in line with the threshold lights. When installed in conjunction with a VASI-2 system, the location should be 75 feet outward from the pavement edge.

SEGMENTED CIRCLE, WIND INDICATOR

A lighted wind cone was installed as part of the 1978 runway extension project. A segmented circle should also be constructed. Reference should be made to FAA AC 150/5340-5 concerning layout.

AIRPORT BEACON

A rotating beacon light is in operation at the airport.
The beacon should be located no closer than 750 feet to the runway centerline. The FAA recommends, for airports with a MIRL system, a 10 inch beacon conforming to FAA specification L-801

NON-DIRECTIONAL RADIO BEACON, N.D.B.

An NDB system is in operation at the airport. The NDB system will need to be relocated to allow expansion of the apron.

D. TERMINAL AREA

APRON

The existing apron is 100' x 200'. The surface composition is concrete. A taxiway, 245' x 20', provides access to the runway. A stub 50' taxiway from the apron provides access to the hangar structures.

Ideally, the apron should provide an improved surface for aircraft tiedowns and gueuing space. The assumption is made that all based aircraft will be in hangars. As such, the apron should provide an adequate area for itinerant aircraft. Reference may be made to the table below.

Table 21: Apron Tiedown Needs

Planning Period	Annual Operations*	Average Day	20% Increase for Busy Day	50% on Ground at Any One Time
I	5,486	15	17	9
II	5,931	16	18	9
III	6,868	19	21	11

*Middle Trend Line

A total of nine aircraft tiedown spaces should be adequate to meet aviation needs through 1987. From 1988 to 1997, an additional two tiedowns would be required. FAA AC 150/5300 - 4B recommends 360 square yards of surface for each itinerant tiedown.

1987: 9 x 360 S.Y. = 3,240 S.Y.
1997: 11 x 360 S.Y. = 3,960 S.Y.

In addition, queuing space is also required. Total apron area needs, as such, are based upon the numbers of tiedowns plus queuing area. The amount of queuing area is a function of the existing apron and terminal area layout.

HANGARS

The number of hangar stalls needed at the facility is based upon the number of aircraft as well as the unit cost. The existing hangar capacity is as follows:

Existing Hangar	Size	Aircraft Capacity
Conventional Hanger	72' x 60'	4 - Varies
Private, six-unit tee	33' x 187'	6
Private, K Products	57' x 133'	5
Total		15

Of the three hangars, two are privately owned. K-Products currently has two aircraft in their hangar and lease space for an additional two aircraft. The private six-unit tee hangar leases stall space to the private sector. The City owns the conventional hangar which has a capacity for four aircraft depending upon the aircraft size and stacking procedures. The City owned hangar serves as the FBO shop, and as such, is not intended for purposes of aircraft storage. In summary, there is aircraft storage space for eleven aircraft, in addition to those aircraft that could be stored in the conventional hangar.

Based upon the forecast of based aircraft, the present number of hangar stalls appears adequate through 1982. Beginning in Phase Two, 1983, some thought should be given to construction of an additional four to six units. It is recommended that such units, if then needed, be constructed by the private sector. For purposes of the terminal area plan, the location for a six-unit tee hangar will be shown.

TERMINAL BUILDING

The present terminal building should adequately serve the airport throughout the twenty-year planning period. The structure, 24' x 24', contains 576 square feet of floor area. Telephone and rest room facilities are provided within.

VEHICLE PARKING AND ACCESS ROAD

The airport supports a concrete parking lot which will satisfy vehicle parking needs for the twenty-year period. No increase in the capacity of the parking or access facilities are anticipated.

GROUND STORAGE DIMENSIONS OF SELECTED
GENERAL AVIATION AIRCRAFT
(in feet and inches)

Single Engine, High Wing Tailwheel

MAKE	MODEL	(WINGSPAN)	(LENGTH)	(HEIGHT)
Bellanca	7	35-5	22-8	6-8
Cessna	120/140	32-10	21-0	6-3
	170	36-0	25-0	6-7
	180/185	36-2	25-9	7-9
	190	36-2	27-1	7-2
	195	27-4	27-1	7-2
Piper	Pa-12/14/15	35-6	22-6	6-10
	PA-18	35-3	22-5	6-8
	PA-20	29-4	20-5	6-3
Taylorcraft	BC-12	36-0	22-0	6-8

Single Engine, Low Wing Tricycle Gear

MAKE	MODEL	(WINGSPAN)	(LENGTH)	(HEIGHT)
Aerostar	415	30-0	20-7	6-3
	M-20	35-0	23-7	8-4
	M-22	35-0	27-0	9-10
Beechcraft	23	32-9	25-0	8-3
	V-35B	33-6	26-5	6-7
	F-33	32-10	25-6	8-3
Bellanca	260/300	24-2	23-6	7-4
Grumman	AA-1	24-6	19-3	6-10
Piper	PA-24	36-0	24-9	7-5
	PA-28-180	30-0	23-6	7-4
	-200	30-0	24-2	8-0
	PA-32	32-10	27-9	7-11
Rockwell Int'l	122	35-0	27-2	10-1

Single Engine, High Wing Tricycle Gear

MAKE	MODEL	(WINGSPAN)	(LENGTH)	(HEIGHT)
Cessna	150	32-9	23-0	8-8
	172	35-10	26-11	8-10
	177	35-6	27-0	9-1
	182	35-10	28-1	8-11
	206	35-10	28-0	9-8
	207	35-10	21-9	9-7
	210	36-9	28-3	9-8
Piper	PA-22	29-4	20-4	6-3

Twin Engine, High Wing Tricycle Gear

MAKE	MODEL	(WINGSPAN)	(LENGTH)	(HEIGHT)
Cessna	366/377	38-2	29-10	9-4
DeHaviland	DHC-6	65-0	65-0	18-7
Mitsubishi	MU-2	39-2	39-6	13-8
Rockwell Int'l.	500	49-6	35-1	14-6
	560/680/Shrike	49-1	36-7	14-6
Short Bros.	Skyvan	40-1	15-1	14-10

Twin Engine, Low Wing Tricycle Gear

MAKE	MODEL	(WINGSPAN)	(LENGTH)	(HEIGHT)
Aerostar	600/601	34-3	34-10	12-2
Beechcraft	B-55	37-10	27-0	9-7
	E-55	27-10	29-0	9-2
	A-60	39-3	33-10	12-4
	A-65	45-11	35-6	14-3
	B-80	50-3	35-6	14-3

Twin Engine, Low Wing Tricycle Gear

Cont.

MAKE	MODEL	(WINGSPAN)	(LENGTH)	(HEIGHT)
Beechcraft	A-90	50-3	36-6	14-8
	A-100	45-11	39-11	15-4
	99A	45-11	44-7	14-4
Cessna	310	37-6	29-7	9-11
	401/402/421	39-10	33-9	11-10
Grumman	Gulfstream I	78-4	63-9	22-10
Piper	PA-23-160	37-2	27-5	9-6
	-250	37-0	27-7	10-4
	PA-30	36-0	25-2	8-3
	PA-31	40-8	32-8	13-0
Swearingen	Merlin IIB	45-11	40-1	14-4
	Merlin III	46-3	42-2	16-8

Turbo Jet, Turbo Fan Aircraft

MAKE	MODEL	(WINGSPAN)	(LENGTH)	(HEIGHT)
Dassault	Fan Jet Falcon	53-6	56-3	17-5
Cessna	Citation	43-9	44-1	14-4
Learjet	24	35-7	43-3	12-7
	25	35-7	47-7	12-7
	35/36	38-1	48-8	12-4
Grumman	G-II	68-10	79-11	24-6
Hawker Siddeley	HS-125	47-0	47-5	16-6
Lockheed	Jetstar	53-8	60-5	20-6
Rockwell Int'l.	40	44-5	43-9	16-0
	60	44-5	48-4	16-0
	70/75A	44-6	47-2	17-3

Source: FAA AC150/5325-5B
AC150/5325-5B, Chg. 1
Airport Services Management, January, 1976

E. FAR Part 77

OBSTRUCTION STANDARDS

Part 77 of Volume XI, Federal Aviation Regulations, sets forth a number of standards to be used in identifying obstructions to air navigation. These standards are of considerable importance. The discussion herein is primarily extracted from Part 77. These standards will be used as a guide in the preparation of a zoning ordinance and the airport layout plan.

STANDARDS FOR DETERMINING OBSTRUCTIONS

1. A stationary or mobile object is defined as an obstruction to air navigation if it is of a greater height than any one of the following:

   A. A height of 500 feet above the ground at the site.

   B. A height of 200 feet above the ground or airport elevation, whichever is higher, within 3 nautical miles of the airport reference point.

   C. The surface of a takeoff or landing area of an airport or any imaginary surface.

   D. Traverse ways on or near an airport to be used for the passage of mobile objects.

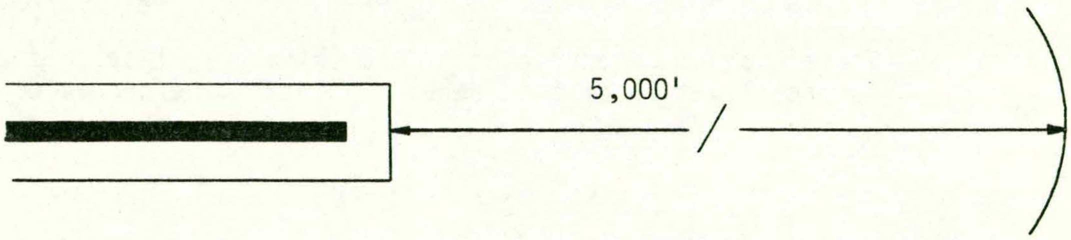
- Interstate Highway	17 Feet
- Public Roadway	15 Feet
- Private Road	10 Feet or height of the highest mobile object
- Railroad	23 Feet

IMAGINARY SURFACES

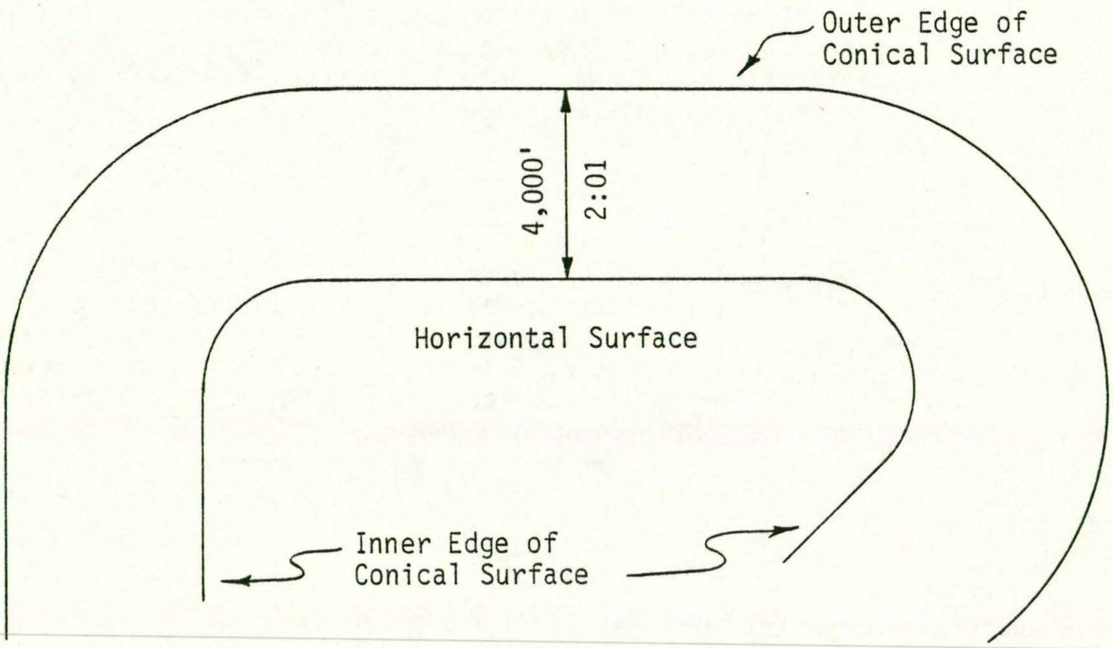
1. Imaginary surfaces establish areas where any object penetrating that surface would be considered an obstruction to air navigation. The imaginary surface establishes an imaginary line that separates ground activities from aircraft activities. In order to select the applicable imaginary surface, the type of approach to each runway must be considered.

A. Horizontal Surface: The horizontal surface is a plane 150 feet above the established airport elevation. It is constructed by swinging arcs of specific radii from the center of each end of the primary surface and by connecting the arcs by lines tangent to those arcs.

- Visual Radius of 5,000 feet
- NPI Radius of 10,000 feet. (Runway larger than Utility)
- NPI Radius of 5,000 feet. (Utility Runway)



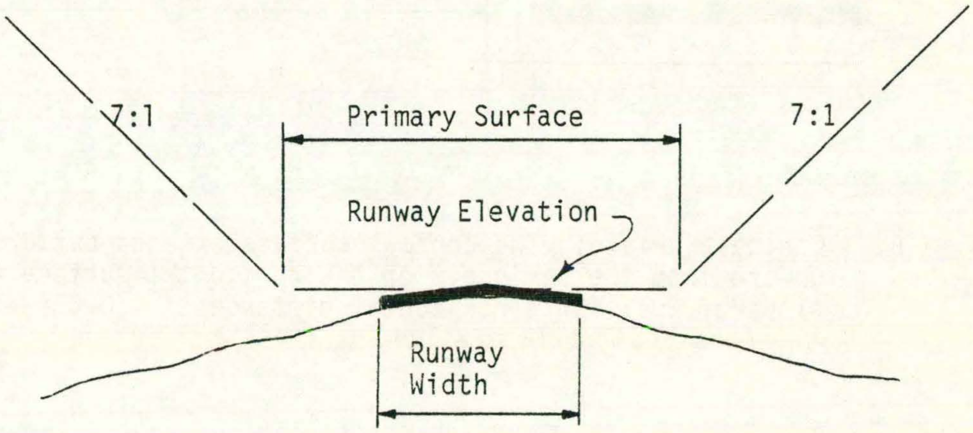
B. Conical Surface: The conical surface extends outward and upward from the periphery of the horizontal surface at a slope of 20:1 for a horizontal distance of 4,000 feet at the ends and 7:1 laterally.



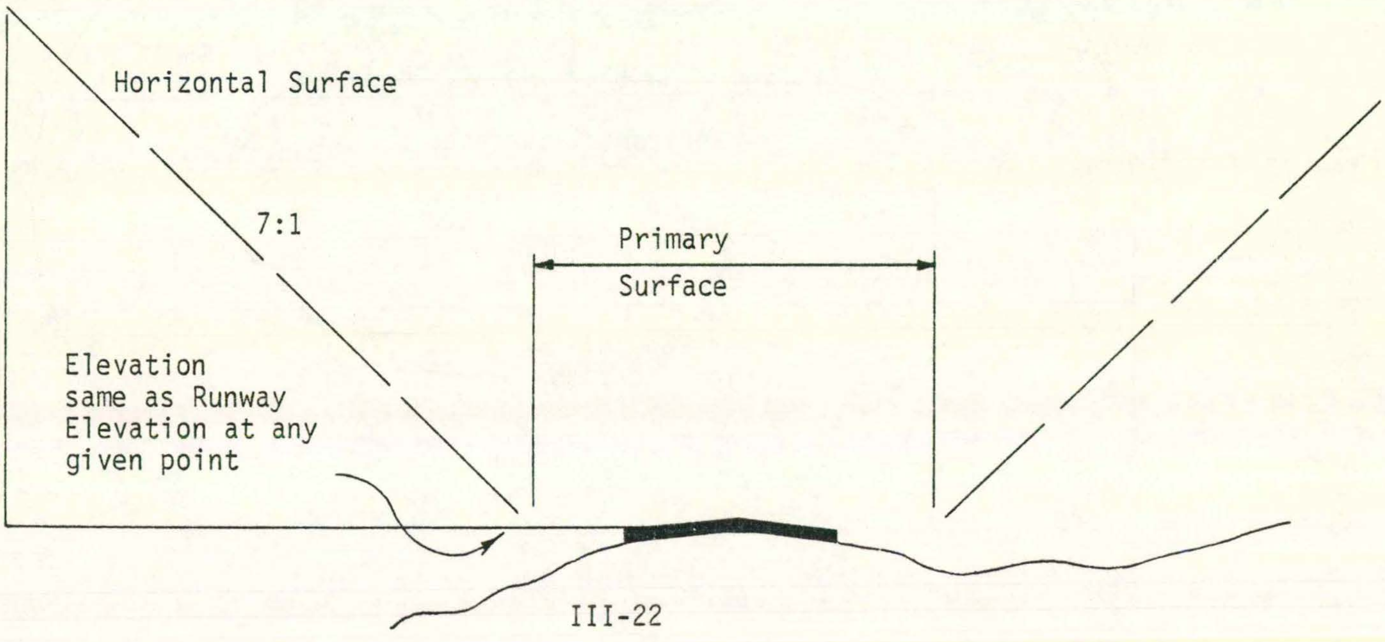
C. Primary Surface: The primary surface is longitudinally centered on the runway and extends 200 feet beyond the runway end in the case of a paved runway. The primary surface end coincides with the runway end in the case of a turf runway. The width of the primary surface varies with the approach.

	Width	End of Runway
Visual	250'	200'
NPI	500'	200'

The elevation of any point on the primary surface is the same as the elevation of the nearest point on the runway centerline.



D. Transitional Surface: The transitional surface extends upward at a slope of 7:1 from the edge of the primary surface and approach surfaces. They extend outward and upward from the runway centerline and runway centerline extended until they intersect with the horizontal surface.



X and Y vary in dimension and are determined by the distance required for an imaginary line at a 7:1 slope, to intersect with the primary surface.

E. Approach Surface: The approach surface is longitudinally centered on the extended runway centerline. The inner edge of the approach surface coincides with primary surface and expands uniformly outward to a width determined by the type of approach:

Visual:	250' x 5,000 x 1,250'	
NPI:	500' x 10,000 x 3,500'	(Runway larger than Utility w/visability minimum as low as 3/4 of a mile)
NPI:	500' x 5,000 x 2,000'	(Utility runways)

The approach slope also varies:

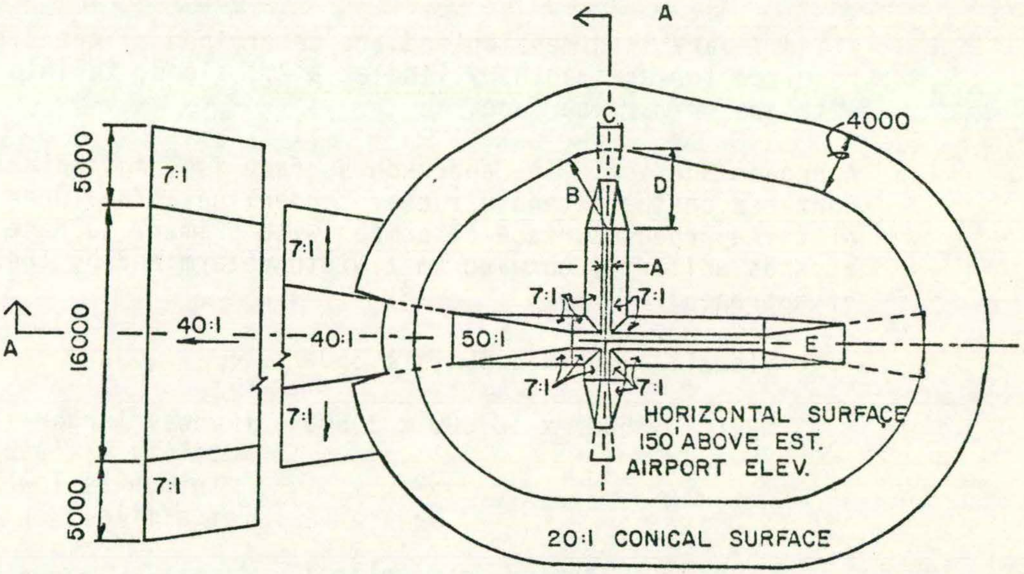
Visual: 20:1

NPI: 34:1 (Larger than Utility)

NPI: 20:1 (Utility Runways)

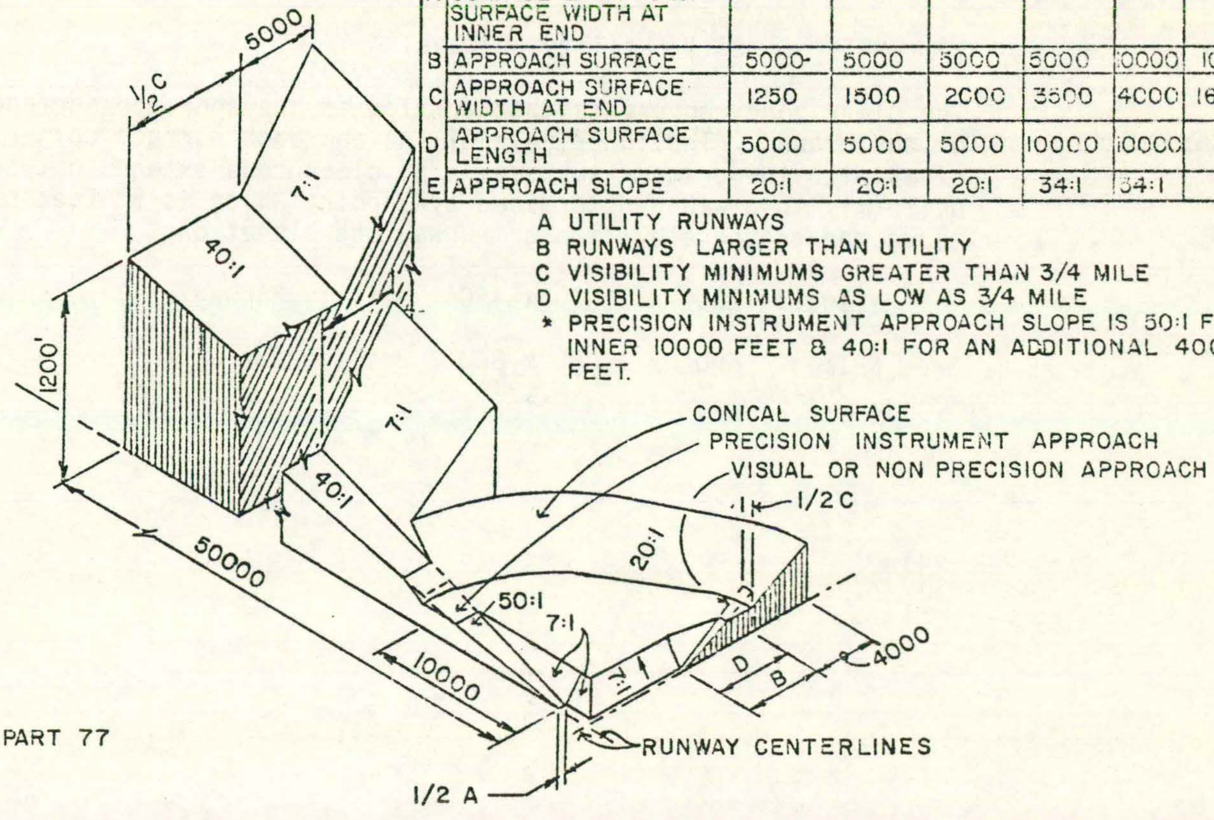
The clear zone represents that portion of the approach surface on the ground. The inner edge of the approach surface coincides with the primary surface. The clear zone extends outward uniformly to a width determined by a point which is 50 feet above the ground elevation or runway end elevation.

Visual:	250' x 1,000 x 450'	Utility Runway
NPI:	500' x 1,000 x 800'	Utility Runway



	ITEM	DIMENSIONAL STANDARDS (in feet)					
		VISUAL RUNWAY		NON-PRECISION INSTRUMENT RUNWAY			PRECISION INSTRUMENT RUNWAY
		A	B	A	B		
					C	D	
A	WIDTH OF PRIMARY SURFACE & APPROACH SURFACE WIDTH AT INNER END	250	500	500	500	1000	1000
B	APPROACH SURFACE	5000	5000	5000	5000	10000	10000
C	APPROACH SURFACE WIDTH AT END	1250	1500	2000	3500	4000	16000
D	APPROACH SURFACE LENGTH	5000	5000	5000	10000	10000	*
E	APPROACH SLOPE	20:1	20:1	20:1	34:1	34:1	*

A UTILITY RUNWAYS
B RUNWAYS LARGER THAN UTILITY
C VISIBILITY MINIMUMS GREATER THAN 3/4 MILE
D VISIBILITY MINIMUMS AS LOW AS 3/4 MILE
* PRECISION INSTRUMENT APPROACH SLOPE IS 50:1 FOR INNER 10000 FEET & 40:1 FOR AN ADDITIONAL 40000 FEET.



Source: FAR PART 77

FIGURE EIGHTEEN

AIRPORT IMAGINARY SURFACE

F. LAND USE GUIDELINES

LAND USE

Airport land use may be discussed in terms of the

- Impact of adjacent land uses on the airport
- Impact of the airport on adjacent land uses.

Each of the two general impacts can further be broken down into specific impacts. The impacts may not all be negative as some impacts are quite positive in nature. The objective is to insure that the land uses conflicts are reduced to a minimal level in view of the fact that it will not be possible to alleviate all problems. The following land use goals in the vicinity of the airport will provide a set of parameters upon which to design specific land use policies. These goals are not static nor is the list all inclusive. Through-out the planning period, goals are expected to change to meet unforeseen demand.

GOALS

- The airport and associated imaginary surfaces should be protected from encroachment of land uses that might impair operational capabilities of the facility.

- Having identified the ultimate level of airport development, care should be exercised through-out the planning period to insure that future expansion of the facility is not compromised.

- Adjacent airport environs should be protected against aircraft operations and noise.

- Establish or organize land uses on the airport and off the airport that will complement each other.

- Encourage the development of an industrial park adjacent to the airport.

LAND USE COMPATIBILITY

Land use compatibility depends upon a number of factors. In other words, to say that industrial activity is compatible depends upon the type to include structures and processes. The latter is of concern where considerable amounts of heat is released.

The following adjacent land use activities, identified by the FAA, are potentially compatible. Potentially compatible may be defined as a land use that does not, for example, exceed Part 77 requirements, or has properly been designed so that noise is not a problem.

Natural Corridors

Rivers	Canals	Natural Buffer Areas
Lakes	Drainage Basins	Forest Reserves
Streams	Flood Plain Areas	Land Reserves and Vacant Land

Open Space Areas

Memorial Parks and Pet Cemeteries	Archery Ranges
Water & Sewage Treatment Plants	Golf Driving Ranges
Water Conservation Areas	Go-Cart Tracks
Marinas, Tennis Courts	Skating Rinks
Golf Courses	Passive Recreation Areas
Park & Picnic Areas	Reservation/Conservation Areas
Botanical Gardens	Sod and Seed Farming
Bowling Alleys	Tree and Crop Farming
Landscape Nurseries	Truck Farming

Industrial and Transportation Facilities

Textile & Garment Industries	Foundaries
Fabricated Metal Products Industries	Saw Mills
Brick Processing Industries	Machine Shops
Clay, Glass, Stone Industries	Office Parks
Chemical Industries	Industrial Parks
Tire Processing Companies	Public Buildings
Food Processing Plants	Auto Storage
Paper Printing & Pbulishing Inds.	Parking Lots, Gas Stations
Public Workshops	Railroad Yards
Research Labs	Warehouse & Storage Buildings
Wholesale Distributors	Freight Terminals
Bus, Taxi & Trucking Terminals	

Airport and Aviation Oriented Facilities

Airparks	Aerial Survey Labs	Aerospace Industries
Banks	Aircraft Repair Shops	Airfreight Terminals
Hotels	Aircraft Factories	Aviation Research & Testing Labs
Motels	Aviation Schools	Aircraft and Aircraft Parts Manufacturers
Restaurants	Employee Parking Lots	

Commercial Facilities

Retail Businesses	Professional Services
Shopping Centers	Gas Stations
Parking Garages	Real Estate Firms
Finance & Insurance Companies	Wholesale Firms

The compatibility of each of these land use activities depends upon the proximity of the specific land use to the airport; the level of sound proofing and the type, height, and location of building structures.

The land uses identified herein as being compatible are not all inclusive nor is the list intended to suggest that such community land uses be located in the vicinity of the airport. Such land uses, when incorporated into the comprehensive growth and management plan, will insure a degree of compatibility within the vicinity of the airport.

G. SUMMARY

	Existing	Future
Runway 16/34	60' x 2,900'	60' x 3,500'
Crosswind Runway	--	60' x 3,500'
Runway Lighting	MIRL	MIRL
Taxiway	Stub	Stub
	(20' Width)	(30' Width)
	--	Partial Parallel
	--	(30' Width)
Runway, Taxiway, Apron Surface Composition	P.C.C.	P.C.C.
VASI-2	--	RW 16/34
REIL's	--	RW 16/34
Beacon	Existing	10-Inch
NDB	--	Relocate
Hangars	Conventional 72' x 60'	Same --
	Tee-Hangar 33' x 187'	Same --
	Tee-Hangar 57' x 133'	Same
	--	Tee-Hangar 52' x 143'
Apron	100' x 200 P.C.C.	Same
	-- --	121' x 200'+/- P.C.C.
Terminal Building	24' x 24'	Same

SECTION FOUR

AIRPORT DEVELOPMENT ALTERNATIVES

SOCIOECONOMIC/ENVIRONMENTAL FEASIBILITY

A. AIRPORT ALTERNATIVES

The present site, as depicted in Figure 19, lies in close proximity to the urbanized areas of the community. The existing runway alignment of N 15°23' west represents one development parameter. Other constraints include the water tower and Northwestern College to the northeast. County roads and farmsteads present additional constraints.

The existing runway, 60' x 2,900', can be extended by 860'±. Extension of the runway facility beyond 3,500' creates potential for land use conflicts. Extension of the runway to the northwest is not considered feasible. An extension of 850' is to be constructed on Runway End 34. This work is expected to be completed in 1979. Limitations to extension of the runway beyond 3750' are summarized below.

1. County Road
2. Farmstead
3. Pole Lines

A clear zone of 500' x 1,000' x 800' off RW 34 encroaches on the farmstead to the south. Without relocation of the county road, the ultimate length that could be obtained is 3,700' +/50' depending upon the runway end elevation.

1. 15' vertical distance from road elevation to approach slope (20:1). 15' x 20' = 300' + 200' = 500' The threshold of the Runway End 34 should be no closer than 500' +/- to the road.
2. The pole lines should be placed underground.
3. The farmstead presents a significant development constraint.

In summary, extension of the primary runway beyond a length of 3750 feet is not considered at present a feasible and prudent alternative.

Alternative locations for the crosswind runway are shown in Figures 20 and 21. A number of potential alignments were considered of which those identified as Alternatives One and Two were the only ones seriously considered. Constraints to the consideration of the other alignments are summarized as follows:

1. 60 degree separation between runway facilities.
2. Intensive urban land use development to the north and northeast. Of these land uses, the water tower and Northwestern College present the most salient constraints.

The runway should be no less than 2,800 feet in length. Because of area farmsteads, county road locations and adjacent land uses, extension of the runway beyond 3,500 feet would not appear to be feasible or prudent.

EXISTING AIRPORT SITE

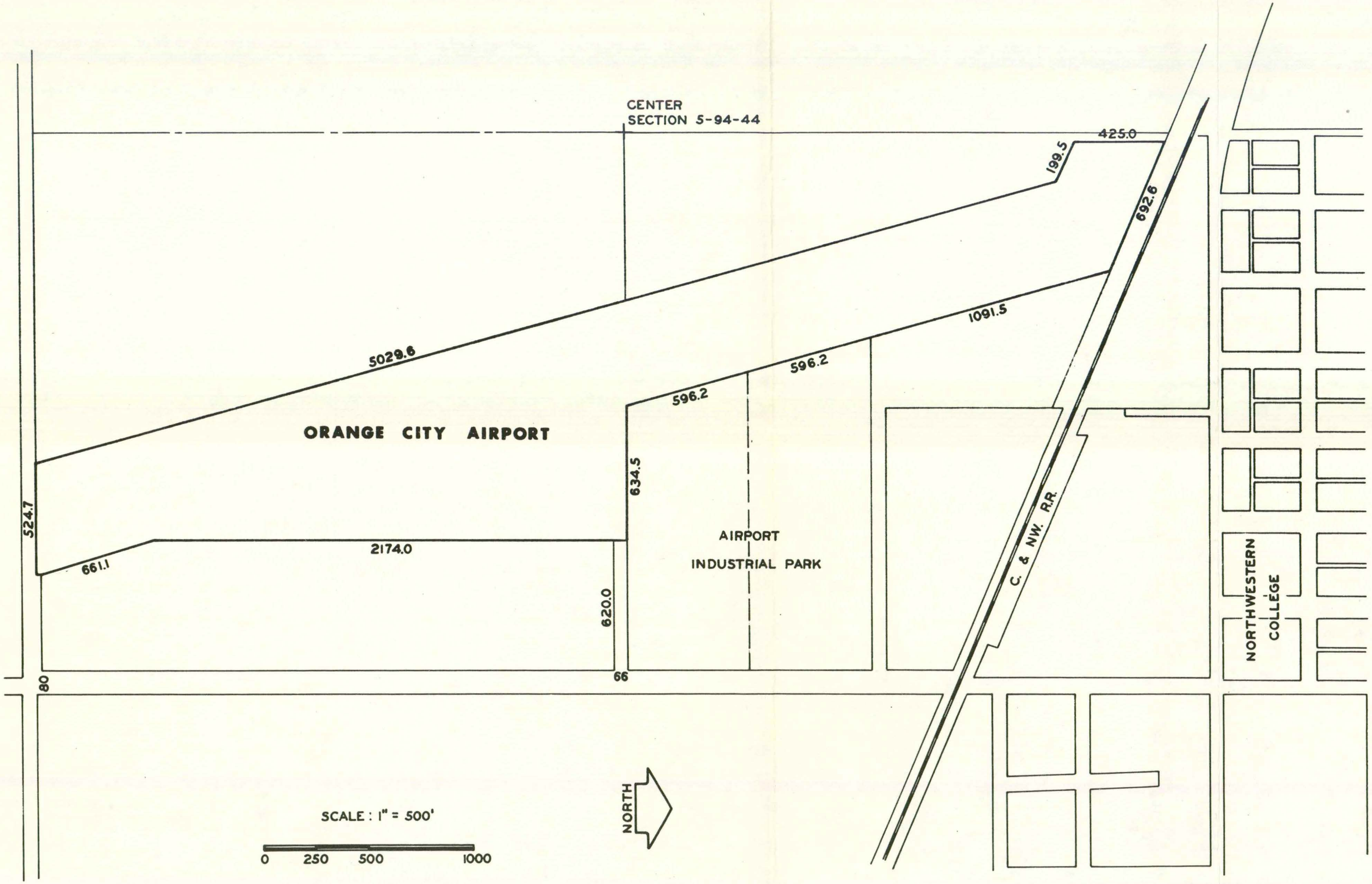
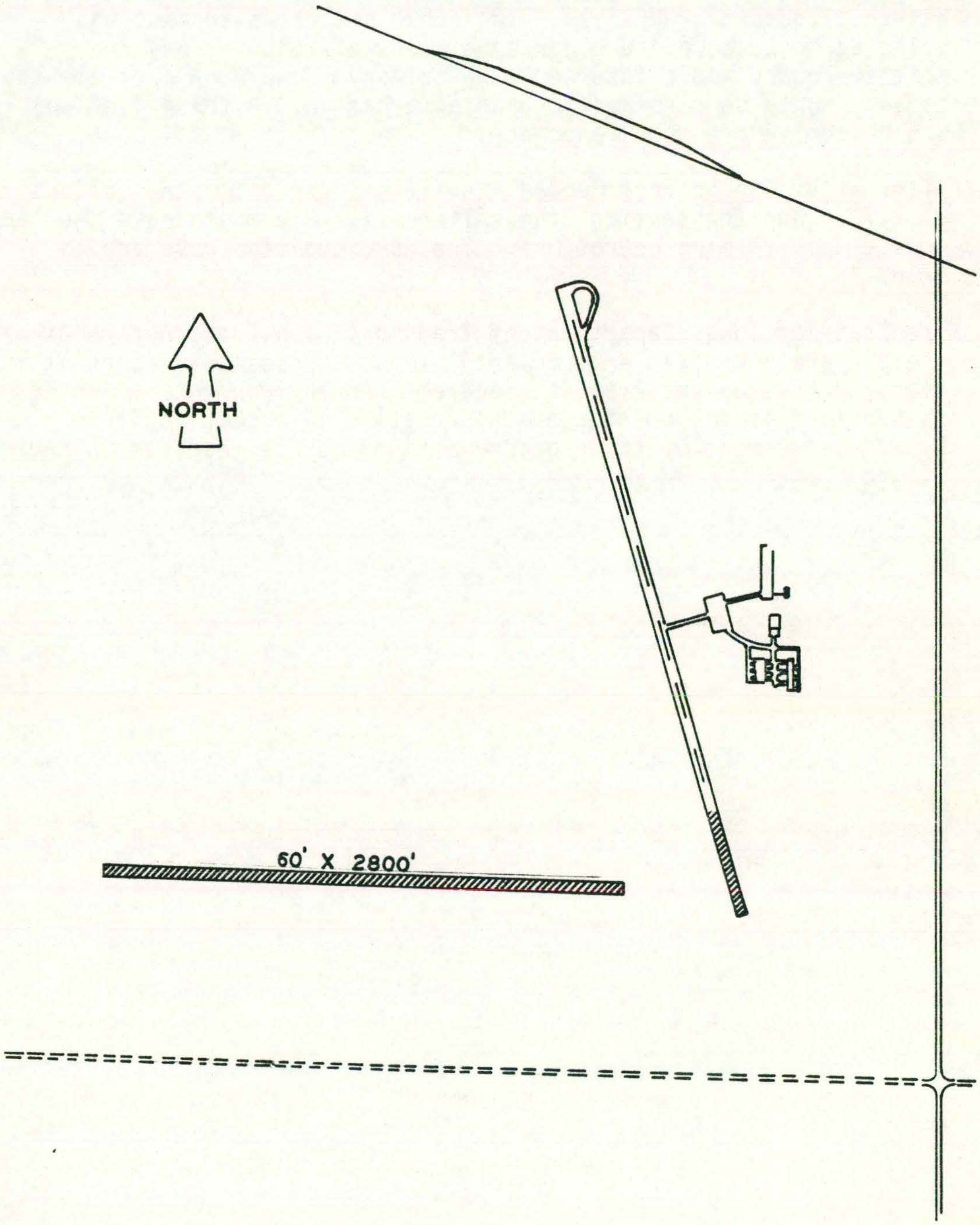


FIG. NINETEEN
PAGE IV-2

Alternative One supports an alighment of N 88° W. Alternative Two has an alignment of N 76° W. In each case, the alignment was selected to accommodate clear zone needs off each runway end. Neither runway would intersect the primary runway. A partial stub taxiway would be required in each alternative. Alternative Two would involve one more landowner.

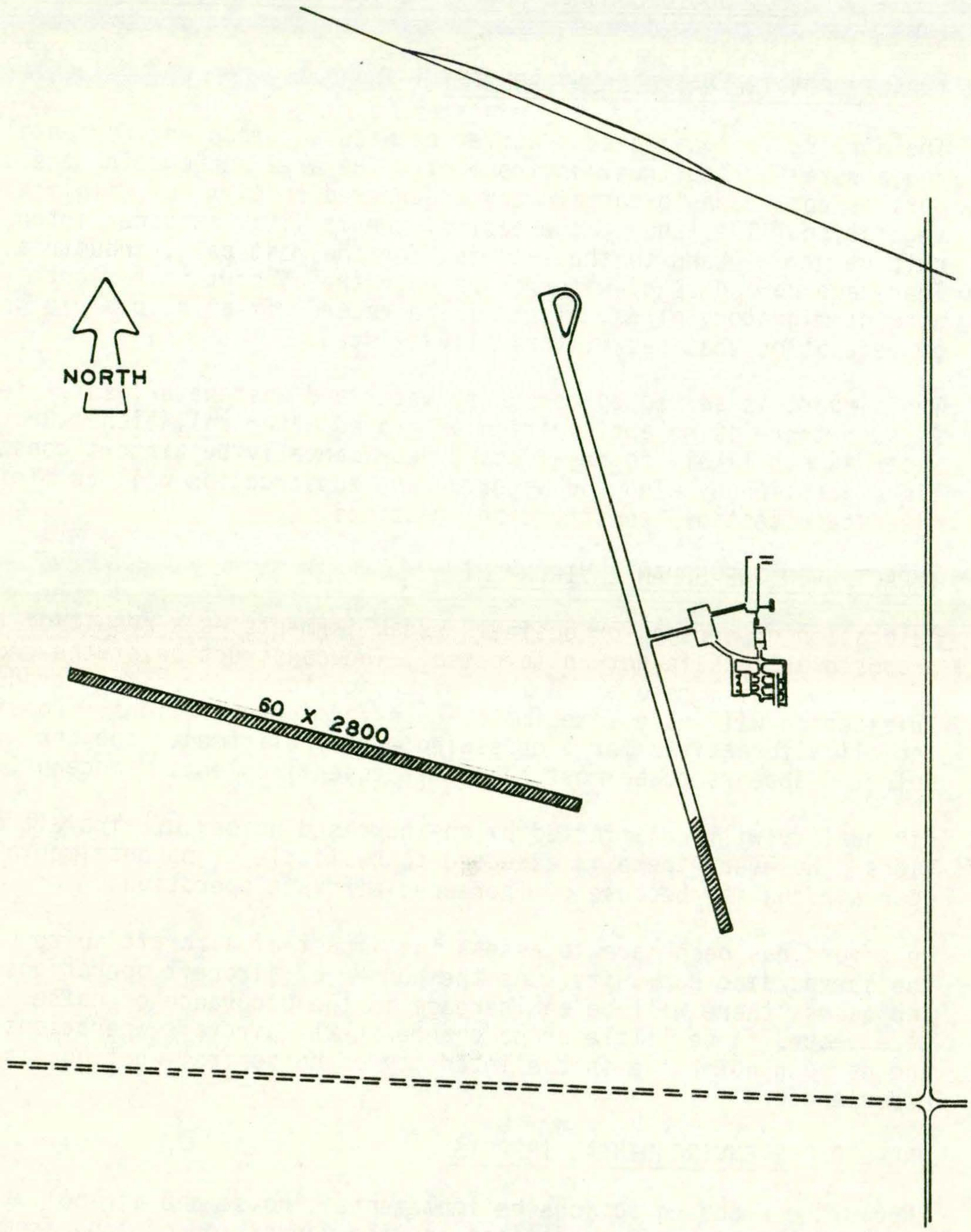
Alternative One is recommended. While neither alignment follows a half or quarter section line, Alternative One would have the least impact upon farming operations. The combined wind coverage is 97.6%.

The State of Iowa, Department of Transportation, does not require the preparation of an environmental impact assessment report at the time the Development Plan is prepared. An environmental overview is provided as follows for the alternative selected. A "full blown" assessment of the proposed actions may be required in the future.



ALTERNATIVE ONE

FIGURE TWENTY



ALTERNATIVE TWO

FIGURE TWENTY-ONE

B. SOCIOECONOMIC ENVIRONMENTAL FEASIBILITY

IMPACT UPON THE NATURAL ENVIRONMENT

The airport is located as a buffer between an urban environmental and a rural agricultrual environment. The area surrounding the airport is not known to contain any endangered species of wildlife or vegetation. The land to the east of the facility is under intensive cultivation. Land to the east is, for the most part, industrial. There are no bodies of water on or near the airport that might attract migratory birds. There is no record of native prairie grass or vegetation that has historically existed.

The airport is served by community water and wastewater facilities. As such there is no anticipation of ground water pollution. Ground water is not likely to be affected detrimentally by airport construction. Erosion by wind and water during construction will be minimized by acceptable construction practices.

IMPACT UPON THE HUMAN ENVIRONMENT

Relocation of persons or business establishments as a result of the proposed actions is not anticipated. The construction of the crosswind runway will remove a number of agricultural acres from production. This action will have some impact upon farming operations. Considering all alternatives for a crosswind runway alignment, the one selected appears to be most sensitive to environmental concerns.

Air quality will be affected by an increased number of aircraft operations. However, there is expected to be little or no detrimental impact upon air quality because of increased aircraft operations.

No effort has been made to assess the impact of aircraft noise upon the surrounding community. As the number of aircraft operations increases, there will be an increase in the occurance of noise. There is expected to be little or no change in the aircraft operations mix and as such no change in the intensity of noise from what no is experienced.

UNAVOIDABLE ENVIRONMENTAL IMPACTS

Should the proposed actions be implemented, noise and air pollution produced by aircraft operations and the conversion of land from natural or agricultural use are considered to be unavoidable enviornmental concerns.

Noise and air pollution impacts are not considered to have a significant adverse impact. The conversion of agricultural lands to airport use is a significant unavoidable environmental concern. There are no public lands involved. No water pollution other than temporary, minor soil erosion during construction of the airport is expected.

SHORT TERM EFFECTS AND LONG TERM BENIFITS

The conversion of agricultural land to airport use will have a short term effect upon agricultural operations. The farmer will be compensated for the loss of such land. Airport improvements will provide long-term improvements to the community.

Short-term impacts, as a result of construction, are summarized as follows:

1. Temporary airborn dust.
2. Noise from construction equipment.
3. Disruption of farming operations.

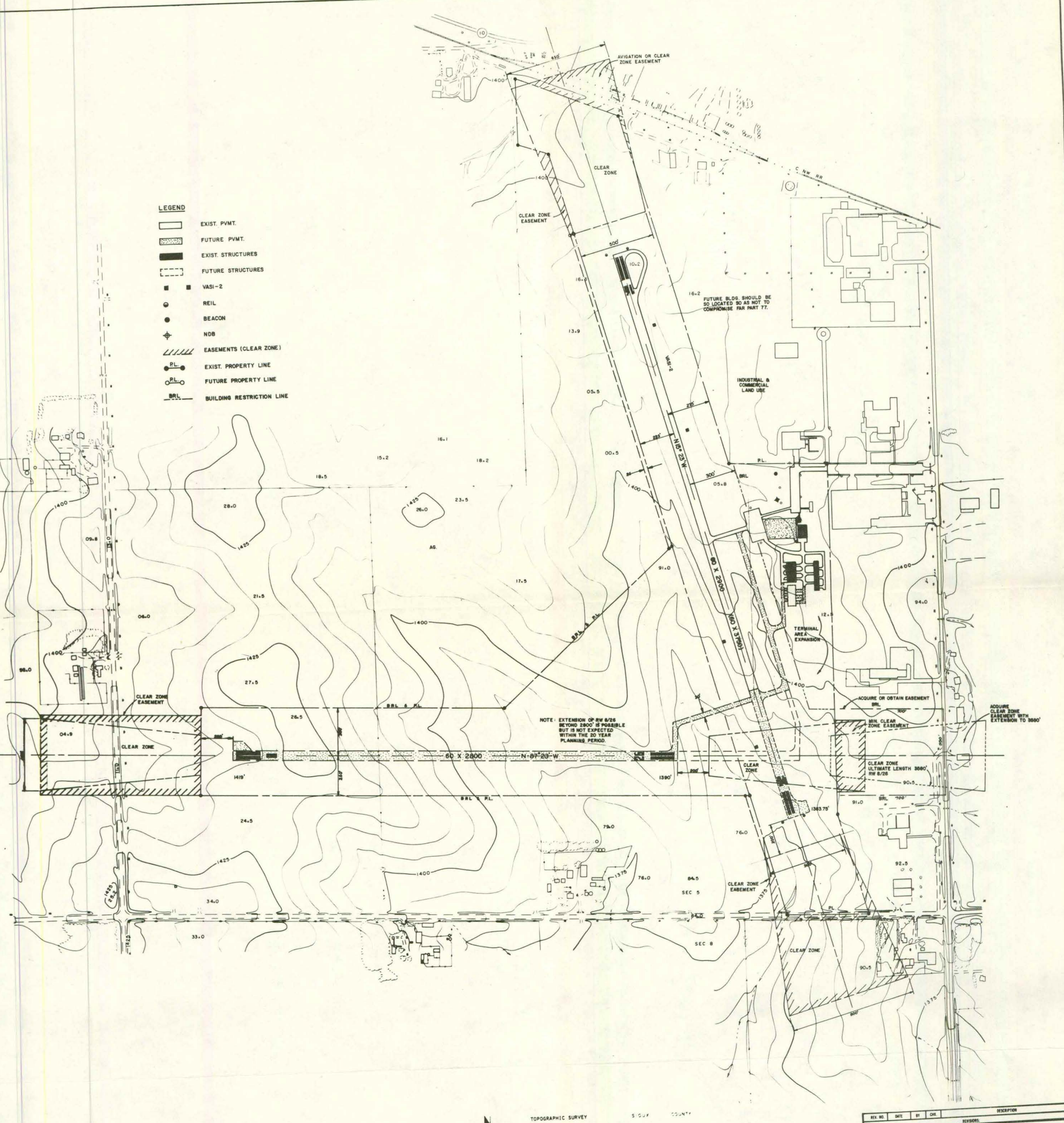
Actions to minimize short-term effects involve the use of sound construction practices as outlined in various FAA Advisory Circulars.

IRREVERSIBLE OR IRRETRIEVABLE COMMITMENTS OF RESOURCES

The commitment of materials, labor, and capital represents an irreversible and irretrievable commitment of resources. In addition, the land area used for construction of the runway or any paved surface represents a long-term commitment of a resource that may not necessarily be reclaimed for agricultural purposes.

SECTION V

AIRPORT SITE PLAN



REV. NO.	DATE	BY	CHK.	DESCRIPTION

REVISIONS:

ORANGE CITY MUNICIPAL AIRPORT
AIRPORT DEVELOPMENT PLAN

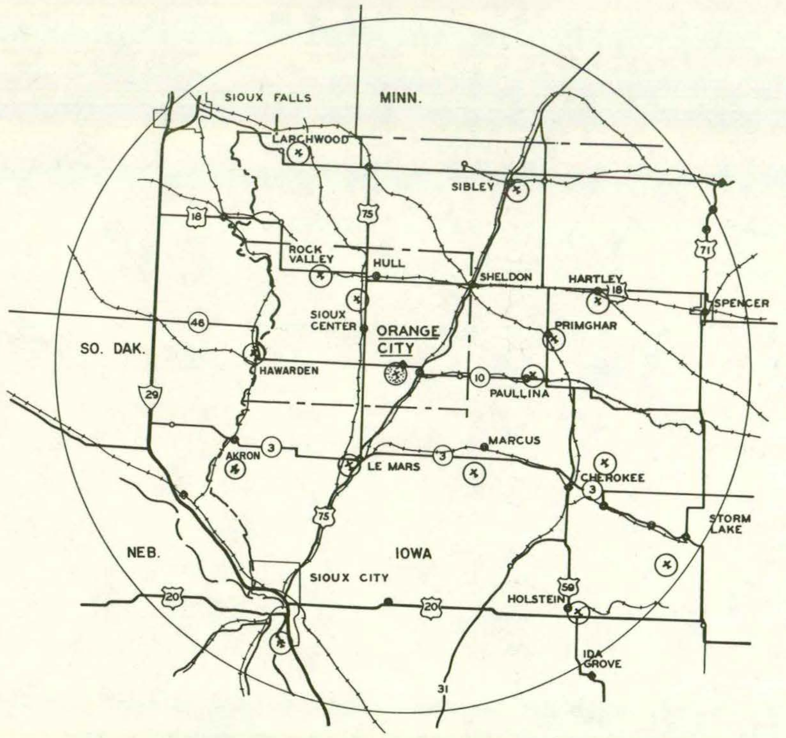
OTTO & CULVER
a Professional Corporation
Engineers Architects Land Surveyors

DESIGNED J.L.S.	DATE 4/19/79
DRAWN H.E.S.	SCALE AS SHOWN
CHECKED	
APPROVED	

AIRPORT LAYOUT PLAN

DWG NO 0-770108

REV NO



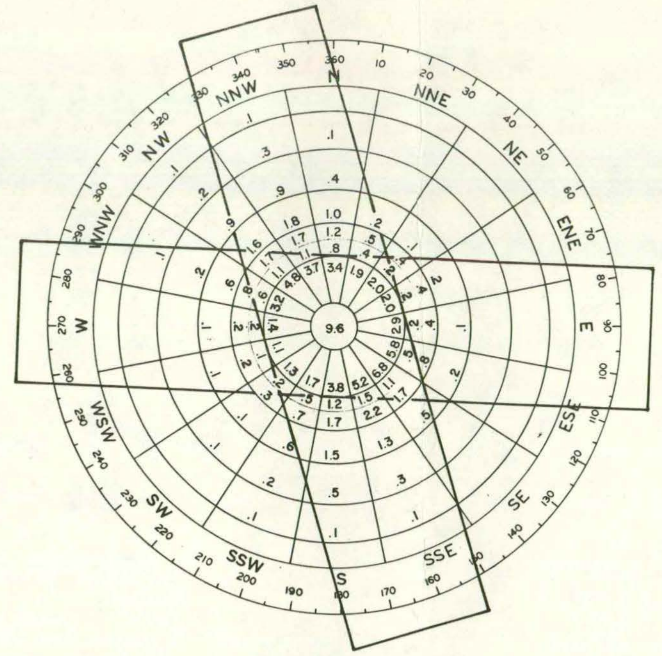
NORTH

VICINITY MAP

SCALE: 1" = 13 MI.

0 6.5 13 26

AIRPORT



WIND ROSE

SOURCE: SIOUX CITY, IOWA
PERIOD: 1951 - 1960

RUNWAY DATA	RUNWAY 16/34		RUNWAY 8/26			
	EXISTING	FUTURE	EXISTING	FUTURE		
EFFECTIVE RUNWAY GRADIENT	0.74 %	0.81 %		1.03%		
% WIND COVERAGE 12 MPH	91.4 %	91.4 %		76.7 %		
INSTRUMENT RUNWAY	N.P.I	N.P.I		NO		
APPROACH SURFACE	20:1	20:1		20:1		
RUNWAY LENGTH	2900'	3750'		2800' (35[illegible]0')		
RUNWAY WIDTH	60'	60'		60'		
RUNWAY STRENGTH	28000 lbs (sw)	28000 lbs (sw)		12500 lbs. (sw)		
RUNWAY SAFETY AREA WIDTH	120'	120'		120'		
RUNWAY LIGHTING	L-840	MIRL		MIRL		
NAVIGATIONAL AIDS	NONE	REIL, VASI-2		SAVASI		
RUNWAY MARKINGS	NPI	NPI		NPI		
RUNWAY END ELEVATIONS	RW 16: 1414'	1414'		RW 8: 1419' ±		
	RW 34: 1392.53'	1386.3'		RW 26: 1390' ±		

AIRPORT DATA		
	EXISTING	FUTURE
AIRPORT ELEVATION	1414' ASL	1419' ASL
AIRPORT LOCATION POINT COORDINATES	Lat. 42° 59' 24" N Long. 96° 04' 02" W	
NORMAL MEAN MAX. TEMP.	86° F	86° F
% WIND COVERAGE	91.4 %	97.6 %
AIRPORT NAVIGATIONAL AIDS	NDB	NDB
AIRPORT ACREAGE	80.5	141.2
FBO FACILITIES	YES	YES
AIRPORT LANDING AIDS	LIRL	MIRL, REIL, VASI-2
BEACON	YES	YES
SEGMENTED CIRCLE	NO	YES
LIGHTED WIND TEE	YES	YES
EASEMENTS	YES	YES

REV. NO.	DATE	BY	CHK.	DESCRIPTION

REVISIONS:

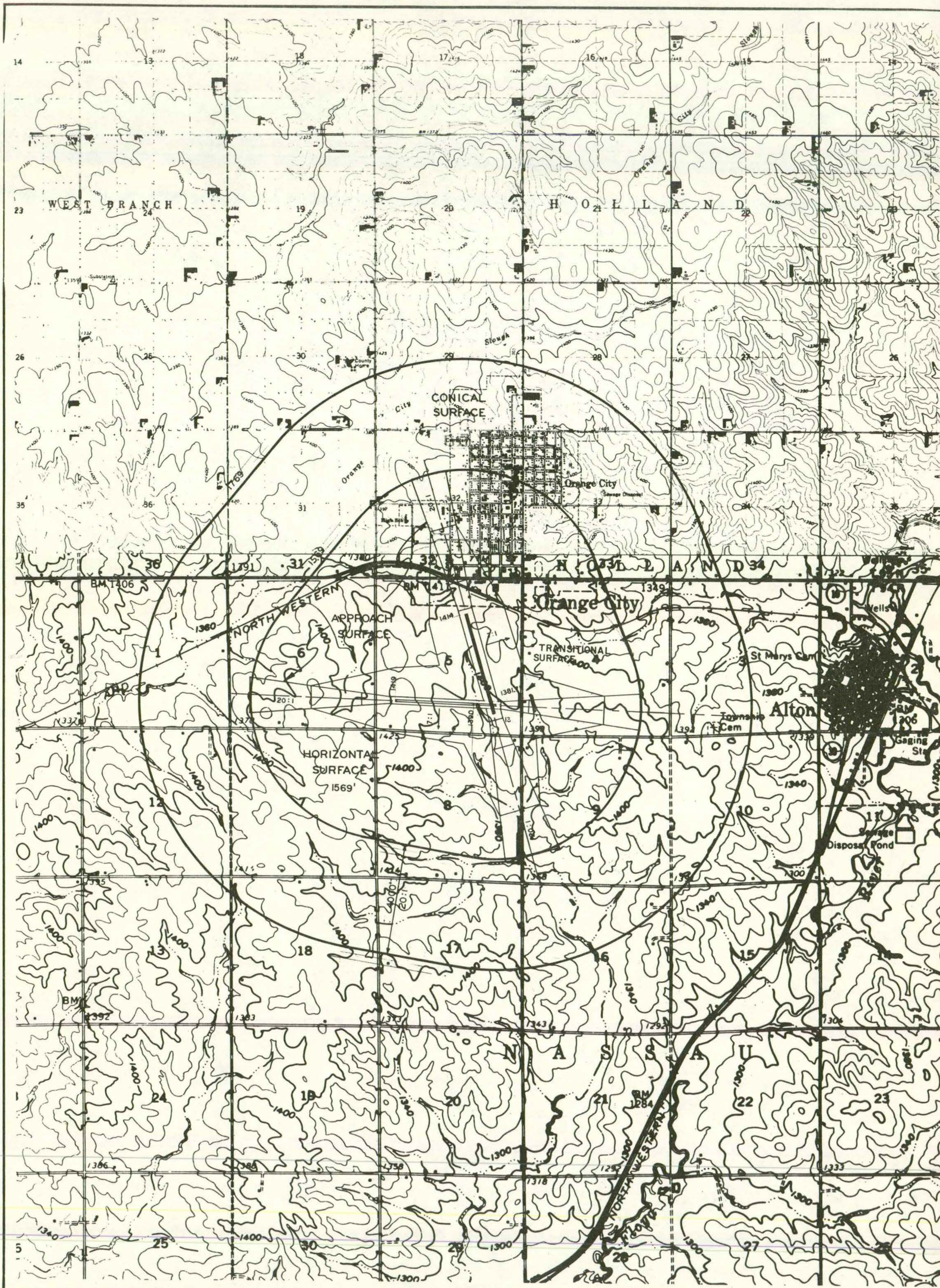
ORANGE CITY MUNICIPAL AIRPORT
AIRPORT DEVELOPMENT PLAN

OTTO & CULVER
a Professional Corporation
Engineers Architects Land Surveyors

DESIGNED: J.L.S.
DRAWN: K.E.B.
CHECKED:
APPROVED:
DATE: 4/15/79
SCALE: AS SHOWN

ALP DATA SHEET

DWG. NO. 0-770108-3
REV. NO.



AIRPORT ELEV. 1419' ASL

REV. NO.	DATE	BY	CHK.	DESCRIPTION
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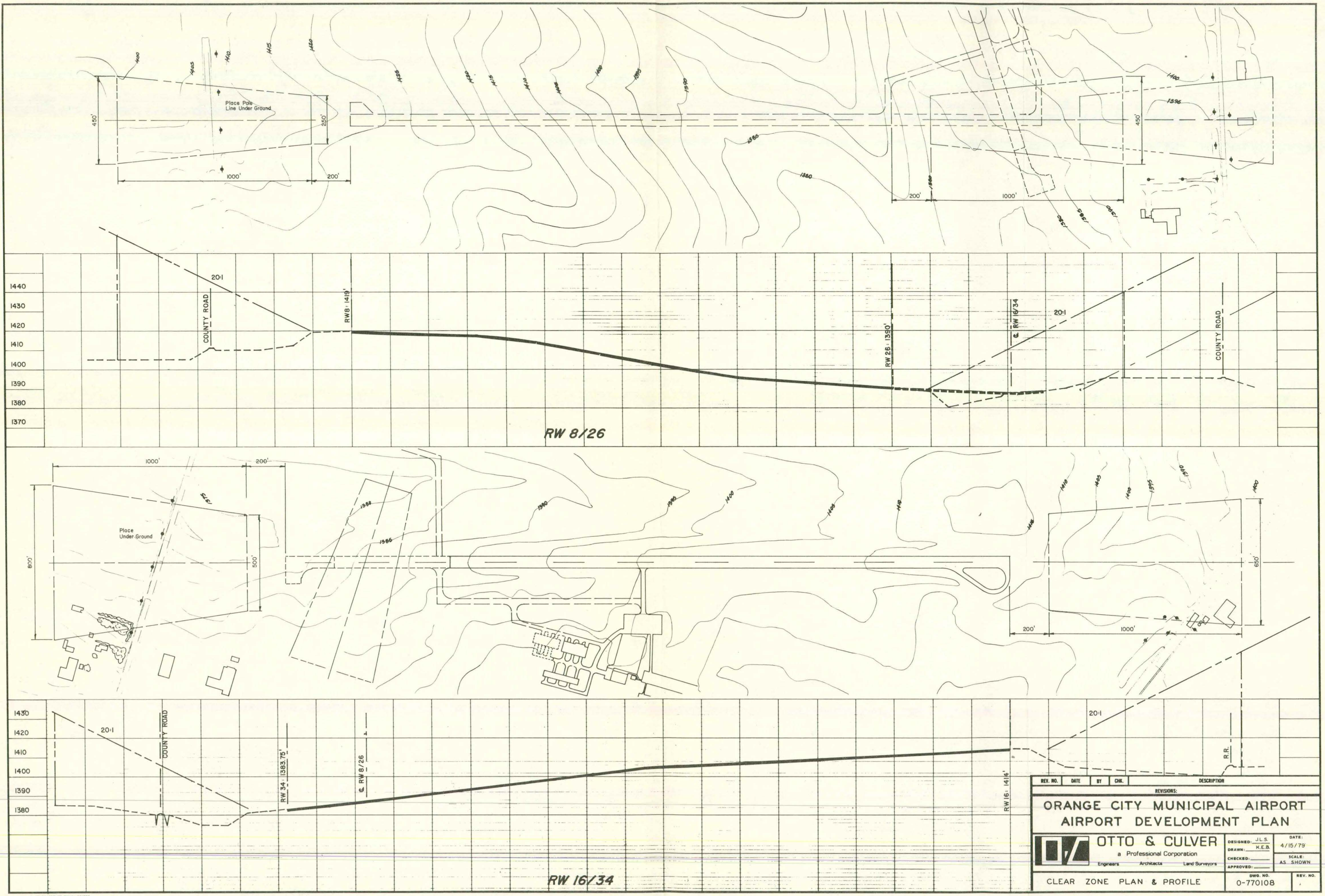
FAR PART 77

DWG. NO. 0-770108
REV. NO.



REV. NO.	DATE	BY	CHK.	DESCRIPTION

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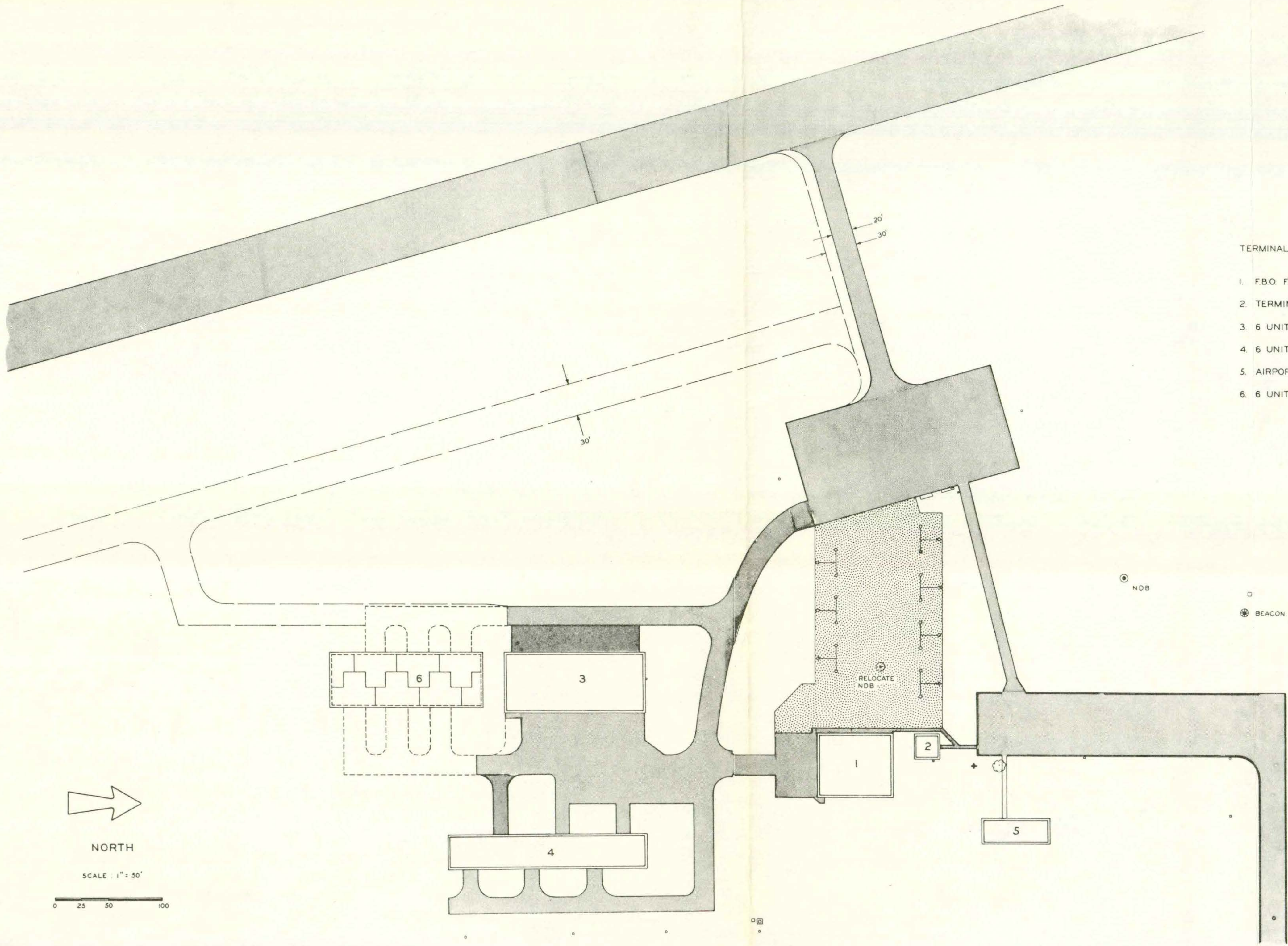
DESIGNED: J.L.S.
DRAWN: K.E.B.
CHECKED:
APPROVED:
DATE: 4/15/79
SCALE: AS SHOWN

CLEAR ZONE PLAN & PROFILE
DWG. NO. 0-770108
REV. NO.



TERMINAL AREA BUILDING

1. F.B.O. FACILITY 60' X 72'
2. TERMINAL BUILDING 24' X 24'
3. 6 UNIT HANGAR 57' X 133'
4. 6 UNIT HANGAR 33' X 187'
5. AIRPORT / F.B.O. MANAGERS RESIDENCE 1512 S.F. ±
6. 6 UNIT NESTED TEE HANGAR 52' X 72' (FUTURE)

LEGEND

⦿	NDB
(shaded)	EXISTING PVMT
---	FUTURE PVMT
⊢	TIEDOWNS
✱	BEACON
(stippled)	APRON EXPANSION - 1979

REV. NO.	DATE	BY	CHK.	DESCRIPTION

REVISIONS:

ORANGE CITY MUNICIPAL AIRPORT
AIRPORT DEVELOPMENT PLAN

OTTO & CULVER
a Professional Corporation
Engineers Architects Land Surveyors

DESIGNED: J.L.S.
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APPROVED:
DATE:
SCALE: AS SHOWN

TERMINAL AREA PLAN

DWG. NO. 0-770108
REV. NO.

SECTION VI

DEVELOPMENT SCHEDULE AND STRATEGY FOR IMPLEMENTATION

A. INTRODUCTION

The development schedule is simply a listing of improvements needed at the airport over the twenty year period in order to satisfy anticipated aviation activity. The development schedule is divided into two five-year phases and one ten-year phase.

Phase I	1978-1982
Phase II	1983-1987
Phase III	1988-1997

There are a number of factors that must be considered in the initial establishment of the development schedule. These factors are:

1. Absolute need.
2. Availability of financial assistance.
3. Anticipated changes in aviation activity.
4. Local financial constraints.

While certain of the proposed actions may be desirable, they are not critical, to the operation of the airport and should be of a lower priority than others. For example, an emphasis should be placed upon obtaining ultimate length on the primary runway prior to construction of the crosswind runway.

In maintaining flexibility, the development schedule should be reviewed along with the aviation forecasts at 5 year intervals. The schedule should be revised in accordance with "Findings" of the update.

B. DEVELOPMENT SCHEDULE AND COST ESTIMATES

PHASE ONE: 1978-1982

The Iowa Department of Transportation allocated funds in 1978 for the following improvements:

1. Extension of RW 16/34.

   a. 60' x 600' P.C.C. (60' x 3500')

2. Installation of medium intensity runway lighting on RW 16/34.

   a. 3500 L.F.

3. Installation of a simple abbreviated visual approach slope indicator on RW 16/34.

   a. SAVASI each end.

4. Installation of taxiway lights on turnaround on RW End 16 and "stub" taxiway.

5. Construction of an 80' x 80' turnaround on RW End 34.

The above project was let in 1978. However, a bid was not accepted and the project was let to bid in 1979. In addition, the IDOT allocated additional funds for apron expansion. These funds were added to the 1978 runway project.

The City of Orange City, also requested that some consideration be given to an extension of RW 16/34 beyond 3500 feet. Because of obstructions on both runway ends, it appeared only feasible to consider an extension on RW End 34. The close proximity of a county road and farmstead (off RW End 34) allows for a maximum extension of 260 feet at present.

A local industry, which has a MU.2 based at the facility, indicated at a public meeting in January 1979 that an additional 250 feet of runway would satisfy their needs. While additional length might be desirable, the aircraft could be "scheduled" during critical summer days. Thus, the decision to propose an 850' extension was made. The IDOT will participate only on that portion of an extension providing a total runway length of 3500 feet. Local sources are to provide funds for the 250' extension.

The proposed apron expansion contains seven tiedowns for itinerant aircraft. The project will also require the relocation of the existing NDB.

1. Construct apron

   a. 2880 S.Y. P.C.C.

The project for 1979 also proposes to accomplish the following:

1. Install runway end identifier lights (REIL) and a visual approach slope indicator, (VASI-2) on RW 16/34.
2. Install wind cone, Type L-807, 8'.
3. Install medium intensity runway lights on RW 16/34, 3,750 L.F.
4. Install medium intensity taxiway lights.

In addition to the improvements in the 1979 project, the City should also accomplish the following within Phase One.

1. Acquire title to 1.65 acres west of RW 16/34.
2. Acquire clear zone easements on both runway ends of RW 16/34.
   a. RW 16: 4.25 acres ±
   b. RW 34: 12.68 acres ±
3. Increase width of stub taxiway to 40 feet and relocate taxiway edge lights (low priority).

PHASE TWO: 1983-1987

Phase Two covers a period of time from 1983 to 1987. With the implementation of the proposed actions in Phase One, the airport should be able to meet aviation demand expectations. A new hangar structure is proposed for construction in Phase Two. The structure should be able to accommodate at minimum, 6 aircraft. Twenty foot taxiways should be constructed from the existing taxiway system.

1. Construct 6 unit nested tee hangar.
2. Construct 466 L.F. of taxiway. (20' x 466')

PHASE THREE: 1988-1997

A crosswind runway is recommended for implementation in Phase Three. The minimum length recommended for implementation is 2800 feet. A taxiway will be required to provide access to the terminal area. A turnaround is recommended on RW End 8.

1. Construct crosswind runway, RW 8/26.
   a. 60' x 2800' (Minimum) 60' x 3580' (Ultimate)
2. Construct turnaround on RW End 8.
   a. 600 S.Y.
3. Install medium intensity runway lights on RW 8/26.
   a. 2800 L.F.

4. Install SAVASI on RW 8/26.

5. Construct a 30 foot wide taxiway from RW End 26 to apron. The taxiway will cross RW 16/34 and parallel RW 16/34 to the existing "stub" taxiway.

6. Construct a 20 foot wide taxiway from the partial parallel taxiway to hangar area.

7. Install taxiway edge lights.

8. Acquire 59.02 acres of land for RW 8/26 (Based upon 2800' length).

   a. Fee Title

9. Acquire clear zone easements off Runway Ends 8 and 26. (Based upon 2800' length).

   a. 10.33 acres (RW End 8).
   b. 1.96 acres (RW End26).

The construction of the crosswind runway is considered of a lower priority than those improvements in Phase One and Two. Funding assistance for crosswind runways at "low activity" airports most likely will not be available until system primary runways are brought to standard. It should be noted that the ultimate length for RW 8/26 is 3,580 feet. Financial constraints may preclude construction of RW 8/26 to the ultimate length within the 20 year planning period.

The cost estimates presented herein are preliminary in scope and are not based upon detailed engineering plans and specifications. The costs are also based upon the 1979 dollar value for all three phases. A more realistic Phase Two and Phase Three cost can be obtained by multiplying the costs presented by 1.45 and 2.0 respectively.

The primary purpose of preparing long-range costs is to provide the sponsor with some indication of total capital needs at the airport. Over the twenty year period, new procedures and technology may change the basis used for the estimates.

The construction of the crosswind runway represents the most significant commitment of financial resources. To be implemented in Phase Three, the proposed action might be accomplished in phases.

1988	Land Acquisition
1990	Grading
1992	Hard Surface, Lighting

PHASE ONE COSTS:

1. 1979 Project - Grading and Paving
   a. 850 foot extension to RW 16/34 (60' x 850')
   b. Turnaround - RW 34 (80' x 80')
   c. Apron and Seven tiedowns (2880 S.Y.)
   d. Subdrain, 6" and 8"
   e. Seeding, Fertilizing
   f. Runway markings

g. Project Cost:

1.	Construction Cost	$199,844.20
2.	Engineering and Contingency (20%)	39,968.84
		$239,813.04

2. 1979 Project - Runway Lighting
   a. Wind Cone, 8'.
   b. Medium Intensity Runway Lights
   c. Medium Intensity Taxiway Lights
   d. Visual Approach Slope Indicator (VASI-2)
   e. Runway End Identifier Lights (REIL)
   f. Project Cost

1.	Construction Cost	$ 25,023.13
2.	Engineering and Contingency (20%)	5,004.26
		$ 30,027.76

3. 1979 to 1982 Projects:

   a. Land Acquisition:

1.	1.65 acres at $2500 per acre	$ 4,125.00

   b. Clear Zone Easements:

1.	4.25 acres at $1250 per acre	$ 5,312.50
2.	12.68 acres at $1250 per acre	15,850.00

   c. Increase width of stub taxiway

1.	10' x 250' (278 S.Y.)	$ 4,170.00
2.	Relocate taxiway edge lights	250.00

   d. Project Cost

1.	Construction Cost	$ 29,707.50
2.	Engineering and Contingency (20%)	5,941.50
		$ 35,648.00

The cost of clear zone easements is assumed to be one-half the cost fee title acquisition. The land acquisition process is one of negotiation and as such, the actual costs could vary considerably.

<u>PHASE TWO COSTS:</u>

1. 1983 to 1987 Projects

a.	6 unit tee hangar (52' x 143')	$ 50,000.00
b.	Taxiway (20' x 466') (1036 S.Y.)	15,540.00
c.	Project Cost	

1.	Construction Cost	$ 65,540.00
2.	Engineering and Contingency (20%)	13,108.00
		$ 78,648.00

2. Assuming that inflation will continue, the above project cost may reach $114,040.00 (1.45 x 78,648) within Phase Two.

PHASE THREE COSTS:

1. 1988 to 1997 Projects:

a. RW 8/26 Paving Project (60' x 2800')

1.	Excavation	$ 84,000.00
2.	Compaction	9,634.00
3.	Granular Subbase	24,636.00
4.	6" P.C.C.	231,204.00
5.	Stripping, Topsoil	33,600.00
6.	Subdrain Tile	16,800.00
7.	Seeding and Fertilizer	5,280.00
8.	Runway Markings	800.00
9.	Project Cost	
	a. Construction	405,954.00
	b. Engineering and Contingency	81,191.00
		$487,145.00

b. RW 8/26 Lighting

1.	MIRL, 2800 L.F. (9.00/ft.)	$ 25,200.00
2.	SAVASI	6,000.00
3.	Project Cost	
	a. Construction	$ 31,200.00
	b. Engineering and Contingency	6,240.00
		$ 37,440.00

c. Taxiway (30' x 2065', 20' x 314)

1.	Paving and Grading: 7581 S.Y. x 21	$159,201.00
2.	Lighting (Medium Intensity) 2370 x 6.50	15,464.00
	a. Construction	$174,664.00
	b. Engineering and Contingency	34,933.00
		$209,597.00

d. Land Acquisition

1.	Fee Title (59.02) 3000/acre	$177,060.00
2.	Easements (12.29) 1500/acre	18,436.00
3.	Project Cost	
	a. Acquisition	$195,496.00
	b. Engineering and Contingency	39,099.00
		$234,596.00

e. Total Phase Three Cost $968,778.00

2. Applying an inflation factor to the Phase Three cost would find the 1979 estimated cost nearer the 2,034,434 dollar figure by Phase Three (968,778 x 2.10).

Development costs anticipated at Orange City over the twenty year planning period are summarized in the following table.

Table 22 Project Development Costs by Phase

PHASE	PERIOD	PROJECT COSTS	INFLATION COSTS
One	1979-1982	$305,488.80	
Two	1983-1987	78,648.00	($114,040.00)
Three	1988-1997	968,778.00	($2,034,434.00)

C. AIRPORT REVENUE AND EXPENDITURES

As with most small general aviation airports, the annual O & M expenditures equal or exceed revenue generated by the airport. In Iowa, those airports generating farm income from the lease or rental of airport property, may have revenues in excess of O & M expenditures. In nearly all cases, such income is not adequate to implement major capital improvements. Thus, it appears that income generated by the airport should be expected to do no more than meet annual O & M costs.

Table 23 Annual O & M Costs, 1975-1979

Year	Insurance	Payroll	Maintenance	Total
1975	$2,225.06	$5,428.71	$2,867.25	$10,521.02
1976	1,279.21	2,691.04	357.62	4,327.87
1977	1,963.61	2,716.12	1,266.18	5,945.91
1978	2,313.42	2,746.33	412.58	5,472.33
1979	1,732.00	3,596.71	1,316.00	6,644.71

Source: City of Orange City

The above table summarizes annual O & M expenditures from 1975 through 1979. The following table summarizes annual revenue for the same period.

Table 24 Annual Revenue, 1975-1979

Year	Hangar Rental	Lease of land
1975	$ 900.00	$ 3,130.40
1976	50.00	3,555.00
1977	--	2,365.00
1978	--	2,370.50
1979	--	2,254.00

Source: City of Orange City

As noted in the above tables, annual O & M costs exceed revenue produced. A long range goal of the city should be to move the airport towards producing sufficient revenue in the amounts to equal O & M costs. While it is recommended that future hangars be constructed by the private sector, the ownership of the hangars should revert to the city after a period of 10 to 20 years. In some cases, it may be possible to lease land for hangar construction which in turn would generate revenue.

A general obligation bond was issued in 1966 to construct the present airport. The bond will be retired in 1981.

D. STATE AND FEDERAL ASSISTANCE

The Department of Transportation, Federal Aviation Administration, (FAA) provide financial assistance for a number of airport components under the Airport and Airway Development Act of 1970. The FAA provides up to 80% of the total cost on eligible items.

In general, eligible items include all airport requirements except those that specifically benefit the private sector. For example: hangars and the taxiway 20-foot from the hangar are not eligible. Parking lots and internal road systems are not eligible. Terminal buildings are not eligible except at CAB certificated air carrier airports.

The Iowa Department of Transportation also provides grants-in-aid to airports with the state airport system. At present, the rate of participation is 70% on eligible items. Airport components eligible for state assistance, are the same as those eligible for federal assistance.

Total assistance available from the FAA and IDOT for general aviation airports in Iowa, has not historically exceeded 1.2 million dollars annually. Available funding anticipated from both sources is summarized in the table below:

Table 25 Summary of State and Federal Assistance for G A Airports.

Year	Federal	State	State Safety Reserve	Total
1978	$656,000	$526,000	$25,000	$1,207,000
1979	700,000	587,000	25,000	1,312,000
1980	700,000	644,000	25,000	1,369,000
1981	700,000	704,000	25,000	1,404,000
1982	700,000	762,000	25,000	1,487,000
1983	700,000	825,000	25,000	1,550,000

Source: IDOT: Improvement Program, 1978-1983, Page A-7

Historic Federal and State assistance is summarized in the table below:

Table 26 Historical Assistance to Orange City

Year	Project Number	Source	Amount
1967	- C701	FAA	$ 115,876.00
1978	Airport Development Plan	IDOT	8,050.00
1979	Runway Extension, Apron & Lighting	IDOT	154,467.92

E. FEASIBILITY

The feasibility of the proposed actions are dependent upon the availability of state and federal assistance as well as the ability of the city to provide the local match. The projects to be completed in 1979 will provide the airport with the capability of providing an adequate level of service except for the crosswind capability.

Local funds have been made available for the 1979 project. It is expected that a general obligation bond would be required for the crosswind runway project.

The construction of the crosswind runway to a ultimate length of 3500 feet (BU-II) is not expected to be realized within the twenty year planning period. It is recommended that a minimum length of 2800 feet be constructed within the twenty year planning period. Major constraints to construction of the crosswind runway will be the availability of federal and state assistance as well as local constraints. Land acquisition will also involve a significant commitment of resources. For these reasons, no effort was made to program for the ultimate length of 3500 feet for the crosswind runway. (RW-8/26) with the 20 years. The ultimate length was, however, depicted on the airport development plan drawings.

In summary, the airport will generate sufficient income to meet annual O & M costs. It will require total community support in order to implement the major capital improvements. With the completion of the 1979 projects, the airport will offer a high level of service except for the crosswind capability. Terminal area development (hangar construction) is expected to be completed by the private sector.

The most immediate concern will be for the community to take measures to protect the investment in facilities. As opportunities for acquisition of clear zones become available, the city should acquire them. If fee title acquisition is not possible, a clear zone easement must be obtained. Use of the Tall Structures Ordinance to control the height of structures with the airports' area of influence must also be exercised.

The following should be considered within the twenty year period as actions which may be justified beyond 1997.

1. Acquisition of farmstead south of RW End 34.
2. Closing of county road off RW End 34.
3. Possibility of extending RW 16/34 to 4100 feet provided justification could be found within the twenty years.
4. Possible construction of RW 8/26 to 3580 feet.
5. Acquisition of 8.8 acres of land off RW 8.

While none of the above considerations appear feasible or justified at present nor in the immediate future, some thought should be given to these actions taking place over the long term. The most salient concern is land use conflicts off Runway End 8.

Financial assistance, a key element, may be obtained through a grant-in-aid from the Federal Aviation Administration or Iowa Department of Transportation. The items proposed for implementation are eligible except for the hangar structure and taxiway twenty feet from the hangar. Should the private sector construct hangars and related facilities, the city would then be left with the required local match to a Federal and/or State Grant-in-aid.

APPENDIX

DEFINITIONS AND ABBREVIATIONS

Air Carrier - A person who undertakes directly, by lease, or other arrangement, to engage in air transportation.

Airport Development Aid Program - ADAP provides public sponsors financial aid for airport development. As a condition precedent to granting ADAP funds,an airport must be included in the National Airport Plan. The federal aid grant agreement requires that the airport sponsor operate the airport, as a public airport for a twenty-year period following the grant.

Airport and Airways Development Act of 1970 - The official legislation enabling the annual obligation authority of the Airport Development Aid Program during the period of July 1, through June 30, 1980, under the Federal Aviation Act of 1958.

Aircraft Operation - The airborne movement of aircraft in controlled and noncontrolled airport terminal areas and about given enroute fixes or at other points where counts can be made.

Airport Advisory Service - A service provided by Flight Service Stations at airports not served by a control tower. This service consists of providing information to landing and departing aircraft concerning wind direction and velocity, favored runway, altimeter setting, pertinent known traffic, pertinent known field conditions, airport taxi routes and traffic patterns, and authorized instrument approach procedures.

Airport Traffic Control Tower (ATCT) - A central operations facility in the terminal air traffic control system, consisting of a tower cab structure, including an associated IFR room if radar equipped, using air/ground communications and/or radar, visual signaling and other devices to provide safe and expenditous movement of terminal air traffic.

Certified Route Air Carrier - One of a class of air carriers holding certificates of public convenience and necessity issued by the Civil Aeronautics Board. These carriers are authorized to perfrom scheduled air transportation on specified routes and a limited amount of non-scheduled operations.

Commuter Air Carrier - An air taxi operator which (1) performs at least five round trips per week between two or more points and publishes flight schedules which specify the times, days of the week, and places between which such flights are performed, or (2) transports mail by air pursuant to current contract with the Post Office Department (FAR 298.3).

Enplanements, Revenue Passenger - The total number of revenue passengers boarding aircraft, including originating,stopover, and transfer passengers.

Fixed-Wing Aircraft - Aircraft having wings fixed to the airplane fuselage and outspread in flight, i.e., nonrotating wings.

Flight Plan - Specified information relating to the intended flight of an aircraft, that is filed orally or in writing with air traffic control.

Flight Service Station (FSS) - A central operations facility in the national flight advisory system utilizing data interchange facilities for the collection and dissemination of NOTAMS, weather, and administrative data, and providing pre-flight and in-flight advisory service and other services to pilots, via air/ground communication facilities.

Freight, Air - Property other than express and passenger baggage transported by air.

General Aviation - That portion of civil aviation which encompasses all facets of aviation except air carriers holding a certificate of convenience and necessity from the Civil Aeronautics Board, and large aircraft commercial operators.

IFR Conditions - Weather conditions below the minimum prescribed for flight under Visual Flight Rules.

Instrument Approach - An approach during which the pilot is dependent entirely upon instruments and ground-based electronic and communication systmes for orientation, position, altitude, etc.

Instrument Flight Rules (IFR) - FAR rules that govern the procedures for conducting instrument flight.

Instrument Landing System (ILS) - A system which provides in the aircraft, the lateral, longitudinal, and vertical guidance necessary for landing.

Local Operation - A local operation is performed by an aircraft that: (1) operates in the local traffic pattern or within sight of the tower; (2) is known to be departing for or arriving from flight in local practice areas; or (3) executes simulated instrument approaches or low passes at the airport.

Navigational Aid (NAVAID) - Any facility used in, available for use in, or designed for use in aid of air navigation, including landing areas, lighting; and apparatus or equipment for disseminating weather information, for signaling, for radio direction finding, or for radio or other electronic communication and any other structure or mechanism having a similar purpose for guiding or controlling flight in the air or the landing or takeoff of aircraft.

Piston-Powered Aircraft - An aircraft operated by an engine in which pistons moving back and forth work upon a crank shaft or other device to create rotational movement.

Precision Approach - An instrument approach conducted in accordance with directions issued by a controller referring to the surveillance radar display until the aircraft is turned onto final runway.

Turbojet - Aircraft operated by jet engines incorporating a turbine-driven air compressor to take in and compress the air for the combustion of fuel, the gases of combustion (or the heated air) being used to both rotate the turbine and to create a thrust producing jet.

Turboprop - Aircraft operated by turbine-propelled engines. The propeller shaft is connected to the turbine wheels, which operate both the compressor and the propeller.

Unicom - Frequencies authorized for aeronautical advisory services to private aircraft. Only one such stations is authorized at any landing area. The frequency 123.0 mcs is used at airports served by airport traffic control towers and 122.8 mcs is used for other landing areas. Services available are advisory in nature, primarily concerning the airport services and airport utilization.

VFR Conditions - Basic weather conditions prescribed for flight under Visual Flight Rules.

VFR Flight - Flight conducted in accordance with Visual Flight Rules.

VOR or Very High Frequency Omnirange Station - A specific type of range operating at VHF and providing radial lines of position in any direction as determined by bearing selection within the receiving equipment. (NOTE: This facility emits a nondirectional "reference" modulation and a rotating pattern which develops an "avariable" modulation of the same frequency as the reference modulation. Lines of position are determined by comparision of phase of the variable with that of the reference.

LIST OF ABBREVIATIONS

ATC - Air Traffic Control

ATCT - Airport Traffic Control Tower

CAB - Civil Aeronautics Board

DME - Distance Measuring Equipment

DOT - Department of Transportation

DWG - Dual Wheel Gear

DTWG - Dual Tandem Wheel Gear

FAA - Federal Aviation Administration

FAR - Federal Aviation Regulations

FAS - Flight Advisory Service

FBO - Fixed Base Operator

FSS - Flight Service Station

HIRL - High Intensity Runway Lights

IFR - Instrument Flight Rules

ILS - Instrument Landing System

MEA - Minimum En Route IFR Altitude

MIRL - Medium Intensity Runway Lights

MSL - Mean Sea Level

NASA - National Aeronautics and Space Administration

NAVAID - Navigational Aid or Air Navigational Facility

NOTAMS - Notice to Airmen

NTS - Not to Standard or Scale

REIL - Runway End Identifier Lights

STOL - Short Takeoff and Landing

SWG - Single Wheel Gear

TACAN - Tactical Air Navigation

TVOR - Terminal Very High Frequency Omnidirectional Radio Range

UNICOM - Air to Ground Radio Communication Facilities